



High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 4: Off-route effects



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Department for Transport

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Preface

The Environmental Statement

This document is Volume 4 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 Impact Assessment Report

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.

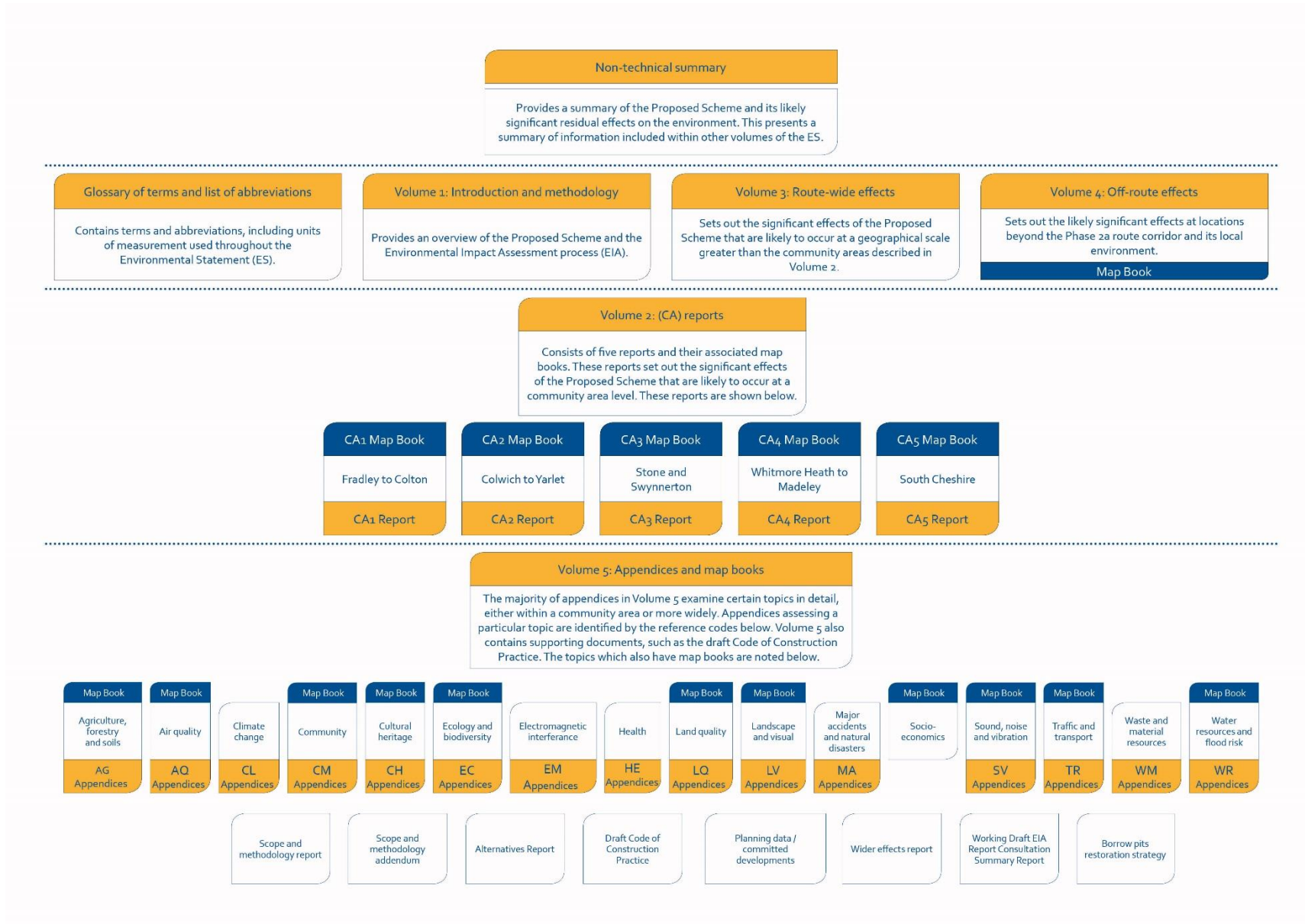
Volume 5: Appendices and map books

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.

Figure 1: Structure of the HS2 Phase 2a ES



1 Introduction

1.1 Overview of High Speed Two

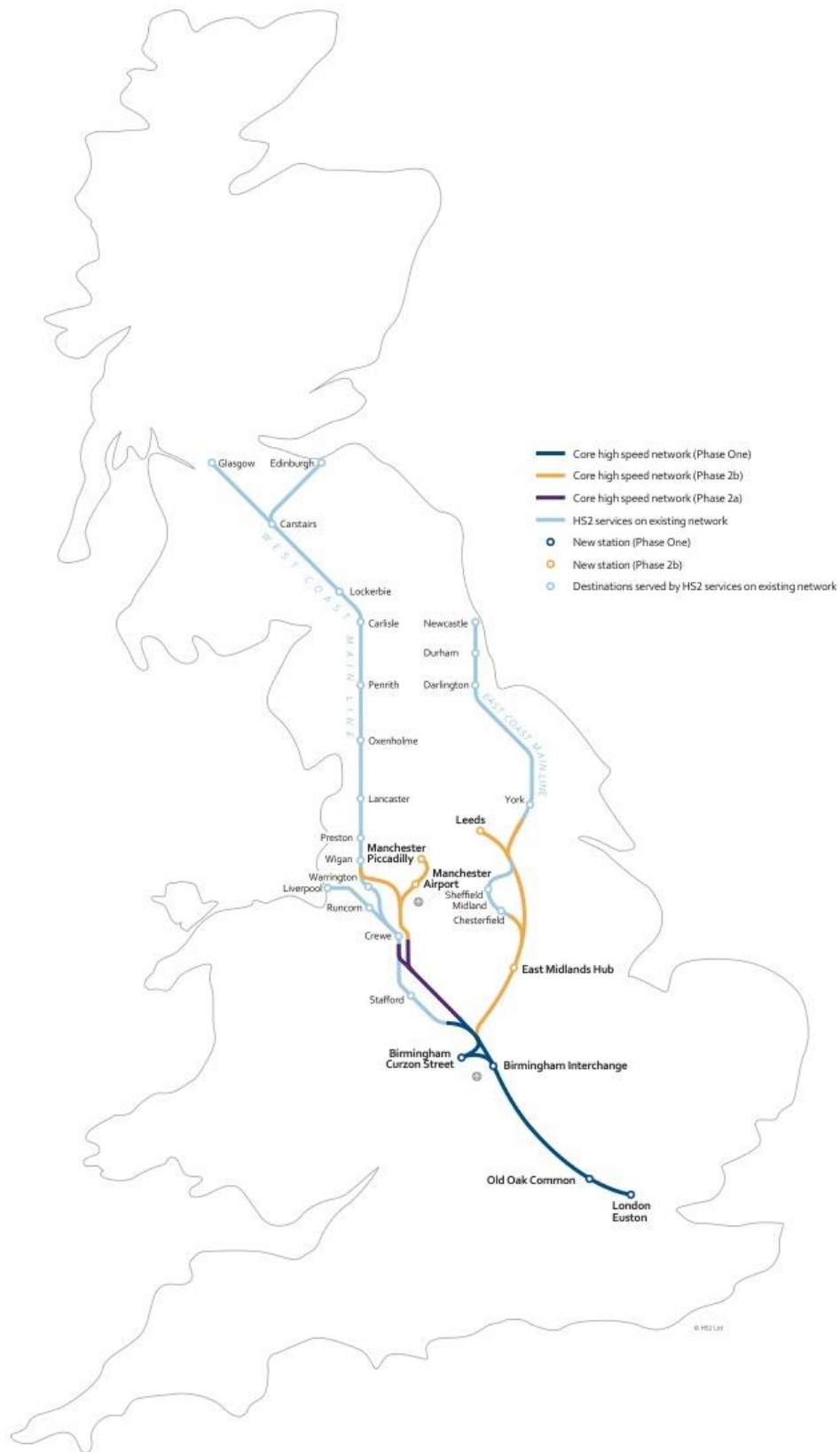
- 1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester and East Midlands will be served by high speed trains running at speeds of up to 225mph (360kph). Trains will also run beyond the HS2 network to serve destinations including South Yorkshire, Liverpool, Glasgow, Edinburgh, Newcastle and York. The proposed HS2 network including the Phase 2a route between the West Midlands and Crewe is shown in Figure 2: The HS2 Core Network.
- 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 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. 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.

1.2 Purpose of this report

- 1.2.1 This report presents those aspects of the construction and operation of the Proposed Scheme that have the potential to generate significant environmental effects in locations outside the route corridor (i.e. 'off-route').
- 1.2.2 The ES Volume 2 Community area reports and Volume 3 Route-wide effects report present the likely significant effects generated 'on-route', that is to say within the route of the Proposed Scheme and the local environment between Fradley and Crewe.
- 1.2.3 Off-route effects are defined as 'those that may occur in locations beyond the scheme's route corridor and its associated local environment, and which are not within the spatial scope of the Volume 2 reports or the Volume 3 route-wide effects report'. The nature of the Proposed Scheme means that such potential effects are principally related to implications for other transport infrastructure.
- 1.2.4 The off-route effects assessment considers likely significant environmental effects in relation to changes and/or works at off-route rail stations; modifications to the Crewe to Manchester Line (which is part of the WCML) north of Crewe; and off-route highways modifications.
- 1.2.5 Figure 2 identifies the relevant off-route stations, Preston and Warrington Bank Quay, which have been taken forward for assessment. The Volume 4: Off-Route Effects Map Book contains maps relating to the modifications to the Crewe to Manchester Line and the off-route highways modifications.

Environmental Statement, Volume 4: Off-route effects

Figure 2: The HS2 Core Network



1.3 Structure of this report

1.3.1 This report is divided into four main sections:

- Section 1 sets out the purpose of this report;
- Section 2 provides an overview of the scope of the assessment and a description of the aspects of construction and operation of the Proposed Scheme that may give rise to off-route effects;
- Section 3 reports the assessment of off-route station impacts;
- Section 4 reports the assessment of the works that will be required on the Crewe to Manchester Line; and
- Section 5 reports the assessment of the off-route highways modifications.

1.3.2 The methodologies used for the assessments reported in sections 3 to 5 accord, unless stated otherwise, with the methodologies for each discipline described in Volume 1¹ (Section 8), the EIA Scope and Methodology Report (SMR)² and the EIA SMR Addendum³. Potential environmental effects are likely to be limited at off-route locations and the assessments undertaken were informed by scoping exercises, reported in sections 3 to 5. The report only presents findings for those topics which were scoped in, which include: air quality; cultural heritage; ecology; landscape and visual; sound, noise and vibration, and traffic and transport. Where appropriate, the environmental baseline, an assessment of construction and operational effects, the proposed mitigation measures, the likely significant residual effects and any requirements for monitoring are reported.

¹ See ES Volume 1, Introduction to the Environmental Statement

² *Environmental Impact Assessment Scope and Methodology Report*, Volume 5: Appendix CT-001-001

³ *Environmental Impact Assessment Scope and Methodology Report Addendum*, Volume 5: Appendix CT-001-002

2 Defining the scope of the off-route effects assessments

2.1 Introduction

- 2.1.1 This section presents the approach to the assessment of off-route effects. It outlines the scoping approach adopted in order to focus the assessment on the likely significant effects on off-route receptors as a result of construction and operation of the Proposed Scheme.
- 2.1.2 The EIA SMR sets out the geographic scope for the EIA. The SMR (Section 4.2) refers to the need for the EIA to consider any likely significant effects caused by activities such as HS2 services on the existing conventional railway network.
- 2.1.3 To facilitate the HS2 services that will run on the conventional Crewe to Manchester Line (part of the WCML) north of Crewe, there is a need to make modifications to the track alignments of the Crewe to Manchester Line. These will be made in two locations, Maw Green and Sandbach, 2.5km and 5.5km north of Crewe Station respectively, and will include additional switches and crossings. The environmental effects of these works are considered in this report.
- 2.1.4 Other track modifications will be required to the WCML south of Crewe, where it runs in parallel with the Proposed Scheme in the Whitmore Heath to Madeley (CA4) and South Cheshire (CA5) areas. Those works are described and any likely significant effects reported in the ES Volume 2, Community area 4, Whitmore Heath to Madeley and Community area 5, South Cheshire reports.
- 2.1.5 The introduction of HS2 train services and changes in service provision on the WCML brought about by the introduction of HS2 train services will also alter the passenger use of some stations on the national rail network. Changes in passenger numbers may affect parking at these stations and traffic volumes on local roads around these stations. Where the environmental effects of such changes are considered likely to be significant, these are reported.
- 2.1.6 A requirement for off-route highway modifications has also been identified to ensure that the routes concerned can meet the construction access requirements for the Proposed Scheme. The modifications have been proposed following an appraisal of local roads required to access particular locations along the Proposed Scheme. This appraisal examined the geometry of the identified roads and the constraints to their use by HGVs⁴ required for the construction and operation of the Proposed Scheme.
- 2.1.7 The proposed modification works include: kerb realignments at junctions to allow safe turning, widening of existing highways that are currently too narrow for construction vehicles to use safely, and the provision of passing bays to allow safe passing of HGV traffic, including abnormal loads, and HS2 maintenance vehicles.

⁴ Large rigid or articulated construction HGV, in some cases carrying abnormal loads

2.2 Assessment scope

- 2.2.1 The following sections provide a summary of the scoping process that was undertaken to identify potential significant effects on off-route receptors. Confirmation of the environmental topics included in the assessment is provided in sections 3 to 5 of this report.

Off-route railway stations

Criteria for environmental assessment

- 2.2.2 The assessment for the Proposed Scheme has followed the same approach as used for HS2 Phase One in order to identify off-route stations where the operation of the Proposed Scheme will result in an increase in passenger numbers. The potential for this to result in significant effects as a result of the Proposed Scheme, and of HS2 Phase One and Phase 2a combined, has been considered. Off-route stations identified and assessed for HS2 Phase One are reported in Volume 4 of the HS2 Phase One ES⁵. The operational impacts on Crewe Station are not considered in this report and are assessed in Volume 2, Community area 5, South Cheshire.
- 2.2.3 The identification of stations for assessment of off-route effects is based upon the SMR criteria for traffic and transport impacts and takes into account the potential for air quality, sound, noise and vibration, community and any other relevant effects. The SMR criteria identify a 10% change in use (measured in this context in terms of station footfall) as a threshold for when impacts on transport infrastructure, such as parking provision, might become significant and when those changes in traffic might affect pedestrian and cyclist severance⁶.
- 2.2.4 A further criterion has been applied to identify the potential effects on traffic congestion and delays, taking into account the capacity of station access routes. A minimum change in likely highway use of 5% has been adopted and this has been used to calculate an equivalent daily change in rail passengers. If a station is served by a busy urban single carriageway road, a threshold of a change of 700 users per day has been applied. For stations with higher capacity and dual carriageway access, a higher threshold of 1,400 users per day has been used. These thresholds assume a reasonable maximum percentage of passengers likely to arrive or depart by car or taxi and likely passenger arrival and departure times.
- 2.2.5 If the thresholds for impacts on transport infrastructure and severance (a 10% change in use) or congestion (5% of highway capacity, i.e. a change of 700 or 1,400 users depending on the type of road) are likely to be exceeded, further analysis has been used to determine whether the changes in use would be likely to result in significant effects. Below these thresholds, the potential impact on transport facilities, congestion, air quality, sound, noise and vibration and community are likely to be negligible.

⁵ HS2 Ltd (2013), *London-West Midlands Environmental Statement Volume 4: Off-route effects*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/259489/Volume_4_Off-route_effects.pdf.

⁶ Severance is the separation of residents from facilities and services they use within their community, generally resulting from changes to transport infrastructure

Forecast change in passengers (PLANET model)

2.2.6 The forecast change in passengers as a result of HS2 Phase One and Phase 2a has been provided from the PLANET Framework Model (PLANET Model), which is a strategic transport model covering all long-distance rail movements across the UK. The PLANET Model is the Department for Transport's (DfT) forecasting model and has been used to develop rail demand forecasts as a result of the Proposed Scheme. It is regularly updated and changes made since the HS2 Phase One analysis in 2013 include:

- revisions to forecast conventional rail services and the HS2 proposed service pattern;
- updated forecasts of the growth in travel, building on the latest evidence of current patterns of rail travel (including updating the base model);
- changes to official forecasts for the growth of the UK economy and other drivers of transport demand; and
- updates to assumptions relating to committed transport investment.

2.2.7 Data from the PLANET Model was used to obtain forecast changes in passenger demand at off-route stations as a result of the Proposed Scheme and of HS2 Phase One and Phase 2a combined. Daily passenger trips for HS2 Phase One and Phase 2a in 2036 were obtained, together with the forecast change in passenger numbers.

Selection of stations to be assessed

2.2.8 The criteria and forecast described above were used to identify stations where changes in passenger use arising from the Proposed Scheme in isolation, and in combination with HS2 Phase One, could give rise to effects on other transport networks. The screening was based on the PLANET Model forecast of changes in passenger numbers at all stations across the UK with the HS2 Phase One and Phase 2a network operational. A 2041 assessment year has been used for this assessment, and since the PLANET Model only provides forecasts up to 2036, these have been increased in line with expected trend growth to 2041⁷.

2.2.9 The screening identified that for the Proposed Scheme, considered in isolation, there are no stations that exceed the threshold criteria in relation to the changes in passenger use. When considering the combined impacts of the Proposed Scheme and HS2 Phase One, the screening identified that one or both of the threshold criteria are predicted to be exceeded at the following off-route stations:

- Milton Keynes Central;
- Stafford;
- Runcorn;

⁷ 2041 is used for the future year operational assessment to be consistent with the HS2 Phase One assessment

- Warrington Bank Quay; and
- Preston.

- 2.2.10 The changes in use identified for the Proposed Scheme and HS2 Phase One combined have been compared to those assessed in the HS2 Phase One ES. As a result of updates to the PLANET Model (described in Section 2.2.6), for Runcorn and Stafford, which exceed the threshold criteria, the changes in passenger use now forecast for the Proposed Scheme and HS2 Phase One combined are less than or similar to those forecast in the HS2 Phase One ES. As a result, any potential significant effects and need for potential mitigation has already been considered and these stations have not, therefore, been the subject of further analysis in this ES.
- 2.2.11 At Milton Keynes Central, a series of dual carriageway boulevards provide access to the station from the A509, the A5 and other routes. As a result, the higher threshold of 1,400 users per day has been applied. In addition, there is a bus interchange at the station, and with a substantial proportion of the increased usage forecast to be local trips, it is expected that there will be a high level of public transport use for accessing the station. It is therefore expected that this will reduce the number of passengers leaving Milton Keynes Central by car to below the 1,400 users per day threshold. Consequently, Milton Keynes Central Station has not been the subject of further assessment.
- 2.2.12 A more detailed assessment was undertaken for the remaining two stations, Preston and Warrington Bank Quay, as reported in Section 3. The HS2 Phase One ES did not identify impacts likely to result in significant effects at either of these stations. However, based upon the updated analysis, using the PLANET Model and current service assumptions, these stations have now been scoped into this assessment.

Modifications to the Crewe to Manchester conventional railway line (part of the WCML), at Maw Green and Sandbach

- 2.2.13 Rail systems modification works are proposed at two locations, Maw Green and Sandbach, on the Crewe to Manchester railway line, which is part of the WCML. These works are required to facilitate train operations that will occur as a result of HS2 Phase 2a services using this line prior to the operation of HS2 Phase 2b, which is planned for 2033. The proposed works will also help to ensure that best use is made of existing capacity, while maintaining operational flexibility.
- 2.2.14 The works require the installation of new at-grade track switches and crossings⁸, replacement of existing crossings, the raising of an existing footbridge at Sandbach station and supporting infrastructure as required. The construction will be intermittent, taking place during a series of rail possessions in 2021 and 2022.
- 2.2.15 These works on the Crewe to Manchester Line are included within the scope of the off-route assessment on the basis that they have potential to give rise to significant environmental effects.

⁸ Sections of track that guide trains from one track to another and allow them to cross paths.

Off-route highway modifications

- 2.2.16 This volume of the ES reports the assessment of a number of minor highway and junction modifications that are at a distance from the route of the Proposed Scheme. Highway modifications that are within or adjacent to the land required for the Proposed Scheme are assessed in the Volume 2, Community area reports.
- 2.2.17 An environmental screening exercise was undertaken to identify which off-route highway modifications may give rise to environmental effects that could potentially be significant. This concluded that 12 highway modification locations should be taken forward to the environmental scoping stage.
- 2.2.18 The scoping exercise considered the potential for likely significant effects and identified four of the off-route modifications for environmental assessment. The scoping exercise identified a need for environmental assessment covering cultural heritage, ecology, and landscape and visual (although not all topics are relevant to all four locations).
- 2.2.19 Traffic and transport is not included as an assessment topic. This is because the highway modifications are not likely to give rise to any significant adverse traffic and transport impacts during their construction, due to the short duration, and relatively localised nature, of the works. Once completed, the purpose of such modifications is to mitigate the adverse impacts arising from HS2 construction traffic that would occur without them.

2.3 Potential impacts scoped out of the off-route assessment

- 2.3.1 A number of other potential off-route impacts, including some considered in Volume 4 of the HS2 Phase One ES, were considered, but have been scoped out of the assessment as they are not likely to give rise to significant environmental effects. These are described in this section.

Other works to Network Rail infrastructure

- 2.3.2 There could be other consequences of HS2 train operations, arising from 'released capacity' on the wider conventional rail network after 2026, which would allow a different mix of passenger and freight services to be operated on parts of that wider network, during HS2's operating hours (05:00 to 00:00). No decisions have yet been made about how such 'released capacity' will be used, nor on which parts of the conventional network there will be 'released capacity'. It is, therefore, not possible to undertake any assessment of the potential environmental impacts of those changes.
- 2.3.3 There may also be further works required to the conventional rail network in future to accommodate the overall growth in demand for passenger and freight services, including planned HS2 services. None of these have been specifically identified at this stage as they are a matter to be addressed as part of ongoing conventional rail network improvement programmes. Insofar as those works involve further powers or are likely to give rise to significant adverse effects likely to require further applications for consents or approval, they will require environmental assessment at the appropriate time.

Utility diversions and works to National Grid infrastructure

- 2.3.4 The Proposed Scheme will affect utilities at various locations. Where utility works have the potential to give rise to significant environmental effects along the route of the Proposed Scheme, these are considered in the relevant Volume 2, Community area reports.
- 2.3.5 With regard to the proposed modifications to the Crewe to Manchester Line assessed in Section 4, there will be no permanent diversions of utilities required. Any utilities on the footbridge at Sandbach, which is to be raised, are assumed to be suitable to be lifted. Therefore, utilities are not considered further in this report.

Waste and material resources

- 2.3.6 Volume 3, Route-wide effects reports the route-wide assessment of the likely significant environmental effects associated with the off-site disposal to landfill of solid waste that will be generated by construction and operation of the Proposed Scheme. That assessment includes the types and quantity of waste that will be generated, the quantity of waste that will require off-site disposal to landfill, and the availability of landfill disposal capacity to manage waste requiring off-site disposal to landfill.
- 2.3.7 It is recognised that waste will arise at terminal stations on, or remote from, the HS2 scheme from passengers travelling on the railway that was not considered as part of the HS2 Phase One assessment. However, the quantities of this waste will be relatively small and are not likely to give rise to any significant effect. This waste has therefore been scoped out of the assessment of the Proposed Scheme.
- 2.3.8 There will be some waste generated through the construction process for the proposed modifications to the Crewe to Manchester conventional railway line assessed in Section 4. This will be managed in accordance with the Code of Construction Practice (CoCP)⁹ and is not likely to give rise to any significant effect.
- 2.3.9 Waste and material resources are not, therefore, considered further in this report.

Off-route rail depots/stabling facilities

- 2.3.10 As part of HS2 Phase One, a number of depots/stabling facilities (Edge Hill depot, Liverpool; Longsight depot, Manchester; Longsight International depot, Manchester and Polmadie depot, Glasgow¹⁰) are expected to require works to accommodate HS2 conventional compatible trains. The impacts of these works were assessed in Volume 4 of the HS2 Phase One ES.
- 2.3.11 These depots/stabling facilities will also serve trains using the Proposed Scheme, but no additional works are expected to be required that are likely to give rise to new or different significant effects to those reported in the Phase One ES.
- 2.3.12 Therefore, off-route rail depots/stabling facilities are not considered further in this report.

⁹ Draft Code of Construction Practice, Volume 5: Appendix CT-003-000.

¹⁰ Edge Hill depot, Longsight depot, Longsight International depot and Polmadie depot required only basic upgrading of facilities, plus Controlled Emission Toilet (CET) and carriage washing equipment works.

3 Off-route railway stations

3.1 Introduction

- 3.1.1 This section reports the assessment undertaken for the two off-route railway stations, Preston and Warrington Bank Quay, where there is potential for significant effects, due to an increase in passenger numbers as a result of the Proposed Scheme in combination with HS2 Phase One. Section 2.2 of this report describes the screening criteria used to identify these railway stations and confirms that the Proposed Scheme, in isolation, will result in no significant effects for any environmental topic as a result of increased passenger use at off-route stations.

3.2 Methodology

- 3.2.1 The assessment of off-route railway stations covers traffic and transport, sound, noise and vibration, and air quality. The impacts that are a consequence of the Proposed Scheme in combination with HS2 Phase One (referred to as the 'Proposed Scheme in combination' in this section) relate solely to changes in passenger numbers at these stations as no physical works are proposed. It should be noted that if the traffic and transport, sound, noise and vibration, and/or air quality assessments had predicted likely significant effects, it would have become necessary to consider the implications for community and socio-economics. However, no likely significant effects were predicted and these topics were not assessed. No other environmental topics were identified as having potential for significant environmental effects.

Traffic and transport assessment methodology

- 3.2.2 In terms of assessing traffic and transport impacts, the focus was primarily on changes to the number of cars and taxis accessing stations as a result of the operation of the Proposed Scheme in combination, as this has a greater potential to give rise to significant environmental effects compared to bus use, walking and cycling. Existing commercial bus operators determine the frequency of bus services and can be expected to make adjustments to accommodate any changes in passenger demand when planning future services.
- 3.2.3 A two-stage approach has been used to assess the operational impacts and consequential effects of the Proposed Scheme in combination on the traffic and transport network local to the two off-route stations.

Stage 1

- 3.2.4 In addition to the identification of stations with increases in passenger use in excess of 10%, stage 1 comprised the estimation of the vehicular trips likely to be generated as a result of the Proposed Scheme in combination at each off-route station, and a comparison with the peak hour threshold trip generation of 75-95 or 150-190 vehicle movements respectively, for single and dual carriageway standard roads. These figures represent the predicted peak hour traffic flows that would arise from the 700 or 1,400 station users/day applied as the EIA screening criteria. If the number of trips to be generated by the Proposed Scheme in combination was equal to or greater than these thresholds, a second stage of analysis was undertaken to establish the potential impacts and effects on the local road network.

- 3.2.5 The following process was used to establish the number of trips generated by the operation of the Proposed Scheme in combination at each off-route station:
- existing conditions at the off-route stations were established through site visits, specially commissioned traffic surveys and data from local authorities. Traffic surveys at the stations and on the local road networks were undertaken in 2017 comprising junction turning counts, automatic traffic counts, car park and drop off surveys;
 - for the purpose of analysis, the highway peak hours were taken as 08:00-09:00 and 17:00-18:00;
 - the existing vehicular trip generation at each off-route station was established from the traffic surveys and the future baseline for the year of assessment, 2041, has been predicted by applying growth in line with the DfT Trip End Model Presentation Program (TEMPro)¹¹; and
 - the Proposed Scheme and HS2 Phase One trip generation was predicted from the traffic survey data, TEMPro growth forecasts and PLANET Model passenger demand forecasts of percentage growth in station use. The mode share¹² in the future with the growth was assumed to remain the same as the existing mode share.

Stage 2

- 3.2.6 To establish the impacts and effects on the local road network at each off-route station, a comparison of the future baseline with the Proposed Scheme and HS2 Phase One traffic flows was carried out.
- 3.2.7 For the Proposed Scheme in combination, traffic flows were developed by assigning the trip generation predicted in Stage 1 to the local road network and adding them to the future baseline traffic flows. The potential for significant effects was identified based on the changes in traffic flows resulting from the changes in station use, together with the percentage increase in use in relation to pressure on transport infrastructure such as parking.

Sound, noise and vibration assessment methodology

- 3.2.8 The predicted traffic flows at each station, arising from the Proposed Scheme in combination, were examined to identify where changes exceed thresholds identified in the assessment methodology¹³ consistent with the Design Manual for Roads and Bridges (DMRB)¹⁴ to identify where an assessment of sound is required. The main criterion adopted for this assessment was to examine where annual average weekday traffic (AAWT) flows increase by more than 20%, where the flow is greater than 1,000

¹¹ The forecasts of traffic growth were taken from the Department for Transport (2017), *National Trip End Model (NTEM) forecasts* (contained within the TEMPro software package), <https://www.gov.uk/government/publications/tempro-downloads>.

¹² The mode share is the proportion of passengers travelling to/from the station by car, taxi, bus, cycle etc.

¹³ Further information is provided in the Sound, noise and vibration methodology, assumptions and assessment, Volume 5: Appendix SV-001-000.

¹⁴ Highways Agency (2011), *The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 7 Noise and Vibration HD213/11*, <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/hd21311.pdf>.

vehicles per day¹⁵. Roads were examined to identify where traffic flows are predicted to increase by more than this threshold. Below this threshold, adverse effects were considered to be negligible and not significant.

- 3.2.9 Where the threshold was exceeded, the change in base noise levels¹⁶ was calculated to establish whether an increase of 3dB or greater could occur at receptors along each road considered. A 3dB change would result in a minor long term adverse effect on residential receptors, which is not considered to be significant. No 3dB or greater changes were identified.
- 3.2.10 The assessment was carried out for the year 2027, which is the year of opening of Phase 2a, using the predicted traffic flows for 2041. This is a reasonable worst case approach. Changes in car technology may offset some of the expected sound level increases due to traffic growth expected without the Proposed Scheme on low speed roads. On higher speed roads¹⁷, tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Air quality assessment methodology

- 3.2.11 The predicted traffic flows at each station, arising from the Proposed Scheme in combination, were examined to identify where changes exceeded thresholds suggested in Volume 11 of the DMRB guidance¹⁸, in order to identify where a detailed air quality assessment was required. The main criteria adopted for this assessment were used to examine where annual average daily traffic (AADT) flows would increase by more than 1,000 vehicles. These criteria were not exceeded, and it can be concluded that the air quality impacts will be negligible.
- 3.2.12 The assessment was carried out for the year 2027, using the predicted traffic flows for 2041. This is a reasonable worst case approach as pollutant concentrations are expected to decrease in future years as vehicle emissions standards improve.

3.3 Preston Station

Introduction

- 3.3.1 The introduction of HS2 services and the use of resulting released capacity on the conventional network provides potential for service improvements and reduced crowding on trains for passengers who use Preston Station, which is expected to result in increased passenger demand. It is forecast that by 2041, passenger demand at Preston Station will increase by approximately 6%, equivalent to 1,586 additional passengers per day, as a result of the Proposed Scheme in combination.

Environmental baseline

- 3.3.2 Preston Station is located approximately 400m west of the town centre. The station is bordered by Fishergate to the north and Butler Street to the east. The western

¹⁵ This corresponds to the lower extent of the validated range of the *Calculation of Road Traffic Noise* prediction methodology

¹⁶ Her Majesty's Stationery Office (1988), *Calculation of Road Traffic Noise*

¹⁷ Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph.

¹⁸ Highways Agency, (2007), *The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07)*, <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/ha20707.pdf>.

boundary is marked by Network Rail property and the Royal Mail delivery office, and the southern boundary by the rail corridor.

- 3.3.3 Vehicular access to Preston Station is off Fishergate and Butler Street. Fishergate provides access to a 'kiss-and-ride' and taxi pick up/drop off. Butler Street provides access to the short stay car park, with a one way loop at the station frontage, and also the main station car park. Butler Street is accessed off Fishergate and Corporation Street via an underpass (entry only). Corporation Street provides the link between Fishergate and the A59 Ring Way to the north. Fishergate connects to the A5072 Strand Road, Liverpool Road and Broadgate to the west, and to the east of Corporation Street is one way westbound.
- 3.3.4 The car park and drop off surveys undertaken in March 2017 recorded 307 vehicle movements to/from the station in the morning peak hour, and 412 in the evening peak hour.
- 3.3.5 Future baseline traffic volumes are forecast to grow by around 28% by 2041 compared to 2017.
- 3.3.6 As a result, in the future baseline of 2041, it is predicted that the station will attract 394 vehicle movements in the morning peak hour and 529 in the evening peak hour.

Overview of environmental effects

Traffic and transport

- 3.3.7 It is predicted that the Proposed Scheme in combination will generate an additional 20 vehicular trips in the morning peak hour and an additional 25 trips in the evening peak hour at Preston Station. The peak hour trip generation is only 33% of that considered to be substantial in the criteria (75-95 trips for a single carriageway road). These results indicate that no significant effects on traffic and transport are likely to arise from the Proposed Scheme in combination, and no further analysis is considered necessary.

Sound, noise and vibration

- 3.3.8 The minimum change in AAWT flows that would be likely to result in an adverse noise effect would be a 20% increase. The highest forecast change in traffic on roads around the station is around 2%, which is below this threshold and is not significant.

Air quality

- 3.3.9 The largest predicted increase in traffic flows is on Fishergate Road where AADT flows are predicted to increase by up to 191 vehicles. This is equivalent to a percentage increase of 1.3% at the eastern end of the road over the baseline AADT flow of 14,981 in 2041 and 1.7% at the western end of the road over the baseline AADT flow of 11,255 in 2041. Elsewhere, on roads around the station, the predicted increases in traffic flows are lower. The predicted changes in traffic flows are well below the threshold where a significant air quality effect is likely to occur.

3.4 Warrington Bank Quay Station

Introduction

- 3.4.1 The introduction of HS2 services and the use of released capacity on the conventional rail network provides potential for service improvements and reduced crowding for passengers who use Warrington Bank Quay Station, which is expected to result in increased passenger demand. It is forecast that by 2041, passenger demand at Warrington Bank Quay Station will increase by approximately 14%, equivalent to 1,095 additional passengers per day, as a result of the Proposed Scheme in combination.

Environmental baseline

- 3.4.2 Warrington Bank Quay Station is located approximately 600m south-west of the town centre. The station is bordered by the A5061 Liverpool Road to the north and the A5061 Parker Street to the east. The western boundary is marked by an industrial area, and the southern boundary by the rail corridor.
- 3.4.3 Vehicular access to Warrington Bank Quay Station is off the A5061 Parker Street, where there is a one way loop at the station frontage for taxi and 'kiss-and-ride' drop off trips. The two station car parks are accessed via the A5061 Parker Street and Slutchers Lane. The A5061 Parker Street provides access to Slutchers Lane and to the north connects with the A5061 Liverpool Road, which to the west intersects with the A57 Froghall Lane/Sankey Way. To the east, the A5061 Parker Street connects to the A49 Wilderspool Causeway/Mersey Street.
- 3.4.4 The car park and drop-off surveys undertaken in March 2017 recorded 218 movements to/from the station in the morning peak hour and 237 in the evening peak hour.
- 3.4.5 Future baseline traffic volumes are forecast to grow by around 27% by 2041 compared to 2017.
- 3.4.6 As a result, in the future baseline in 2041, it is predicted that the station will attract 278 vehicle movements in the morning peak hour and 302 in the evening peak hour.

Overview of environmental effects

Traffic and transport

- 3.4.7 It is predicted that the Proposed Scheme in combination will generate an additional 35 vehicular trips in the morning peak hour and an additional 38 trips in the evening peak hour at Warrington Bank Quay Station. The peak hour trip generation is only 50% of that considered to be substantial in the screening criteria (75-95 trips for a single carriageway road). These results indicate that no significant effects due to increased traffic are likely to arise from the Proposed Scheme in combination, and no further analysis is considered necessary.
- 3.4.8 There may be an increase in parking demand and use of drop off facilities as a result of the increased passenger numbers using the station. The station owner/operator and the highway authority may need to consider measures to control traffic and parking in the area. However, in the absence of clear plans to increase parking provision or

otherwise manage parking, the increased demand for parking and drop off facilities has been assessed as having a minor adverse effect, which is significant.

Sound, noise and vibration

- 3.4.9 The minimum change in AAWT flows that would be likely to result in an adverse noise effect would be a 20% increase. The highest forecast change in traffic on roads around the station is around 13%¹⁹, which is below this threshold and is not significant.

Air quality

- 3.4.10 The largest predicted increase in traffic flows is on Parker Street between Liverpool Road and the station where AADT flows will increase by up to 361 vehicles. This is equivalent to a percentage increase of 1.0% over the baseline flow of 37,270 in 2041. Elsewhere, on roads around the station, the predicted increases in traffic flows are lower. The predicted changes in traffic flows are well below the threshold where a significant air quality effect is likely to occur.

3.5 Mitigation measures

- 3.5.1 No further mitigation measures are considered necessary during operation of the Proposed Scheme based on the outcome of this assessment.

3.6 Summary of likely residual significant effects

- 3.6.1 The forecast increase in daily passengers due to the Proposed Scheme and HS2 Phase One in combination may increase pressure on car parking and drop off facilities at Warrington Bank Quay station, arising from the operation of the Proposed Scheme and HS2 Phase One in combination, leading to minor adverse significant effects on traffic and transport. No other likely significant effects have been identified.

¹⁹ This change is predicted on the Station Entrance Road, i.e. the drop off and taxi lane. Other routes are subject to changes of less than 2%.

4 Modifications to the Crewe to Manchester railway line (part of the WCML) at Maw Green and Sandbach

4.1 Introduction

4.1.1 Modifications will be required to the Crewe to Manchester railway line (part of the WCML) infrastructure at two locations between Crewe and Manchester. These are required to make best use of existing capacity while maintaining operational flexibility on the existing railway as a result of operation of the Proposed Scheme. This section outlines the changes and the likely significant environmental effects associated with the modification works. All map references mentioned in this section relate to the Volume 4: Off-Route Effects Map Book.

Overview of the area and scope of the assessment

4.1.2 The proposed modifications to the Crewe to Manchester railway line comprise two distinct areas of works: at Maw Green (located approximately 2.5km north of Crewe Station); and Sandbach (located approximately 5.5km north of Crewe Station) respectively.

4.1.3 The proposed works at Maw Green are within Haslington parish, Cheshire East. The Sandbach works are within Sandbach parish, Cheshire East.

4.2 Description of the modifications

4.2.1 The proposed works include:

- the installation of new at-grade track switches and crossings at Maw Green;
- reconfiguration of the track layout and crossings around Sandbach Station;
- raising of an existing footbridge close to Sandbach Station; and
- modifications to the existing rail systems including new or relocated signalling, overhead line equipment and other assets at Maw Green and Sandbach.

4.2.2 These works will enable the conventional train services, which stop at Sandbach and other stations, to be regulated in either direction, allowing HS2 trains to overtake these stopping services. They will also assist in the efficient operation of freight services.

4.2.3 The works at Maw Green and Sandbach are described and reported below.

Maw Green

4.2.4 The works will extend along approximately 600m of the railway, from a point approximately 850m to the north of the urban edge of Crewe to a point approximately 1.45km to the north of Crewe. The surrounding land use area is predominantly agricultural.

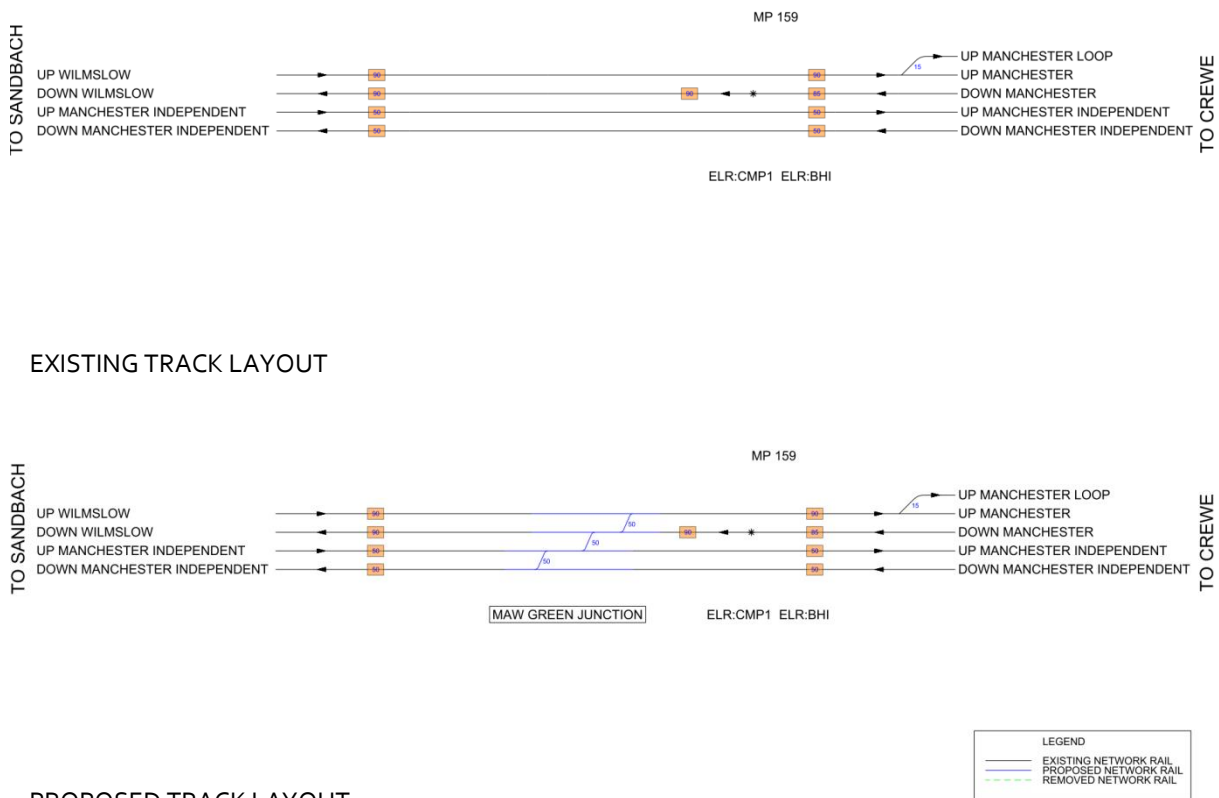
- 4.2.5 All works will be contained within the corridor of the existing railway. Tommy's Lane satellite compound and Crewe Retail Park satellite compound, both of which are located north of Crewe Station, will be used to manage the works. Both compounds will be operational for approximately one year and six months. Further details on these compounds are provided in Table 1.
- 4.2.6 Construction materials and equipment will be predominantly brought in and removed by rail, although access by road (using Tommy's Lane and Grand Junction Way) will also be required.

Proposed works at Maw Green

- 4.2.7 The works comprise the installation of three additional crossings at Maw Green to allow train services to switch from one line to another.
- 4.2.8 Works at Maw Green are required to the track layout to complement those at Sandbach, allowing conventional and HS2 Phase 2a services to use this section of the railway more efficiently. The proposed track layout at Maw Green will be re-configured to allow for conventional rail services and HS2 services to switch between the Crewe to Manchester lines and Independent lines, creating a railway junction.
- 4.2.9 As part of these works, there is a need for minor realignment of existing tracks to accommodate the installation of three crossings to provide connections between the tracks. Installation of new crossings typically requires removal and replacement of rails, sleepers and ballast on top of the existing formation. Construction of the new crossings requires modifications to the existing rail systems including new or relocated signalling, overhead line equipment and other associated railway assets.
- 4.2.10 Figure 3 illustrates the existing track layout at Maw Green and the proposed track layout with the realignment of tracks and amended crossings.

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Figure 3: Schematic diagram of existing and proposed track layout at Maw Green



PROPOSED TRACK LAYOUT

- 4.2.11 The location of the works at Maw Green is shown in Volume 4 Map Book: Map CT-o6-243.

Sandbach Station area

- 4.2.12 The works extend across approximately 1.5km of the railway, from approximately 1.2km south-west of Sandbach Station to 300m north-east of Sandbach Station. Sandbach Station is located to the west of Sandbach, at Elworth. To the west of the station is a residential area extending south to the point at which Sandbach Footpath 46 crosses over the existing railway on a footbridge. Further south of Footpath 46 and to the west of the proposed works, the land use is primarily industrial.
- 4.2.13 All works will be contained within the corridor of the existing railway. Rookery Bridge Road Rail Access Point satellite compound (an existing Network Rail compound adjacent to the railway) and Sandbach Station satellite compound, located within Sandbach Station car park, will be used to manage the works. As this car park, although it permits 24 hour parking, is used mainly for daytime commuter parking, the compound will be used at night only during the week and during weekend rail possessions, when no train services are running and the car park is less likely to be used. Plant and equipment will only be kept at the Sandbach Station satellite compound during periods of construction. At all other times, plant and equipment will be removed so that all parking spaces are available for use. Rookery Bridge Road Rail Access Point satellite compound will be operational for seven months and Sandbach Station satellite compound will be operational for eight months. Further details on these compounds are provided in Table 1.

- 4.2.14 Construction materials and equipment will be predominantly brought in and removed by rail, although access by road (using the A553 London Road and the B5079 Station Road) will also be required.

Proposed works around Sandbach Station

- 4.2.15 Works are required to the track layout around Sandbach Station to enable the efficient use of the railway by HS2 services, which also use the Phase 2a route, south of Crewe. The track layout will be re-configured to improve speeds at which trains can travel through crossings and to ensure that parallel movements are possible for trains travelling in opposite directions using Platform 2 and Platform 3. Works will also enable either Platform 2 or Platform 3 to be used for regulating stopping services (that is, those stopping at Sandbach and other stations).
- 4.2.16 As part of these works, there will be a need for a minor realignment of the existing tracks to accommodate additional crossings. The works involve the removal of five crossings and the re-laying of seven crossings. Installation of new crossings typically requires removal and replacement of rails, sleepers and ballast on top of the existing formation. Construction of the new crossings requires modifications to the existing rail systems, including new or relocated signalling, overhead line equipment and other associated railway assets.
- 4.2.17 Figure 4 illustrates the existing track layout at Sandbach Station and the proposed track layout with the realignment of tracks and amended crossings.

Figure 4: Schematic diagram of existing and proposed track layout at Sandbach Station



4.2.18 None of the proposed works around Sandbach Station will require changes to the width of the existing railway corridor. The vertical track alignment will be subject to minor adjustments to improve the geometry of the tracks, increasing the speed at which trains can travel through the crossings from 25mph to 40mph.

4.2.19 In order to modify the existing overhead line equipment, it will be necessary to raise the existing steel pedestrian overbridge Number 18 (Sandbach Footpath 46) by approximately 1m. The footbridge will be closed for approximately three months, during which period users will be able to cross the railway via the A533 London Road bridge via a diversion that is approximately 220m longer than the existing route.

4.2.20 The location of the works around Sandbach Station is shown in Volume 4 Map Book: Maps CT-06-244 and CT-06-245.

Operational train services around Sandbach station and at Maw Green

4.2.21 Once Phase 2a is operational, there are likely to be three HS2 trains per hour in each direction using the Crewe to Manchester railway line through Maw Green and Sandbach. This corresponds to a maximum of two additional HS2 trains in each direction over and above the HS2 trains assessed in Volume 4 of the HS2 Phase One ES. These trains will replace the existing conventional fast services. Once HS2 Phase 2b is operational, HS2 trains will use the Phase 2b infrastructure to reach Manchester Piccadilly Station, instead of this route.

4.2.22 At Sandbach, there will be some alterations to the timing of existing conventional rail services on the Crewe to Manchester line, although it is expected that they will

continue to operate at current frequencies with the same station calling patterns. HS2 trains will not stop at Sandbach Station. Certain freight trains may have to wait at Sandbach for a path to Manchester.

- 4.2.23 It is expected that the works at Maw Green will allow conventional and freight train services to use this section of the railway more efficiently.

Construction of the modifications

- 4.2.24 General information relating to the construction process is set out in Volume 1 (Section 6).
- 4.2.25 All contractors will be required to comply with the HS2 Phase 2a CoCP. The CoCP will be the means of controlling the construction works associated with the Proposed Scheme, and will set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced as far as reasonably practicable. The draft CoCP contains general control measures and standards to be implemented throughout the construction process.
- 4.2.26 The works at Maw Green involve railway installation works and those around Sandbach Station will involve a combination of civil engineering and railway installation works. Both works will be within the corridor of the existing railway. The land required for construction of the Proposed Scheme is shown in Volume 4 Map Book: Maps CT-05-242 to CT-05-245. Following construction, any land required during construction will be restored.
- 4.2.27 All construction works will be undertaken only during track possessions²⁰. The works will take place over a period of up to two years. The nature of the works, and the constraints of working on the existing operational railway, means that construction work will not be continuous and will be undertaken using a phased approach. Construction works in each particular location will be carried out over identified weekend and night-time periods.
- 4.2.28 Disruption to rail passengers and freight movements on the conventional railway will be reduced as far as reasonably practicable. Works will be programmed to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway, insofar as this can reasonably be achieved. Diversion routes or local rail replacement bus services will be put in place where appropriate when the railway is closed.
- 4.2.29 There will be a single track possession (predicted to be three days) at Maw Green to install the crossings.
- 4.2.30 There will be a limited number of weekend track possessions required around Sandbach Station to install the crossings and a track possession (predicted to be four days) to install the overhead line equipment for the crossings. A further long track possession (predicted to be nine days) will be required to complete the removal and installation of the crossings and signals.

²⁰ Periods when all or part of the railway is closed to enable works to track and other infrastructure to take place.

- 4.2.31 A track possession (predicted to be four days) will be required to raise the existing steel pedestrian overbridge Number 18 (Sandbach Footpath 46) and carry out the associated works on the abutments.

Construction compounds

- 4.2.32 Construction works at Maw Green and around Sandbach Station will be coordinated from four satellite construction compounds. Most elements of the Proposed Scheme can be constructed from within the corridor of the railway using rail mounted construction plant. However, other land at Sandbach Station and at either end of overbridge Number 18 (Sandbach Footpath 46) will be required temporarily, as shown in Volume 4 Map Book: Maps CT-05-242 to CT-05-245.
- 4.2.33 Further information on the function of compounds is provided in Volume 1 (Section 6) and the draft CoCP (Section 5). This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.
- 4.2.34 Details of the construction compounds are provided in Table 1. In each case the predicted duration is shown as the maximum period for which the compound will be in use. No compound will be operational for the full duration as works will be organised around available track possessions.

Table 1: Satellite compounds for the modifications to the Crewe to Manchester line

Location	Principal use	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use	Number of workers (average/peak)
Tommy's Lane satellite compound (Map CT-05-241b)	Works at Maw Green	Tommy's Lane to the A534 Crewe Road	Jan 2021	1 year and 6 months	20/100
Crewe Retail Park satellite compound (Map CT-05-241b)	Works at Maw Green	Grand Junction Way to the A532 Hungerford Road	Jan 2021	1 year and 6 months	8/8
Rookery Bridge Road Rail Access Point satellite compound (Map CT-05-244, C6-D6)	Works around Sandbach Station area	Hall Lane, Warmingham Road, Forge Mill Lane, School Lane to the A530 Nantwich Road	Nov 2021	8 months	14/50
Sandbach Station satellite compound (Map CT-05-245, D5-F5)	Works around Sandbach Station area	B5079 Station Road to A533 London Road	Oct 2021	8 months	25/100

- 4.2.35 HGV two-way movements to and from the construction compounds will be required mainly for transport of small plant, such as site working cabins and construction machinery, and will be occasional rather than frequent during the construction period. As a reasonable worst case, there will be an average of 22 two-way HGV movements per day for the four compounds combined, during the peak month of construction activity. It is predicted that eight of these two-way movements will be to the Tommy's Lane satellite compound, six two-way movements will be to the Sandbach Station satellite compound, six two-way movements will be to the Rookery Bridge Road Rail Access Point satellite compound and two two-way movements to the Crewe Retail Park satellite compound.

4.3 Environmental baseline

- 4.3.1 The Maw Green and Sandbach works are within the section of the Crewe to Manchester conventional railway that extends northwards from Maw Green to the Sandbach Station area.
- 4.3.2 The baseline environment is dominated by the presence of the existing railway, which is a four-track electrified railway (reducing to three tracks at Sandbach Station). The railway is on embankment through the Maw Green area and primarily at grade with the existing topography in the Sandbach area.
- 4.3.3 The settlement of Maw Green adjoins the north-eastern edge of Crewe. The Maw Green works will take place to the north-east of the built up area, within a rural setting. The nearest residential receptors are approximately 200m east of the works, on Maw Lane. The settlement of Maw Green is approximately 700m to the south-west.
- 4.3.4 Maw Green landfill site is situated on the western side of this section of railway, and a watercourse, Fowle Brook, runs parallel to the railway between the landfill and the Proposed Scheme.
- 4.3.5 The works in the vicinity of Sandbach will take place in two locations within a built-up environment.
- 4.3.6 The works to the south of Sandbach Station are located on the western edge of the settlement of Ettiley Heath. There is a housing development to the west of the railway and Springvale Industrial Estate is located on the eastern side. The nearest residential properties are located approximately 30-40m from this section of railway. The Trent and Mersey Canal passes under the railway approximately 350m to the south of the works and then continues parallel to the western side of the railway.
- 4.3.7 The works around Sandbach Station, in Elworth, are within an environment dominated by the station and existing railway. An industrial area bounded by Station Road and Moss Lane is situated to the south. The nearest residential properties to the works are located within approximately 50m.

4.4 Scope of the assessment

- 4.4.1 A scoping exercise was undertaken to determine whether the proposed works at Maw Green and Sandbach had the potential to result in any significant environmental effects.
- 4.4.2 The predicted changes to the operational train movements on the existing WCML route through Sandbach and Maw Green were considered in the HS2 Phase One ES and did not give rise to likely significant effects. The train movement assumptions have not materially altered since that assessment, and therefore, no further assessment of operational effects was undertaken.
- 4.4.3 It was concluded that the proposed construction works at Maw Green will not give rise to significant environmental effects. This is due to their temporary nature on an existing operational railway, the limited duration of construction works and the ability to manage any potential nuisance effects through implementation of the CoCP. No further assessment of the Maw Green works was undertaken.

- 4.4.4 With regard to the construction of the works along the Sandbach section of the Crewe to Manchester Line, it was considered that assessment was required in respect of potential sound, noise and vibration, and traffic and transport impacts arising during the construction period. These assessments are reported below. All other topics were scoped out on the basis that the proposed works will not give rise to the potential for likely significant effects.

4.5 Environmental assessment

Sound, noise and vibration

- 4.5.1 An assessment of sound, noise and vibration effects from the construction works around Sandbach Station has been undertaken and is reported below.
- 4.5.2 The approach to assessing sound, noise and vibration and appropriate mitigation is outlined in the SMR, the SMR Addendum and Volume 5: Appendix SV-001-000²¹.

Environmental methodology

- 4.5.3 The assessment of sound, noise and vibration effects has been based on reasonable worst-case baseline assumptions. Specifically, the effects of airborne construction noise have been assessed assuming a baseline in the lowest Assessment Category 'A' and the effects of vibration have been assessed using the absolute vibration criteria. The assessment took 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. The criteria are defined in the SMR.
- 4.5.4 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-

²¹ Sound, noise and vibration methodology, assumptions and assessment, Volume 5: Appendix SV-001-000.

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.

4.5.5 The construction arrangements that formed the basis of the assessment are presented in Section 4.2 of this report. It is anticipated that there will be a limited number of weekend track possessions to install the crossings and a track possession (predicted to be four days) to install the overhead electrification equipment for the crossings. A further long track possession (predicted to be nine days) will be required to complete the removal and installation of the crossings and signals.

Effects during construction

4.5.6 The majority of the construction works associated with the Sandbach works are likely to take place during weekend track possessions. The noise effects from these works will be limited in duration and are, therefore, not considered likely to be significant using the significance criteria set out in Annex A of Volume 5: Appendix SV-001-000. Any noise effects arising from these short-term construction activities will be controlled and reduced by the management processes set out in the draft CoCP.

4.5.7 Sound levels from the construction activities anticipated to take place during the single nine day possession have been calculated for dwellings in Sandbach close to the railway within a study area as defined in the SMR. These activities have been assumed to occur continuously throughout the nine day period, including the night-time.

4.5.8 Sound levels of approximately 55-60dB $L_{pAeq,T}$ are predicted at those dwellings closest to the railway (approximately 60 dwellings on Redshank Place, Harry Mortimer Way and Halliwell Court). This would not result in construction noise effects during the daytime, but would constitute adverse noise effects during the evening and night-time. However, as these effects would last for less than a month, they are not considered to be significant using the significance criteria set out in Annex A of Volume 5: Appendix SV-001-000.

4.5.9 Sound levels of approximately 45-50dB $L_{pAeq,T}$ are predicted at dwellings further from the railway (approximately 25 dwellings on Redshank Place, Harry Mortimer Way and Clifton Road). This would not result in construction noise effects during the daytime or evening, but would result in adverse noise effects during the night-time. However, as

these effects would last for less than a month, they are not considered to be significant using the significance criteria set out in Annex A of Volume 5: Appendix SV-001-000.

- 4.5.10 No significant construction noise effects have been identified at non-residential receptors.

Traffic and transport

- 4.5.11 An assessment of the traffic and transport impacts likely to arise as a result of the works on the Crewe to Manchester Line has been undertaken.

Environmental methodology

- 4.5.12 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8), the SMR and the SMR Addendum.

Assessment of impacts and effects

- 4.5.13 Due to the limited scope of the works, the number of two-way vehicle movements to compounds is expected to be low. The daily maximum flow is predicted to be 230 two-way vehicle movements to the Tommy's Lane satellite compound, 22 two-way vehicle movements to the Crewe Retail Park satellite compound, 232 two-way vehicle movements to the Sandbach Station satellite compound and 126 two-way vehicle movements to the Rookery Bridge Road Rail Access Point satellite compound. The majority of these vehicle movements will be employee car or LGV movements and are expected to occur outside the local road network peak periods. The maximum HGV flow is expected to be eight two-way movements to the Tommy's Lane satellite compound, two two-way movements to the Crewe Retail Park satellite compound, six two-way movements to the Sandbach Station satellite compound and six two-way movements to the Rookery Bridge Road Rail Access Point satellite compound. This will not result in any significant effects on vehicle users or non-motorised users.
- 4.5.14 Modifications to the conventional railway line at Maw Green and Sandbach are expected to require a number of rail possessions over a period of up to two years including 14 possessions of up to 27 hours, one 72 hour possession and two 100-hour weekend possessions. One blockade will also be required for a period of up to nine days. Disruption to rail users will be reduced by limiting possessions, where reasonably practicable, to existing maintenance periods. The works will be staged so that weekend possessions and blockades are shared where possible and will thereby reduce the disruption to the travelling public. 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.
- 4.5.15 The works to the WCML at Sandbach will require the existing foot overbridge No. 18 at Sandbach Station to be raised by approximately 1m. The overbridge will need to be closed for a period of approximately three months. Users will cross the WCML via the A533 London Road bridge, the length of diversion being approximately 220m.
- 4.5.16 This will be a temporary minor adverse effect, which is significant, on non-motorised users as a result of severance from increased travel distance.

Other mitigation measures

- 4.5.17 While traffic and transport impacts and effects will be limited, the implementation of the CoCP, in combination with the construction workforce travel plan, will further reduce traffic and transport impacts during construction of the Proposed Scheme.

Summary of likely residual significant effects

- 4.5.18 There will be a temporary minor adverse effect from severance for non-motorised users of the Sandbach Station overbridge.

4.6 Mitigation measures

- 4.6.1 No mitigation measures other than adherence to relevant requirements of the CoCP for sound, noise and vibration and traffic and transport are considered necessary based on the results of the assessment.

4.7 Summary of likely residual significant effects

- 4.7.1 There will be a temporary minor adverse severance effect for non-motorised users of the Sandbach Station overbridge.

5 Off-route highway modifications

5.1 Introduction

5.1.1 This section provides details of a number of highway and junction modifications at a distance from the route of the Proposed Scheme. Highway modifications that are within or adjacent to the land required for the main elements of the Proposed Scheme are reported in the Volume 2, Community area reports of the ES.

5.1.2 Highways modifications are required to facilitate the construction and maintenance of the Proposed Scheme. The proposed modification works include: kerb realignments at junctions to allow safe turning; widening of existing highways that are currently too narrow for construction vehicles to use safely; and the provision of passing bays to allow safe passing of HGV traffic, including abnormal loads, and HS2 maintenance vehicles.

5.2 Overview of scope and methodology

5.2.1 Twelve locations have been identified where highway modifications are required. There are two types of highway modification, which are:

- temporary highway modifications required to facilitate the construction of the Proposed Scheme. Unless it is agreed with the landowner and local highway authority that these should remain permanently, the modifications will be removed and the existing highway layout reinstated following construction; and
- permanent highway modifications required to facilitate the maintenance of the Proposed Scheme, which in some instances are also required for construction. These modifications will remain in place following construction.

5.2.2 Table 2 provides details of the 12 locations, including a brief description of the proposed works and whether it is considered that there is potential for likely significant environmental effects. The 12 locations are as shown in Volume 4 Map Book: Maps CT-05-250 to CT-06-253.

Table 2: Locations and description of off-route highway modifications

Highway modifications	Summary of works	Temporary or permanent	Location and map reference	Potential for likely significant effects
Alrewas Hayes Road	Provision of two passing bays	Permanent	Fradley, Community area 1 CT-05-250, B3-D3 CT-06-250, B3-D3	No
Junction of A513 Kings Bromley Lane and B5014 Uttoxeter Road	Removal of traffic islands ²² and street furniture, and localised widening	Temporary	Handsacre, Community area 1 CT-05-250, H9-I9	No

²² A traffic island is a solid or painted object in a road that channels traffic.

Environmental Statement, Volume 4: Off-route effects

Highway modifications	Summary of works	Temporary or permanent	Location and map reference	Potential for likely significant effects
B5014 Uttoxeter Road	Provision of six passing bays, localised widening and two HGV control points ²³	Temporary	Hill Ridware, Community area 1 CT-05-250, F3-I3 and B9-G8 CT-06-250, F3-I3	Yes
Junction of B5014 Uttoxeter Road and Blithbury Road	Provision of localised widening at junction	Permanent	Blithbury, Community area 1 CT-05-251, G8-G9 CT-06-251, G8-G9	No
Moor Lane	Provision of two passing bays and localised widening	Permanent	Colton, Community area 1 CT-05-251, C8-D6 CT-06-251, C8-D6	No
Great Haywood Road	Provision of three passing bays and localised widening	Temporary	Tixall, Community area 2 CT-05-251, B4-I3 CT-06-251, B4-I3	Yes
Marston Lane	Provision of three passing bays and localised widening	Permanent	Marston, Community area 2 CT-05-252, G7-J8 CT-06-252, G7-J8	No
Yarnfield Lane	Provision of localised widening	Temporary	Stone, Community area 3 CT-05-252, A8-C8 CT-06-252, A8-C8	Yes
Junction of A51 The Rowe and Bent Lane/Dog Lane	Provision of permanent signage	Permanent	Stableford, Community area 3 CT-05-252, G5-I5 CT-06-252, G5-I5	No
Junction of A51 Nantwich Road and A525 Newcastle Road	Removal of street furniture	Temporary	Woore, Community area 4 CT-05-253, A2	No

²³ An HGV control point is a lay-by that allows HGV to be held at the side of the road.

Environmental Statement, Volume 4: Off-route effects

Highway modifications	Summary of works	Temporary or permanent	Location and map reference	Potential for likely significant effects
A525 Bar Hill Road	Provision of 13 passing bays and localised widening	Temporary	Onneley, Community area 4 CT-05-253, A9-J9 CT-06-253, A9-J9	Yes
B5071 Wybunbury Road	Provision of 12 parking bays and footpath	Temporary	Wybunbury, Community area 5 CT-05-252, C3	No

- 5.2.3 As noted in Table 2, four of the 12 off-route highway modifications are considered to have the potential to result in significant environmental effects and have been assessed accordingly. The remaining eight modifications are minor in scale; the works to construct them are of limited duration and it is considered that neither their construction nor operation will result in significant environmental effects.
- 5.2.4 The four highway modifications identified for assessment were considered further to determine which environmental topics required assessment. The topics identified for assessment were community, ecology, cultural heritage and landscape and visual. Not all of these topics are considered relevant for all four locations.
- 5.2.5 Traffic and transport is not included as an assessment topic. The purpose of these highway modifications is to ensure that construction vehicles can access construction compounds and work sites, and undertake maintenance in a safe manner. The works associated with the highway modifications will be undertaken under temporary traffic management measures, as required, ensuring that the impact of the works is reduced so far as is reasonably practicable and that access is maintained. Construction of the highway modifications will not lead to any significant traffic effects, due to the short duration and relatively localised nature of the works.
- 5.2.6 On completion, the works will facilitate the safe passing of construction traffic and reduce the risk of vehicle conflicts along the construction routes. Where the highway modifications are permanent, these may provide benefits to road users over the longer term.
- 5.2.7 The assessment of impacts of the construction routes on road users, including non-motorised users, is reported in Volume 2, Community area reports and Volume 5: Appendix TR-001-000, Transport Assessment.
- 5.2.8 Limited ecological survey information was available for the areas of proposed off-route highways works. A precautionary approach was, therefore, adopted, following the guidance in the SMR and the SMR Addendum. This constitutes a 'reasonable worst case' basis for the assessment and development of mitigation. For example, it is assumed that all hedgerows to be removed are species-rich and all trees to be removed have the potential to support roosting bats.

5.3 The Proposed Scheme and environmental effects

- 5.3.1 This section describes the nature of the works required at each highway modification location and provides an overview of the local environment. For the four locations

subject to further environmental assessment, the outcome of the assessment is presented. For the avoidance of doubt, references in the assessment to 'construction' are to the entire period of HS2 construction, between 2020 and 2027, while those to 'operation' are to the period after 2027, when HS2 will be operational.

- 5.3.2 Maps showing the location of the key environmental features (Map Series CT-28), the key construction features (Map Series CT-05) and key operational features (Map Series CT-06) of the Proposed Scheme can be found in the Volume 4 Map Book.

Alrewas Hayes Road permanent modifications, Fradley

Introduction

- 5.3.3 Alrewas Hayes Road is to the north-west of Fradley, and links the A513 Alrewas Road with Fradley. The section that includes the highway modifications is approximately 300m in length and is located south of the A513 Alrewas Road, as shown on Volume 4 Map Book: Map CT-05-250, B3-D3.
- 5.3.4 The works will be located on a section of road with no nearby properties and the land either side of Alrewas Hayes Road is in agricultural use.

Overview of works

- 5.3.5 The existing highway in this location is not sufficiently wide for the safe passing of HGVs that will need to access a balancing pond west of Alrewas Hayes Road for maintenance.
- 5.3.6 There is, therefore, a need to provide two permanent passing bays (each approximately 15m long and 2m wide), approximately 250m apart along a section of Alrewas Hayes Road. Construction works will be undertaken within the existing highway boundary.
- 5.3.7 Construction of the passing bays will be undertaken in the first quarter of 2021, and will require a short term road closure of Alrewas Hayes Road (predicted to be two days) during this period. The works will be managed locally within the highway.

Environmental effects

- 5.3.8 The permanent modifications to Alrewas Hayes Road will not result in any significant environmental effects.

Junction of A513 Kings Bromley Lane and B5014 Uttoxeter Road temporary modifications, Handsacre

Introduction

- 5.3.9 The junction of the A513 Kings Bromley Lane and the B5014 Uttoxeter Road is to the north of Handsacre and south of the River Trent. The section that includes the highway modifications is centred on the junction itself, as shown on Volume 4 Map Book: Map CT-05-250, H9-I9.
- 5.3.10 The land immediately surrounding the junction is in agricultural use. The closest residential properties are located on Osier Bed Lane to the north-east of the junction and Pipe Place Farm on the A513 Kings Bromley Lane to the south.

Overview of works

- 5.3.11 The junction of the A513 Kings Bromley Lane and the B5014 Uttoxeter Road is located on a construction route required for the Proposed Scheme. The existing design of the junction will constrain HGVs turning into/from the B5014 Uttoxeter Road (to the north of the junction) and from/into the A513 Kings Bromley Lane (to the east of the junction).
- 5.3.12 There is, therefore, a need to temporarily remove the islands (which are currently used to separate traffic) and other street furniture and undertake temporary localised widening at the junction.
- 5.3.13 Construction works will be undertaken within the existing highway boundary and are required to remain in place for the duration of the construction of the Proposed Scheme.
- 5.3.14 The removal of the traffic islands and street furniture and localised widening will take place in the third quarter of 2020. The works will be managed locally within the highway.

Environmental effects

- 5.3.15 The temporary modifications at the junction of the A513 Kings Bromley Lane and the B5014 Uttoxeter Road will not result in any significant environmental effects.

B5014 Uttoxeter Road temporary modifications, Hill Ridware

Introduction

- 5.3.16 The B5014 Uttoxeter Road is to the east of Rugeley and links the villages of Hill Ridware and Handsacre. Temporary highway modifications are required on two sections of the B5014 Uttoxeter Road to the north-west and east of Hill Ridware.
- 5.3.17 The section to the north-west of Hill Ridware is approximately 600m in length and extends from the edge of the village towards the junction with Stonyford Lane, as shown on Volume 4 Map Book: Map CT-05-250, F3-I3. The section to the east of Hill Ridware is approximately 1.5km in length and extends from the eastern edge of the village, alongside four residential properties, to the point where the B5014 Uttoxeter Road crosses the River Trent, as shown on Volume 4: Map CT-05-250, B9-G8. Land to the north and south of both sections of the B5014 Uttoxeter Road is in agricultural use.

Overview of works

- 5.3.18 The existing highway through Hill Ridware is not sufficiently wide for the safe passing of construction HGVs, which will use this road to access the Blithbury Central cutting satellite compound.
- 5.3.19 There is, therefore, a need to provide six temporary passing bays (each approximately 15m long and 2m wide) to the east of Hill Ridware and undertake temporary localised widening on bends to the north-west and east of Hill Ridware. The passing bays will be between 125m and 200m apart. Two temporary control points for four to six HGVs (each approximately 30m long by 15m wide) will also be provided, at the north-western and eastern approaches to Hill Ridware. HGVs will be held, as necessary, at

these points to enable the flow of these vehicles to be controlled, ensuring that HGVs are only able to travel through Hill Ridware in one direction at any time.

- 5.3.20 As the existing highway boundary is limited in certain locations, land currently in agricultural use will be required temporarily during construction. The modifications will remain in place for the duration of the construction of the Proposed Scheme
- 5.3.21 Construction of the passing bays, localised widening and HGV control points will be undertaken in the first quarter of 2021. Local traffic management measures will be put in place to allow the B5014 Uttoxeter Road to remain open during the works. The works will be managed locally within the highway.

Environmental effects

- 5.3.22 These highway modifications have the potential for significant landscape and visual effects.

Landscape and visual

Environmental baseline

- 5.3.23 The B5014 Uttoxeter Road is within the Colton and Stockwell Heath Settled Farmlands Landscape Character Area (LCA), an undulating and rural landscape divided by historic small scale field patterns with occasional woodland blocks. The landscape is characterised by pastoral and arable medium scale field patterns defined by mature hedgerows, hedgerow trees and woodland belts, with dispersed settlements linked by a traditional rural road and lane network.
- 5.3.24 The LCA is assessed as having a medium-high landscape value, medium-high landscape susceptibility and medium landscape sensitivity. The B5014 Uttoxeter Road has a distinctive rural character and is enclosed by mature hedgerows with prominent oak trees. It is, therefore, judged to be a valued landscape feature, because of the considerable time needed to replace such elements if lost.
- 5.3.25 Visual receptor viewpoints in the vicinity of the modifications to the B5014 Uttoxeter Road include residences adjacent to the road on the northern and southern approaches to Hill Ridware, notably Rake End Cottage and Eastfields, as well as several public rights of way (PRoW), notably Mavesyn Ridware Footpaths 9, 15, 16 and 31, which cross or are in the vicinity of the B5014 Uttoxeter Road.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.26 Measures have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction, and include:
- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction²⁴;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

Assessment of impacts and effects

- 5.3.27 Construction of passing bays, localised widening and HGV control points on the B5014 Uttoxeter Road will result in the localised removal of mature hedgerows and mature hedgerow oak trees. Volume 2, Community area report 1, Fradley to Colton, Section 11 reports that the construction of the Proposed Scheme will result a high magnitude of change on the character of the Colton and Stockwell Heath Settled Farmlands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the major adverse (significant) effect reported in Volume 2.
- 5.3.28 The removal of hedgerows and trees for construction and the creation of passing bays will be visible from residential receptors adjacent to the B5014 Uttoxeter Road on the northern and southern approaches to Hill Ridware, notably Rake End Cottage and Eastfields, as well as several PRoW, notably Mavesyn Ridware Footpaths 9, 15, 16 and 31. Residential and recreational receptors have a high sensitivity to change. However, due to the small scale and temporary nature of change in the wider views from these locations and the short duration of these modification works, the overall magnitude of change is considered to be low. Therefore, the visual effects are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.29 Localised replacement hedgerow planting is proposed upon removal of the temporary works along the B5014 Uttoxeter Road to restore landscape character lost to the construction works.

Summary of likely residual significant effects

- 5.3.30 These highway modifications will result in localised impacts on the Colton and Stockwell Heath Settled Farmlands LCA during construction. This will not change the major adverse (significant) effect reported in Volume 2. Visual effects during construction will be either negligible or minor adverse (non-significant).

Effects arising during operation

Avoidance and mitigation measures

- 5.3.31 No further avoidance or mitigation measures (beyond localised replacement hedgerow planting described above) are required during operation.

²⁴ British Standards Institution (2012), BS 5837:2012, Trees in relation to design, demolition and construction – Recommendations.

Assessment of impacts and effects

- 5.3.32 The loss of historic and mature roadside vegetation and boundaries along parts of the B5014 Uttoxeter Road will persist at operation and will locally alter the distinctive historic field patterns that are characteristic of the Colton and Stockwell Heath Settled Farmlands LCA. Section 11 of Volume 2, Community area report 1, Fradley to Colton, reports that the operation of the Proposed Scheme will result in a high magnitude of change in years 1, 15 and 60 on the character of this LCA. The changes to the LCA arising from the highway modifications are localised and will not change the major adverse (significant) effect for operation years 1, 15 and 60 reported in Volume 2.
- 5.3.33 The loss of mature hedgerows and trees will be visible from residential receptors adjacent to the B5014 Uttoxeter Road on the northern and southern approaches to Hill Ridware, notably Rake End Cottage and Eastfields, as well as several PRow, notably Mavesyn Ridware Footpaths 9, 15, 16 and 31. However, due to the local and small scale nature of change in the general views, visual effects in operation years 1, 15 and 60 are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.34 No further mitigation measures are proposed.

Summary of likely residual significant effects

- 5.3.35 These highway modifications will result in localised impacts on the Colton and Stockwell Heath Settled Farmlands LCA during operation years 1, 15 and 60. These will not change the major adverse (significant) effect reported in Volume 2. Visual effects during operation will be either negligible or minor adverse (non-significant).

Junction of B5014 Uttoxeter Road and Blithbury Road permanent modifications, Blithbury

Introduction

- 5.3.36 The junction of the B5014 Uttoxeter Road and Blithbury Road is located within the village of Blithbury, to the north-east of Rugeley. The B5014 Uttoxeter Road lies in a north-south direction and Blithbury Road crosses the B5014 Uttoxeter Road in a west-east direction at this staggered junction, as shown on Volume 4 Map Book: Map CT-05-251, G8-G9.
- 5.3.37 The Bull and Spectacles public house, Blithbury Reindeer Lodge, Manor Farm and approximately 10 residential properties are located near the junction.
- 5.3.38 Land surrounding the village and junction is rural and in agricultural use.

Overview of works

- 5.3.39 The junction of the B5014 Uttoxeter Road and Blithbury Road is on a construction route that will serve the Blithbury Central cutting satellite compound. Permanent maintenance access will be required to the Newlands Lane auto-transformer feeder station and two balancing ponds on the B5014 Uttoxeter Road, to the west of the Proposed Scheme. The existing design of the junction will constrain HGVs turning left

from the B5014 Uttoxeter Road (travelling in a northwards direction) into Blithbury Road.

- 5.3.40 There is, therefore, a need to undertake permanent localised widening at the junction (on its south-western section) to allow HGVs to turn safely into Blithbury Road during both construction and operation.
- 5.3.41 As the existing highway boundary is limited in certain locations, land currently in agricultural use will be required permanently.
- 5.3.42 Construction of the localised widening will be undertaken in the first quarter of 2021 over a period of approximately one month. Local traffic management measures will be put in place to allow the B5014 Uttoxeter Road and Blithbury Road to remain open during the works. The works will be managed locally within the highway.
- 5.3.43 There will also be works to realign a section of the B5014 Uttoxeter Road as a result of the Proposed Scheme. These are described and assessed in Volume 2, Community area 1, Fradley to Colton.

Environmental effects

- 5.3.44 The permanent modifications at the junction of the B5014 Uttoxeter Road and Blithbury Road will not result in any significant environmental effects.

Moor Lane permanent modifications, Colton

Introduction

- 5.3.45 Moor Lane is located to the north of Rugeley, and immediately north of the village of Colton. Moor Lane links the B5013 Uttoxeter Road to the west with Newlands Lane, Stockwell Heath to the east, as shown on Volume 4 Map Book: Map CT-05-251, C8-D6.
- 5.3.46 The adjacent land is rural in nature and largely in agricultural use. Hamley House Farm, is located close to the proposed modifications. There are no other residential properties in the immediate vicinity.

Overview of works

- 5.3.47 The existing highway in this location is not sufficiently wide for the safe passing of HGVs that will need to access a balancing pond, located on Moor Lane to the west of the Proposed Scheme, for maintenance.
- 5.3.48 There is, therefore, a need to provide two permanent passing bays (15m long by 2m wide), which will be spaced approximately 75m apart along a section of Moor Lane and undertake permanent localised widening on bends where the road is currently too narrow to allow two HGVs to pass. Construction works will be undertaken within the existing highway boundary.
- 5.3.49 Construction of the passing bays and localised widening will be undertaken in the third quarter of 2020 over a period of approximately two weeks. The works will be managed locally within the highway.

Environmental effects

- 5.3.50 The permanent modifications at Moor Lane will not result in any significant environmental effects.

Great Haywood Road temporary modifications, Tixall

Introduction

- 5.3.51 Great Haywood Road runs through the village of Tixall and eastwards in the direction of Great Haywood. The section that will be modified is approximately 1.4km in length and is shown on Volume 4 Map Book: Map CT-05-251, B4-13.
- 5.3.52 Tixall is a former estate village and consists of around 85 dwellings, including a number of listed buildings. Much of the land surrounding the village (to both the north and south of Great Haywood Road) is parkland, which includes areas of woodland.

Overview of works

- 5.3.53 The existing highway through Tixall and along Great Haywood Road is not sufficiently wide for the safe passing of HGVs, which will use this road to access the Trent North embankment satellite compound.
- 5.3.54 There is, therefore, a need to undertake temporary localised widening (particularly on bends) at four locations over a 1.4km length of the road and provide three temporary passing bays (15m long by 2m wide). The passing bays will be spaced approximately 250m apart.
- 5.3.55 As the existing highway boundary is limited in certain locations, land currently in agricultural use will be required temporarily during construction. The modifications will be required to remain in place for the duration of the construction of the Proposed Scheme.
- 5.3.56 Construction of the localised widening and passing bays will take place in the first quarter of 2021, and will take up to three months. Local traffic management measures will be put in place to allow Great Haywood Road to remain open during the works. The works will be managed locally within the highway.
- 5.3.57 There will also be works to Great Haywood Road, where it joins at the junction of Hoo Mill Lane, Ingestre Park Road and Mill Lane as a result of the Proposed Scheme. These are described and assessed in Volume 2, Community area 2, Colwich to Yarlet.

Environmental effects

- 5.3.58 These highway modifications have the potential for significant cultural heritage, ecology and landscape and visual effects.

Cultural heritage

Environmental baseline

- 5.3.59 A section of Great Haywood Road which is to be temporarily modified is within the Tixall Conservation Area (COY071)²⁵, a heritage asset of moderate value. Important elements of its historic significance include the interrelationships of different historic structures and landscape features, such as parkland, within it, as well as outward views, notably south-eastwards across the Sow Valley. The modifications within the Conservation Area will comprise:
- minor widening of the north side of the road, opposite the church of St John the Baptist, including the removal of approximately 0.1ha of woodland, which forms part of the historic parkland planting between the road and the former site of Tixall Hall. These works will extend from the centre of the village for approximately 250m; and
 - the construction of two passing bays on the north side of the road between Tixall Gatehouse and Tixall Farm.
- 5.3.60 Other heritage assets within the vicinity of the modifications include:
- The Church of St John the Baptist (COY155), a Grade II listed building and a heritage asset of moderate value. The northern boundary of the surrounding graveyard adjoins Great Haywood Road. Significant elements of the church's setting at the heart of a quiet rural village include its historical, aesthetic and communal relationships with the graveyard, surrounding historic buildings, the adjacent road and historic woodland planting opposite (associated with Tixall Park);
 - Tixall Gatehouse (COY070), a Grade I listed building and a heritage asset of high value. It is located approximately 100m north of Great Haywood Road, where minor widening is proposed. Significant aspects of its setting include its relationship with the former site of Tixall Hall and the surviving stables, and the south-easterly views across the Tixall Wide (a landscaped section of the Staffordshire and Worcestershire Canal (COY040)) and the Sow Valley; and
 - Tixall Farm and Tixall Bottle Lodge, Grade II listed buildings (COY067) and heritage assets of moderate value. They are located on opposite sides of Tixall Road at the eastern edge of Tixall Conservation Area. Aspects of their setting that contribute to their significance include their relationships with one another, and with Great Haywood Road and the surrounding elements of the Tixall Estate.
- 5.3.61 The highways modifications are within the Tixall and Ingestre Historic Landscape Character Area²⁶ (HLCA). This HLCA extends from the north-western boundary of

²⁵ Heritage assets are assigned a unique reference code (for example COY001). Further detail on these heritage assets can be found in the *Gazetteer of heritage assets*, Volume 5: Appendix CH-002-002.

²⁶ This HLCA is described in more detail in the Volume 5: Appendix CH-005-000, Route-wide historic landscape character report.

Shugborough Park across the former landscape parks of Ingestre and Tixall beyond the River Sow. The heritage value of this HLCA is considered to be moderate.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.62 Section 8 of the draft CoCP sets out measures that will be adopted to control effects, so far as reasonably practicable, on cultural heritage assets. This includes a requirement to ensure that disturbance to all heritage assets is managed in accordance with accepted historic environment practice, and where disturbance cannot reasonably be avoided, is controlled and limited as far as reasonably practicable.

Temporary effects

- 5.3.63 Impacts on all the heritage assets described above have been assessed. However, only those likely to give rise to significant effects are described in the assessment set out below.
- 5.3.64 The widening of Great Haywood Road to the north of the Church of St John the Baptist (COY155) will involve the removal of approximately 0.1ha of mature woodland, which will change the historic context of the road and graveyard boundary, although there will be no direct impact on the graveyard itself. The road widening works will introduce additional activity and movement into the normally peaceful village core. This will constitute a medium impact and a moderate adverse significant effect.
- 5.3.65 The highways modifications through Tixall Conservation Area (COY071) will introduce temporary noise and visual impacts into the setting, specifically within the historic village and the remnant designed landscape associated with the Tixall Estate. This will constitute a medium impact and a moderate adverse significant effect.
- 5.3.66 Tixall Gatehouse (COY070) will be subject to a temporary change in its setting during construction. It is a Grade I listed building within a remnant designed landscape, and has designed views to the south-east across Great Haywood Road towards Tixall Wide. The works to widen the road within this view, just over 100m from the gatehouse, will introduce noise and visual impacts into this view for up to three months. This will constitute a low adverse impact and a moderate adverse significant effect.
- 5.3.67 Volume 2, Community area report 2, Colwich to Yarlet, Section 7, reports that the construction of the Proposed Scheme will result in a medium adverse impact on the Tixall and Ingestre HLCA. The changes to the HLCA arising from the highway modifications are localised and small in scale and will not change the moderate adverse significant effect reported in Volume 2.

Permanent effects

- 5.3.68 As the modifications to Great Haywood Road are temporary there will be no significant permanent physical effects or permanent effects on the settings of heritage assets.

Other mitigation

- 5.3.69 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.

Summary of likely residual significant effects

- 5.3.70 The temporary effects of these highway modifications on the setting of heritage assets have been identified. However, they are largely reversible in nature and will be restricted to the duration of the construction works.

Effects arising during operation

- 5.3.71 The modifications to Great Haywood Road are temporary and will not give rise to any effects during operation.

Ecology

Environmental baseline

- 5.3.72 Great Haywood Road is within a landscape that includes parkland associated with Tixall Park, arable and pasture fields, well-established species rich hedgerows with mature trees, scattered mature trees (potentially veteran or ancient trees²⁷) and mixed semi-natural woodland. The Tixall Broadwater Local Wildlife Site (LWS), designated for its diverse marginal flora along a stretch of the Staffordshire and Worcestershire Canal, is located approximately 200m to the south of the closest point of the highway modifications. Lionlodge Covert LWS, designated for its broadleaved woodland and inland salt meadow, is located approximately 280m north of the closest point of the highway modifications. The village of Tixall contains a number of historic buildings and mature trees, which given their proximity to high quality woodland and the habitats associated with the canal and River Sow habitats, are likely to support roosting bats.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.73 The assessment assumes implementation of the measures in the draft CoCP, where reasonably practicable, including sensitive construction practices and preparation of habitat management plans.

Assessment of impacts and effects

- 5.3.74 Great Haywood Road has characteristics of a historic route, such as banked hedgerows and mature standard trees. This may indicate that the hedgerows meet both landscape and ecological criteria as 'important' as described in the Hedgerows Regulations 1997²⁸. In the absence of detailed survey information, it is assumed, on a precautionary basis, that the hedgerows do meet the criteria as 'important', and are

²⁷ 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.

²⁸ *The Hedgerow Regulations 1997 (No. 1160)*. Her Majesty's Stationery Office, London.

species-rich. The permanent loss of approximately 450m in length of hedgerow will represent a permanent adverse effect of significance at district/borough level.

- 5.3.75 There will be a loss of mature trees along Great Haywood Road that are potentially veteran or ancient trees. Veteran or ancient trees are an irreplaceable resource, the loss of which will result in a permanent adverse effect of significance at district/borough level.
- 5.3.76 The removal of mature or veteran trees that have the potential to support roosting bats, as well as the removal of good quality woodland foraging habitats and commuting routes along hedgerows, has the potential to result in a permanent adverse effect on the local bat population. On a precautionary basis, in the absence of detailed survey information, it is assumed that bats are present within the mature trees on Great Haywood Road and that this will result in significant adverse effects at up to county level, depending on the types of bat roosts found to be present within the trees and historic buildings.
- 5.3.77 The mature trees on Great Haywood Road also have the potential to provide nesting opportunities for barn owl, and the adjacent agricultural landscape and river and canal corridor offer suitable foraging habitats for barn owl. On a precautionary basis, in the absence of detailed survey information, it is assumed that barn owl are present. The loss of barn owl nesting sites represents a permanent adverse effect of significance at up to county level.
- 5.3.78 The widening of Great Haywood Road to the north of the Church of St John the Baptist will result in localised loss of part of a small well-established woodland, approximately 0.7ha in total area. The unnamed semi-natural broadleaved woodland includes semi-mature and mature (potentially veteran) pedunculate oak, silver birch and ash. The loss of approximately 0.1ha of the well-established woodland will have a permanent adverse effect on the structure and function of the woodland and is significant at district/borough level.
- 5.3.79 The introduction of construction HGVs onto rural roads such as Great Haywood Road during the construction of the highway modifications has the potential to increase disturbance related impacts to bat populations roosting within mature trees and historic buildings adjacent to the road, and on barn owls hunting on road verges. This disturbance effect is assessed and reported in Volume 2, Community area 2, Colwich to Yarlet, Section 8 as it relates to construction of the Proposed Scheme as a whole in this community area.

Other mitigation

- 5.3.80 Where hedgerows are removed, replacement species rich-hedgerows will be planted upon removal of the temporary works. They will be sited as close to the original hedgerow location as possible, following previous field boundaries to maintain landscape character. Hedgerows will be created using species consistent with those found in the affected hedgerows and the local landscape, in accordance with the Ecological Principles of Mitigation in the SMR Addendum. Following establishment and maturation of planting, it is expected that any adverse effect on the hedgerow network will be reduced to a level that is not significant.

5.3.81 Due to the landscape sensitivity of the setting of Tixall Gatehouse, compensatory woodland planting is not appropriate in this immediate location and compensatory planting to offset the loss has been proposed alongside existing planting near Tixall Park Pond and the woodland at Ford's Belt. This will provide enhanced connectivity between belts of woodland within the wider historic landscape around Tixall. Following establishment and maturation of planting, it is expected that any adverse effect on woodland will be reduced to a level that is not significant.

5.3.82 Where bat tree roosts are lost, within the woodland at Tixall and hedgerows along Great Haywood Road, artificial roosting provision will be provided. Where bat flight lines are temporarily severed due to hedgerow removal, and prior to the establishment of replacement hedgerows, advance planting and artificial hedgerows will be used to maintain corridors. These works will be carried out in accordance with the Ecological Principles of Mitigation in the SMR Addendum.

5.3.83 The loss of nesting opportunities for barn owl will be mitigated by the provision of artificial nest boxes at an appropriate distance from the highway modifications in accordance with the Ecological Principles of Mitigation in the SMR Addendum.

Summary of likely residual significant effects

5.3.84 Veteran and ancient trees are irreplaceable. If any are confirmed to be present, their loss will lead to a permanent adverse effect that is significant at a district/borough level, which cannot be mitigated.

Effects arising during operation

5.3.85 The modifications to Great Haywood Road are temporary and will not give rise to any effects during operation.

Landscape and visual

Environmental baseline

5.3.86 Great Haywood Road is within the Ingestre Park Sandstone Estatelands LCA, an area comprising the historic designed parkland of Ingestre and the designed landscape and deer park of Tixall Park, lying between the valley sides of the River Trent and the River Sow. Ingestre Park is the setting for the Jacobean Grade II* listed Ingestre Hall. Notable features of this parkland include boundary tree belts and coppices, the former Park Pool at Tixall and an early 20th century lime avenue at Ingestre.

5.3.87 Settlement comprises farmsteads and the historic villages of Little Ingestre and Tixall. Tixall is recognised as representing one of the special qualities of the Cannock Chase Area of Outstanding Natural Beauty (AONB), within which part of the Ingestre Park Sandstone Estatelands LCA falls. There are numerous estate vernacular buildings including Tixall Mews. The Tudor Tixall Gatehouse is a distinctive local landmark. Overall, landscape value is judged to be high, as is landscape susceptibility and landscape sensitivity.

5.3.88 Great Haywood Road forms the approach to Tixall Gatehouse, which is within the AONB and the Ingestre Park Sandstone Estatelands LCA. It is a rural lane bounded to the north by historic woodland within the designed landscape of Tixall Park.

5.3.89 Visual receptor viewpoints in the vicinity include residents at Bottle Lodge and Tixall Court on the Great Haywood Road near Tixall Gatehouse, a small number of residential properties on the eastern edge of Tixall village, and users of Tixall Bridleway 1, which intersects Great Haywood Road adjacent to Bottle Lodge, and Tixall Bridleway 0.1629, which crosses Tixall Park from north to south.

Effects arising during construction

Avoidance and mitigation measures

5.3.90 Measures in the draft CoCP to avoid or reduce landscape and visual effects during construction insofar as reasonably practicable, include:

- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;
- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

Assessment of impacts and effects

5.3.91 The highway modifications will result in localised removal of a small area of historic woodland, which forms part of the designed landscape of Tixall Park. There will also be the need to remove a small number of mature oak trees and sections of fragmented hedgerow, alongside Great Haywood Road. The works will alter the integrity of the landscape pattern and associated rural road character at the boundary of Tixall Park. Volume 2, Community area report 2, Colwich to Yarlet, Section 11 reports that the construction of the Proposed Scheme will result in a high magnitude of change on the character of the Ingestre Park Sandstone Estatelands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the major adverse (significant) effect reported in Volume 2.

5.3.92 The highway modifications will be visible from some residential receptors at Bottle Lodge and Tixall Court located on the Great Haywood Road near Tixall Gatehouse, as well as three residential properties on the eastern edge of Tixall village. The works will also be visible from several PRow, notably Tixall Bridleway 1, and Tixall Bridleway 0.1629. Residential and recreational receptors have a high sensitivity to change. However, due to the small scale and temporary nature of change in the wider views from these locations and the short duration of these modification works, the overall magnitude of change is considered to be low. Therefore, visual effects are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

5.3.93 Localised replacement hedgerow planting is proposed upon removal of the temporary works along Great Haywood Road to restore landscape character lost to the

construction works. Due to the sensitivity of the setting of Tixall Gatehouse, compensatory woodland planting is not appropriate in this location and compensatory planting to offset the loss has instead been proposed alongside existing historic planting near Tixall Park Pond and the woodland at Ford's Belt.

Summary of likely residual significant effects

- 5.3.94 These highway modifications will result in localised impacts on the Ingestre Park Sandstone Estatelands LCA during construction. This will not change the major adverse (significant) effect reported in Volume 2. Visual effects during construction will be either negligible or minor adverse (non-significant).

Effects arising during operation

Avoidance and mitigation measures

- 5.3.95 No further avoidance or mitigation measures, apart from the localised replacement hedgerow planting and compensatory planting described above, are required during operation.

Assessment of impacts and effects

- 5.3.96 The loss of historic and mature roadside woodland, trees and hedgerows on parts of Great Haywood Lane will persist at operation and will locally alter the integrity of the landscape character and rural road character at the boundary of Tixall Park, which are characteristic of this LCA. Volume 2, Community area report 2, Colwich to Yarlet, Section 11 reports that the operation of the Proposed Scheme will result in a high magnitude of change in years 1, 15 and 60 on the character of the Ingestre Park Sandstone Estatelands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the major adverse (significant) effect on the character of the LCA in operation years 1, 15 and the moderate adverse (significant) effect in year 60, reported in Volume 2.
- 5.3.97 The loss of trees will be apparent due to the presence of new gaps in the views from residential receptors at Bottle Lodge and Tixall Court located on the Great Haywood Road near Tixall Gatehouse, as well as three residential properties on the eastern edge of Tixall village. The modification works will also be visible from several PRoW, notably Tixall Bridleway 1 and Tixall Bridleway 0.1629. However, due to the local and small scale nature of change in the general views, visual effects in operation year 1, 15 and 60 are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.98 No further mitigation measures are proposed.

Summary of likely residual significant effects

- 5.3.99 The highway modifications will result in localised impacts on the Ingestre Park Sandstone Estatelands LCA during operation years 1, 15 and 60. This will not change the major adverse (significant) effect for years 1 and 15 and moderate adverse (significant) effect in year 60 reported in Volume 2. Visual effects during operation will be either negligible or minor adverse (non-significant).

Marston Lane permanent modifications, Marston

Introduction

- 5.3.100 Marston Lane links the A513 Beaconside, to the south, with the small settlement of Marston, and continues north to join Enson Lane, as shown in Volume 4 Map Book: Map CT-05-252, G7-J8.
- 5.3.101 The A513 Beaconside separates the urban area of Stafford, to the south, from the rural area through which Marston Lane passes. The local area is characterised by land in agricultural use and a small number of farms and residential properties at intervals along Marston Lane.

Overview of works

- 5.3.102 The existing highway in this location is not sufficiently wide for the safe passing of HGVs, which will need to access two balancing ponds located on Marston Lane, adjacent to the Proposed Scheme, for maintenance.
- 5.3.103 There is, therefore, a need to provide three permanent passing bays (each approximately 15m long by 2m wide), which will be approximately 200m apart, along a section of Marston Lane, and permanent localised widening where the road is currently too narrow to allow two HGVs to pass. Construction works will be undertaken within the existing highway boundary.
- 5.3.104 Construction of the passing bays and localised widening will be undertaken in the first quarter of 2021 over an approximately three month period. Local traffic management measures will be put in place to allow Marston Lane to remain open during the works. The works will be managed locally within the highway.
- 5.3.105 There will also be works to realign a section of Marston Lane via a new underbridge as a result of the Proposed Scheme. These are described and assessed in Volume 2, Community area 2, Colwich to Yarlet.

Environmental effects

- 5.3.106 The permanent modifications at Marston Lane will not result in any significant environmental effects.

Yarnfield Lane temporary modifications, Stone

Introduction

- 5.3.107 Yarnfield Lane is located to the west of Stone and between the A34 Stafford Road/The Fillybrooks, immediately to the east, and the M6, to the west. The section that includes the highway modifications is approximately 500m in length and is shown on Volume 4 Map Book: Map CT-05-252, A8-C8.
- 5.3.108 The surrounding area is generally rural in nature, with woodland and agricultural uses on the northern side of Yarnfield Lane and Stone Golf Club's golf course on the southern side. The Wayfarer public house and restaurant is situated at the junction of Yarnfield Lane and the A34 Stafford Road/The Fillybrooks to the east. There is one residential property and an access drive to a second property (set back from the road) to the east of the modifications.

Overview of works

- 5.3.109 The existing highway is not sufficiently wide for the safe passing of construction HGVs that will use this road to access Yarnfield North embankment satellite compound.
- 5.3.110 There is, therefore, a need to temporarily widen Yarnfield Lane. Consideration has been given to the need to reduce both loss of woodland and the impact on the golf course. To achieve this, the road will be widened on the south side, as it passes adjacent to woodland, and on the north side as it passes the golf course.
- 5.3.111 As the existing highway boundary is limited in certain locations, both woodland and land currently in agricultural use will be required temporarily during construction. The modifications are required to remain in place for the duration of the construction of the Proposed Scheme.
- 5.3.112 Construction of the localised widening will be undertaken in the first quarter of 2021 over a period of approximately three months. Local traffic management measures will be put in place to allow Yarnfield Lane to remain open during the works. The works will be managed locally within the highway.
- 5.3.113 There will also be temporary and permanent works to Yarnfield Lane as a result of the Proposed Scheme. These are described in Volume 2, Community area 3, Stone and Swynnerton.

Environmental effects

- 5.3.114 These highway modifications have the potential for significant ecology and biodiversity and landscape and visual effects.

Ecology

Environmental baseline

- 5.3.115 Yarnfield Lane is located to the south-west of Stone within an agricultural landscape mostly comprising arable fields, with hedgerows, scattered mature trees, ponds and broadleaved woodland parcels. Yarnfield Lane is characterised by well-established hedgerows supporting mature standard pedunculate oak trees. In places the lane is sunken into the landscape with banked hedgerows on either side.
- 5.3.116 Stone Golf Club's golf course supports amenity grasslands, landscape tree planting, rough grassland margins and ponds. The River Trent is located approximately 120m north-east of the modification works. Trentwood LWS, designated for its replanted ancient woodland on the slopes of the River Trent, is located approximately 275m south of the modification works. The mature oak trees within the hedgerows that line Yarnfield Lane are assumed, on a precautionary basis in the absence of detailed survey information, to offer roosting opportunities for bats and potential nesting opportunities for barn owl.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.117 The assessment assumes implementation of the measures set out within the draft CoCP, where reasonably practicable, which includes sensitive construction practices and preparation of habitat management plans.

Assessment of impacts and effects

- 5.3.118 Yarnfield Lane has the characteristics of a historic route, such as banked hedgerows and mature standard trees. This may indicate that the hedgerows along the road meet both landscape and ecological criteria as 'important' as described in the Hedgerow Regulations 1997. The loss of hedgerows to construction of the proposed works represents an adverse effect of significance at district/borough level. In the absence of detailed survey information, it is assumed, on a precautionary basis, that the hedgerows do meet the criteria as 'important', and are species-rich. The permanent loss of approximately 350m in length will degrade the hedgerow network and ecological dispersal corridors in this location and will represent a permanent adverse effect of significance at district/borough level.
- 5.3.119 The mature trees along Yarnfield Lane could potentially be veteran or ancient trees. Veteran and ancient trees are an irreplaceable resource and their loss will result in a permanent adverse effect of significance at the district/borough level.
- 5.3.120 The highway modifications will result in the removal of mature, ancient or veteran trees that have the potential to support roosting bats, as well as the removal of high quality woodland foraging habitats and commuting routes along hedgerows. On a precautionary basis, in the absence of detailed survey information, it is assumed that bats are present and that this will result in significant adverse effects at up to county level, depending on the types of bat roosts found to be present within the trees.
- 5.3.121 The mature, ancient or veteran trees on Yarnfield Lane have the potential to provide nesting opportunities for barn owl. On a precautionary basis in the absence of detailed survey information, it is assumed that barn owl are present. The loss of barn owl nesting sites represents a permanent adverse effect of significance at up to county level.
- 5.3.122 The highway modification works along Yarnfield Lane will result in the loss of approximately 350m of hedgerow along the banked lane and woodland vegetation. This includes the removal of semi-mature and mature trees within the hedgerows and the removal of semi-mature woodland on the southern side of Yarnfield Lane, within the golf course. The loss of part of this well-established woodland will represent a permanent adverse effect of significance at district/borough level.
- 5.3.123 The introduction of construction HGVs onto rural roads such as Yarnfield Lane during the construction of the highway modifications has the potential to increase disturbance related impacts on bat populations roosting within mature trees and historic buildings adjacent to the road, and on barn owls hunting on road verges. This disturbance effect is assessed and reported in Volume 2, Community area 3, Stone and Swynnerton as it relates to construction of the Proposed Scheme as a whole, within that community area.

Other mitigation measures

- 5.3.124 Where hedgerows are removed, replacement species rich-hedgerows will be planted upon removal of the temporary works. They will be sited as close to the original hedgerow location as possible. Hedgerows will be created using species consistent with those found in the hedgerows affected and those within the local landscape in accordance with the Ecological Principles of Mitigation in the SMR Addendum. Two additional areas of woodland habitat creation are also proposed next to existing woodland blocks, to mitigate the loss of existing woodland adjacent to Yarnfield Lane. Following establishment and maturation of planting, it is expected that any adverse effect on the hedgerow network will be reduced to a level that is not significant.
- 5.3.125 Where bat roosts are lost, artificial roosting provision will be provided in accordance with the Ecological Principles of Mitigation in the SMR Addendum. Where bat flight lines are temporarily severed due to hedgerow removal prior to establishment of replacement hedgerows, advance planting and artificial hedgerows will be utilised to maintain corridors in accordance with the Ecological Principles of Mitigation in the SMR Addendum.
- 5.3.126 The loss of nesting opportunities for barn owl will be mitigated by the provision of artificial nest boxes at an appropriate distance from the highway modifications in accordance with the Ecological Principles of Mitigation in the SMR Addendum.

Summary of likely residual significant effects

- 5.3.127 Veteran and ancient trees are irreplaceable. If any are confirmed to be present, their loss will lead to a permanent adverse effect that is significant at a district/borough level, which cannot be mitigated.

Effects arising during operation

- 5.3.128 The modifications to Yarnfield Lane are temporary and will not give rise to any effects during operation.

Landscape and visual

Environmental baseline

- 5.3.129 Yarnfield Lane is within the Yarnfield Settled Farmlands LCA. The Yarnfield Settled Farmlands LCA is an undulating rural landscape, which includes the village of Yarnfield. The arable landscape consists of poorly maintained and gappy hedgerow field boundaries, surrounding medium sized fields. The area includes a few isolated settlements and a number of woodland blocks within the LCA, including Darlaston Wood.
- 5.3.130 Yarnfield Lane is a highly distinctive sunken lane lined by historic hedgerows and mature trees, which has a strong sense of scenic quality. Such lanes are recognised as irreplaceable historic features. Overall, landscape value is judged to be medium, as is landscape susceptibility and landscape sensitivity.
- 5.3.131 Visual receptor viewpoints in the vicinity include residents at South Lodge, at the entrance to Darlaston Park, and recreational users of Stone Golf Club's golf course.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.132 Measures have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction, and include:
- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;
 - avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction;
 - prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles; and
 - replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

Assessment of impacts and effects

- 5.3.133 The construction of the Yarnfield Lane temporary modifications will result in the loss of approximately 350m of the historic sunken lane at Yarnfield Lane, associated landform and ancient hedgerow vegetation, plus a woodland block forming part of the designed landscape of Darlaston Park. Volume 2, Community area report 3, Stone and Swynnerton, Section 11 reports that the construction of the Proposed Scheme will result in a high magnitude of change on the character of the Yarnfield Settled Farmlands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the major adverse (significant) effect reported in Volume 2.
- 5.3.134 The loss of woodland, hedgerows and trees to accommodate localised road widening will be visible from some residential receptors near the junction of Yarnfield Lane with the A34 The Fillybrooks, in particular South Lodge, at the entrance to Darlaston Park. However, due to the small scale and temporary nature of change in the wider views from these locations and the short duration of these modification works, construction effects are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.135 Localised replacement hedgerow planting is proposed after removal of the temporary works along Yarnfield Lane to restore landscape character lost to the highway modification works. Two additional areas of woodland habitat creation are proposed adjoining existing woodland blocks to mitigate the loss of existing woodland adjacent to Yarnfield Lane.

Summary of likely residual significant effects

- 5.3.136 These highway modifications will result in localised impacts on the Yarnfield Settled Farmlands LCA during construction. This will not change the major adverse (significant) effect reported in Volume 2. Visual effects during construction will be either negligible or minor adverse (non-significant).

Effects arising during operation

Avoidance and mitigation measures

- 5.3.137 No further avoidance or mitigation measures, beyond the localised replacement hedgerow planting and compensatory planting described, are proposed during operation.

Assessment of impacts and effects

- 5.3.138 The permanent loss of vegetation and changes in landform associated with the sunken lane on parts of Yarnfield Lane will persist at operation and will locally change the scenic quality and character of this LCA. Volume 2, Community area report 3, Stone and Swynnerton, Section 11 reports that the operation of the Proposed Scheme will result in a medium magnitude of change in years 1 and 15 and low magnitude of change in year 60 on the character of the Yarnfield Settled Farmlands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the moderate adverse (significant) effect on the character of the LCA in operation years 1, 15 and the minor adverse (non-significant) effect in year 60, reported in Volume 2.
- 5.3.139 The loss of woodland, hedgerows and trees to accommodate localised road widening will be visible from some residential receptors near the junction of Yarnfield Lane with the A34 The Fillybrooks, in particular South Lodge, at the entrance to Darlaston Park. However, due to the local and small scale nature of change in the general views, visual effects in operation years 1, 15 and 60 are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.140 No further mitigation measures are proposed.

Summary of likely residual significant effects

- 5.3.141 These highway modifications will result in localised impacts on the Yarnfield Settled Farmlands LCA during operation years 1, 15 and 60. This will not change the moderate adverse (significant) effect for years 1 and 15 and minor adverse (non-significant) effect in year 60 reported in Volume 2. Visual effects during operation will be either negligible or minor adverse (non-significant).

Junction of A51 The Rowe and Bent Lane/ Dog Lane permanent modifications, Stableford

Introduction

- 5.3.142 The junction of the A51 The Rowe and Bent Lane/Dog Lane is situated to the east of Stableford and is immediately to the east of the existing WCML.
- 5.3.143 Modifications are required to a section of road to the west of the junction (the A51 Stone Road through Stableford) and a section of road to the south of the junction (the A51 The Rowe), as shown on Volume 4 Map Book: Map CT-05-252, G5-15.

- 5.3.144 The junction is located in a largely rural area, where adjacent land is in agricultural use. There are groups of residential properties nearby in Stableford and at The Rowe. The area is also characterised by the presence of the WCML.

Overview of works

- 5.3.145 The Junction of the A51 The Rowe and Bent Lane/Dog Lane is located on a construction route that will serve Hatton North cutting satellite compound. Permanent access will be required to balancing ponds located on Dog Lane and Bent Lane for maintenance. The existing design of the junction will constrain HGVs turning without moving into the opposite lane during both construction and operation.
- 5.3.146 The modifications allow for the provision of permanent signage to warn of a potential hazard ahead (that of HGVs turning into oncoming traffic). Other traffic management measures will also be put in place to assist safe movement of HGVs.
- 5.3.147 Installation of the signage will be undertaken within the existing highway boundary.
- 5.3.148 The modifications will take place in the third quarter of 2020 within a period of approximately six weeks. The works will be managed locally within the highway.

Environmental effects

- 5.3.149 The permanent modifications at the junction of the A51 The Rowe and Bent Lane/Dog Lane will not result in any significant environmental effects.

Junction of A51 Nantwich Road and A525 Newcastle Road temporary modifications, Woore

Introduction

- 5.3.150 The junction of the A51 Nantwich Road and the A525 Newcastle Road is in Woore, to the west of Stoke-on-Trent, as shown on Volume 4 Map Book: Map CT-05-253, A2.
- 5.3.151 The junction is in the centre of Woore, which is a large village that is predominantly residential, with some shops and services. The Coopers Arms public house, The Falcon public house, a church, and post office/ general store are located near the junction.

Overview of works

- 5.3.152 The junction of the A51 Nantwich Road and the A525 Newcastle Road is located on the construction route to access Madeley cutting satellite compound and Madeley Tunnel south satellite compound. The existing design of the junction will constrain construction HGVs carrying abnormal loads, for example those carrying beams, from turning from/into the A51 Nantwich Road into/from the A525 Newcastle Road.
- 5.3.153 There is, therefore, a need to temporarily remove existing street furniture to allow HGVs to pass through the junction safely. In addition, the junction and adjoining roads will be closed for short periods while abnormal loads are escorted through the junction.
- 5.3.154 There will also be other temporary diversions of Dog Lane and Bent Lane during construction of the Proposed Scheme. These are described and assessed in Volume 2, Community area 3, Stone and Swynnerton.

Environmental effects

- 5.3.155 The removal of street furniture at the junction of the A51 Nantwich Road and the A525 Newcastle Road will not result in any significant environmental effects.

A525 Bar Hill Road temporary modifications, Onneley

Introduction

- 5.3.156 The A525 Bar Hill Road passes through the villages of Onneley to the south-west and Madeley to the north-east, and is situated to the west of Stoke-on-Trent. The section that includes the highway modifications is approximately 2km in length and is shown on Volume 4 Map Book: CT-05-253, A9-J9.
- 5.3.157 The surrounding area is rural in nature and largely used for agriculture. Onneley Golf Club is located on this section of the A525 Bar Hill Road. There are residential and business premises on this section of road, including Bar Hill House Farm and Baa Hill Farm and farm shop.

Overview of works

- 5.3.158 The existing highway is not sufficiently wide for the safe passing of construction HGVs that will use this road to access Madeley cutting satellite compound and Madeley tunnel (south) satellite compound.
- 5.3.159 There is, therefore, a need to provide 13 temporary passing bays (approximately 15m long by 1.5m wide) and temporary localised widening where the road is currently too narrow to allow two HGVs to pass. Part of the road that requires widening includes a section of sunken lane, which will necessitate earthworks and the removal of an exposed rock face.
- 5.3.160 As the existing highway boundary is limited in certain locations, land currently in agricultural use will be required temporarily during construction. The modifications are required to remain in place for the duration of the construction of the Proposed Scheme.
- 5.3.161 Construction of the passing bays and localised widening will be undertaken in the first quarter of 2021 over a period of approximately three months. Local traffic management measures will be put in place to allow the A525 Bar Hill Road to remain open during the works. The works will be managed locally within the highway.
- 5.3.162 There will also be permanent works to the A525 Bar Hill Road as a result of the Proposed Scheme. These are described and assessed in Volume 2, Community area 4, Whitmore Heath to Madeley.

Environmental effects

- 5.3.163 These highway modifications have the potential for significant landscape and visual effects.

Landscape and visual

Environmental baseline

- 5.3.164 The A525 Bar Hill Road, at the location of the highway modifications, is a deeply incised historic sunken lane within the Madeley Ancient Clay Farmlands LCA. The Madeley Ancient Clay Farmlands LCA is defined by undulating landform, and covered by pastoral and arable farmland with dispersed farmsteads and properties. Small to medium scale irregular fields dating from the 17th to 19th century are bounded by mostly robust hedgerows with mature hedgerow trees, connecting to shelterbelts²⁹ and coppices in the wider area. Larger tracts of woodland are found towards the edges of the LCA.
- 5.3.165 Vehicular access is typically confined to farm tracks and private roads, as well as the historic rural roads, such as the sunken lane at the A525 Bar Hill Road, which is a locally important historic landscape feature. At this point the road is deeply incised within a sandstone outcrop and almost completely enclosed by mature trees, creating a strong local sense of place and scenic quality. Overall, landscape value is judged to be medium, as is landscape susceptibility and landscape sensitivity.
- 5.3.166 Visual receptor viewpoints in the vicinity include residences along the A525 Bar Hill Road, notably at Bar Hill House Farm, Baa Hill Farm, Bar Hill Top Cottage, Fodderbing House and Bar Hill Villa, and the Madeley Footpath 64, which intersects with the A525 Bar Hill Road, opposite Bar Hill House Farm.

Effects arising during construction

Avoidance and mitigation measures

- 5.3.167 Measures have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects so far as reasonably practicable during construction, and include:
- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;
 - avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction;
 - prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles; and
 - replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

Assessment of impacts and effects

- 5.3.168 The highway modifications will result in the removal of one side of the historic sunken lane, associated prominent sandstone outcrop and prominent hedgerow vegetation. This will result in local change to this distinctive landscape feature. Volume 2,

²⁹ A barrier of trees and shrubs to help reduce wind speed to protect buildings / planting and provide shelter.

Community area 4 report, Whitmore Heath to Madeley, Section 11 reports that the construction of the Proposed Scheme will result in a medium magnitude of change on the character of the Madeley Ancient Clay Farmlands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the moderate adverse (significant) effect reported in Volume 2.

- 5.3.169 The removal of vegetation and the construction of the highway modifications will be visible from residential receptors along the A525 Bar Hill Road notably at Bar Hill House, Bar Hill Farm, Bar Hill Top Cottage, Fodderbing House and Bar Hill Villa, and the Madeley Footpath 64. However, due to the small scale and temporary nature of change in the wider views from these locations and the short duration of these modification works, visual effects at construction are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.170 Localised replacement hedgerow planting is proposed in a number of locations along the A525 Bar Hill Road upon removal of the temporary works to compensate for vegetation loss resulting from the works.

Summary of likely residual significant effects

- 5.3.171 These highway modifications will result in localised impacts on the Madeley Ancient Clay Farmlands LCA during construction. This will not change the moderate adverse (significant) effect reported in Volume 2. Visual effects during construction will be either negligible or minor adverse (non-significant).

Effects arising during operation

Avoidance and mitigation measures

- 5.3.172 No further avoidance or mitigation measures (beyond localised replacement hedgerow planting described above) are required during operation.

Assessment of impacts and effects

- 5.3.173 The permanent loss of vegetation and changes in landform associated with the sunken lane will persist at operation and will locally change the scenic quality and character of this LCA. Volume 2, Community area 4, Whitmore Heath to Madeley, Section 11 reports that the operation of the Proposed Scheme will result in a medium magnitude of change in year 1 and a low magnitude of change in year 15 and 60 on the character of the Madeley Ancient Clay Farmlands LCA. The changes to the LCA arising from the highway modifications are localised and will not change the moderate adverse (significant) effect on the character of the LCA in operation year 1 and the minor adverse (non-significant) effect in years 15 and 60, reported in Volume 2.
- 5.3.174 The loss of parts of the sunken lane will be visible from residential receptors along the A525, notably at Bar Hill House, Bar Hill Farm, Bar Hill Top Cottage, Fodderbing House and Bar Hill Villa, and Madeley Footpath 64. However, due to the local and small scale nature of change in the general views visual effects in operation years 1, 15 and 60 are assessed as either negligible or minor adverse (non-significant).

Other mitigation measures

- 5.3.175 No further mitigation measures are proposed.

Summary of likely residual significant effects

- 5.3.176 These highway modifications will result in localised impacts on the Madeley Ancient Clay Farmlands LCA during operation years 1, 15 and 60. This will not change the moderate adverse (significant) effect for year 1 and minor adverse (significant) effect in years 15 and 60 reported in Volume 2. Visual effects during operation will be either negligible or minor adverse (non-significant).

B5071 Wybunbury Road temporary modifications, Wybunbury

Introduction

- 5.3.177 The B5071 Wybunbury Road is located on the southern edge of the village of Wybunbury, as shown on Volume 4 Map Book: Map CT-05-252, C3.
- 5.3.178 Wybunbury Delves Church of England Primary School is located at the junction of the B5071 Wybunbury Road and Back Lane. The B5071 Wybunbury Road is currently used for on-street parking.

Overview of works

- 5.3.179 The B5071 Wybunbury Road is located on a construction route that will serve the Crewe South cutting satellite compound. At present, vehicles park along that part of Wybunbury Road adjoining the Primary School, restricting the highway width for construction HGVs.
- 5.3.180 Twelve temporary parking bays (each approximately 6m long and 2m wide) will be provided on the western side of the road within an area that is currently part of the grass verge. A 1.5m wide footway will also be provided as the existing footway will be removed in order to provide the parking bays. The new section of footway will connect into the existing footway. A 1m high retaining wall will be required due to the gradient of the verge.
- 5.3.181 Construction works will be undertaken within the existing highway boundary and are required to remain in place for the duration of the construction of the Proposed Scheme.
- 5.3.182 Construction of the parallel parking bays, footpath and retaining wall will be undertaken in the first quarter of 2021 over an approximately one month period. Disruption to the Primary School will be limited so far as reasonably practicable. Local traffic management measures will be put in place to allow the B5071 Wybunbury Road to remain open during the works. These works will be managed locally within the highway.

Environmental effects

- 5.3.183 The temporary modifications at the B5071 Wybunbury Road will not result in any significant environmental effects.

6 References

Department for Transport (2015), *High Speed Two: East and West. The next steps to Crewe and beyond*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/480712/hs2-east-and-west.pdf.

Department for Transport (2015), *HS2 Phase 2a Strategic Outline Business Case: Strategic Case*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/570472/hs2-phase-2a-strategic-case.pdf.

Department for Transport (DfT), (2017), *High Speed Two Phase Two Strategic Case 2017*. Available online at: <https://www.gov.uk/>.

Department for Transport (DfT), (2017), *High Speed Two Phase 2a Outline Business Case: Economic Case*. Available online at: <https://www.gov.uk/>.

Department for Transport (2016), *High Speed Two: From Crewe to Manchester, the West Midlands to Leeds and beyond*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/568208/high-speed-two-crewe-manchester-west-midlands-leeds-web-version.pdf.

Department for Transport (2017), *National Trip End Model (NTEM) forecasts* (contained within the TEMPro software package). Available online at:

<https://www.gov.uk/government/publications/tempro-downloads>.

Her Majesty's Stationery Office (1988)/ Department of Transport/Welsh Office, *Calculation of Road Traffic Noise*. Available online at: <http://www.devon.gov.uk/core-doc-n3-calculation-of-road-traffic-noise.pdf>.

Her Majesty's Stationery Office (1997), *The Hedgerows Regulations*. Available online at:

<http://www.legislation.gov.uk/ukSI/1997/1160/made/data.pdf>.

Highways Agency (2007), *Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07)*. Available online at:

<http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/ha20707.pdf>.

Highways Agency (2011), *Design Manual for Roads and Bridges (Volume 11, Section 3, Part 7 Noise and Vibration HD213/11)*. Available online at:

<http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/hd21311.pdf>.

HS2 Ltd (2013), *London-West Midlands Environmental Statement Volume 4: Off-route effects*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/259489/Volume_4_Off-route_effects.pdf.

HS2 Ltd (2014), *HS2 Plus – A report by David Higgins*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/374695/HS2_Plus_-_A_report_by_David_Higgins.pdf.

HS2 Ltd (2014), *Rebalancing Britain – From HS2 towards a national transport strategy*. Available online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/374709/Rebalancing_Britain_-_From_HS2_towards_a_national_transport_strategy.pdf.

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