LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 2 | Community Forum Area report

CFA19 | Coleshill Junction

November 2013

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ES 3.2.1.19

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Department for Transport

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A report prepared for High Speed Two (HS2) Limited:

ARUP ATKINS CAPITA ERM

ineco Mott MacDonald PARSONS BRINCKERHOFF TEMPLE URS

High Speed Two (HS2) Limited,
Eland House,
Bressenden Place,
London SW1E 5DU

Details of how to obtain further copies are available from HS2 Ltd.

Telephone: 020 7944 4908

General email enquiries: HS2enquiries@hs2.org.uk

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Contents

List of figures

List of tables

Structure of the HS2 Phase One Environmental Statement

The Environmental Statement (ES) documentation comprises:

- Non-technical summary (NTS) – which provides a summary in non-technical language of the Proposed Scheme, the likely significant environmental effects of the Proposed Scheme, both beneficial and adverse, and the means to avoid or reduce the adverse effects;
- Volume 1: Introduction to the ES and the Proposed Scheme – this describes High Speed Two (HS2), and the environmental impact assessment process, the approach to consultation and engagement, details of the permanent features and generic construction techniques as well as a summary of main strategic and route-wide alternatives and local alternatives (prior to 2012) considered;
- Volume 2: Community forum area reports and map books – 26 reports and associated map books providing a description of the scheme and of environmental effects in each area;
- Volume 3: Route-wide effects – provides an assessment of the effects of the Proposed Scheme where it is not practicable to describe them within the CFA descriptions in Volume 2;
- Volume 4: Off-route effects – provides an assessment of the off-route effects of the Proposed Scheme;
- Volume 5: Appendices and map books – contains supporting environmental information and associated map books; and
- Glossary of terms and list of abbreviations – contains terms and abbreviations, including units of measurement, used throughout the ES documentation.

1 Introduction

1.1 Introduction to HS2

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

1.1.2 HS2 is proposed to be built in two phases. Phase One, the subject of this ES, will involve the construction of a new railway line of approximately 230km (143 miles) between London and Birmingham. Construction will begin in 2017 and the line will become operational by 2026; with a connection to the West Coast Main Line (WCML) near Lichfield and to the existing HS1 railway line in London.

1.1.3 During Phase One, beyond the dedicated high speed track, these high speed trains will connect with and run on the existing WCML to serve passengers beyond the HS2 network to destinations in the north. A connection to HS1 will also allow some services to access that high speed line through east London and Kent and connect with mainland Europe via the Channel Tunnel.

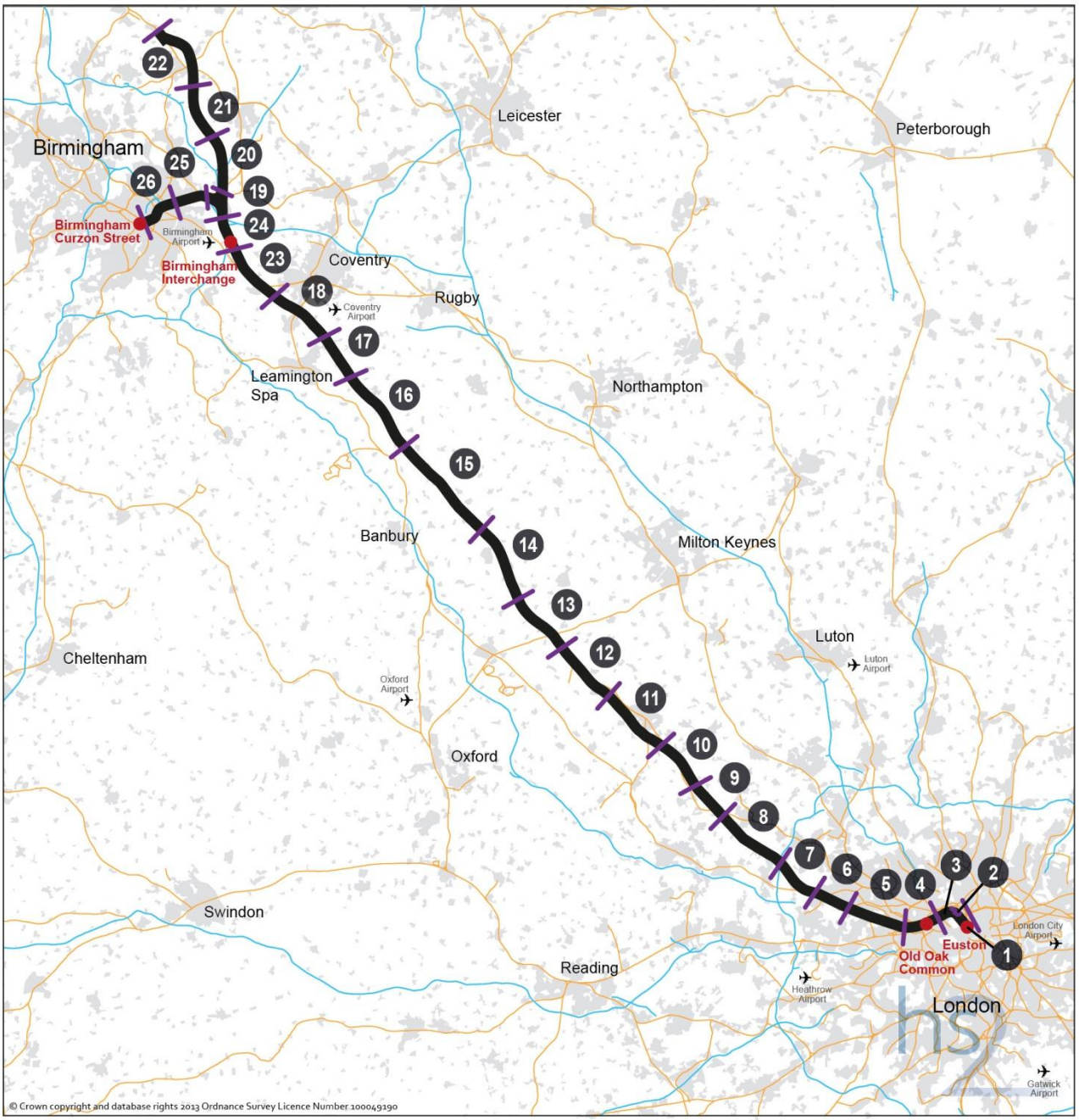
1.1.4 Phase Two will involve the construction of lines from Birmingham to Leeds and Manchester; with construction commencing approximately 2023, and planned to be operational by 2033.

1.1.5 Section 4 of Volume 1 describes the anticipated operational characteristics of HS2, including the anticipated frequency of train services. As Volume 1 shows, the frequency of trains is expected to increase over time and to increase further upon opening of Phase Two. In assessing the environmental effects of the Proposed Scheme the anticipated Phase 2 operational frequency has been used. For further detail of the anticipated operation of the Proposed Scheme in the Coleshill Junction area (CFA19), see Section 2.4.

1.1.6 The Government believes that the HS2 network should link to Heathrow and its preferred option is for this to be built as part of Phase Two. However, the Government has since taken the decision to pause work on the Heathrow link until after 2015 when it expects the Airports Commission to publish its final report on recommended options for maintaining the country's status as an international aviation hub.

1.1.7 For consultation and environmental assessment purposes, the proposed Phase One route has been divided into 26 community forum areas (CFA), as shown in Figure 1. This has enabled wider public engagement on the Proposed Scheme and on the likely adverse and beneficial effects.

Figure 1: HS2 Phase One route and community forum areas



1.2 Purpose of this report

1.2.1 This report presents the likely significant environmental effects of the construction and operation of Phase One of HS2 (referred to throughout the ES as the 'Proposed Scheme') that have been identified within the area of Coleshill Junction (CFA19). It reports the likely significant environmental effects and proposed mitigation measures, for those significant effects which are adverse, within the Coleshill Junction area.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1 – an introduction to HS2 and the purpose and structure of this report;
- Section 2 – overview of the area, description of the Proposed Scheme within the area and its construction and operation, and a description of the main local alternatives;
- Sections 3-13 – an assessment for the following environmental topics:
  - agriculture, forestry and soils (Section 3);
  - air quality (Section 4);
  - community (Section 5);
  - cultural heritage (Section 6);
  - ecology (Section 7);
  - land quality (Section 8);
  - landscape and visual assessment (Section 9);
  - socio-economics (Section 10);
  - sound, noise and vibration (Section 11);
  - traffic and transport (Section 12); and
  - water resources and flood risk assessment (Section 13).

1.3.2 Each environmental topic section comprises: an introduction to the topic; a description of the environmental baseline within the area; the likely significant environmental effects arising during construction and operation of the Proposed Scheme; and proposed mitigation measures for any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1, the Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-000/1) and Section 6A of the SMR Addendum (see Volume 5: Appendix CT-001-000/2).

1.3.4 Where appropriate, potential climate change impacts and adaptation measures are discussed in the relevant environmental topic section. Volume 1 and Section 6A of the

SMR Addendum also include additional information about climate change adaptation and resilience.

1.3.5 The maps relevant to Coleshill Junction are provided in a separate corresponding document entitled Volume 2: CFA19 Map Book, which should be read in conjunction with this report.

1.3.6 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) (Volume 2: CFA19 Map Book) and CT-06 (operation) (Volume 2, CFA19 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.4.

1.3.7 In addition to the environmental topics covered in Sections 3-13 of this report, electromagnetic interference is addressed in Volume 1 and climate (greenhouse gas emissions and carbon) and waste and material resources are addressed in Volume 3. An assessment of potential environmental effects beyond the CFA has also been undertaken and this 'off-route' assessment is reported in Volume 4.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

2.1.1 The Coleshill Junction area covers a section of the Proposed Scheme in North Warwickshire, where it passes to the west of Coleshill. The area extends from the M6 in the south to the boundary between Coleshill and Curdworth parishes in the north and the boundary between Water Orton parish and Birmingham in the north-west. Parts of Solihull are included within the area, to the west of the M6 and the Proposed Scheme. The area includes land within the parishes of Coleshill, Fordbridge, Kingshurst, Smith's Wood and Water Orton.

2.1.2 The area includes the Delta junction of the Proposed Scheme, which has three components. These are the main line, which is orientated south to north through the area over a distance of approximately 4.6km; the Birmingham spur, which is the line that separates from the main line just north of the M6 and continues towards Birmingham city centre and Curzon Street Station; and the north chord, which is the line that joins the Birmingham spur to the main line going north. These three components form a triangle and are illustrated in Figure 2.

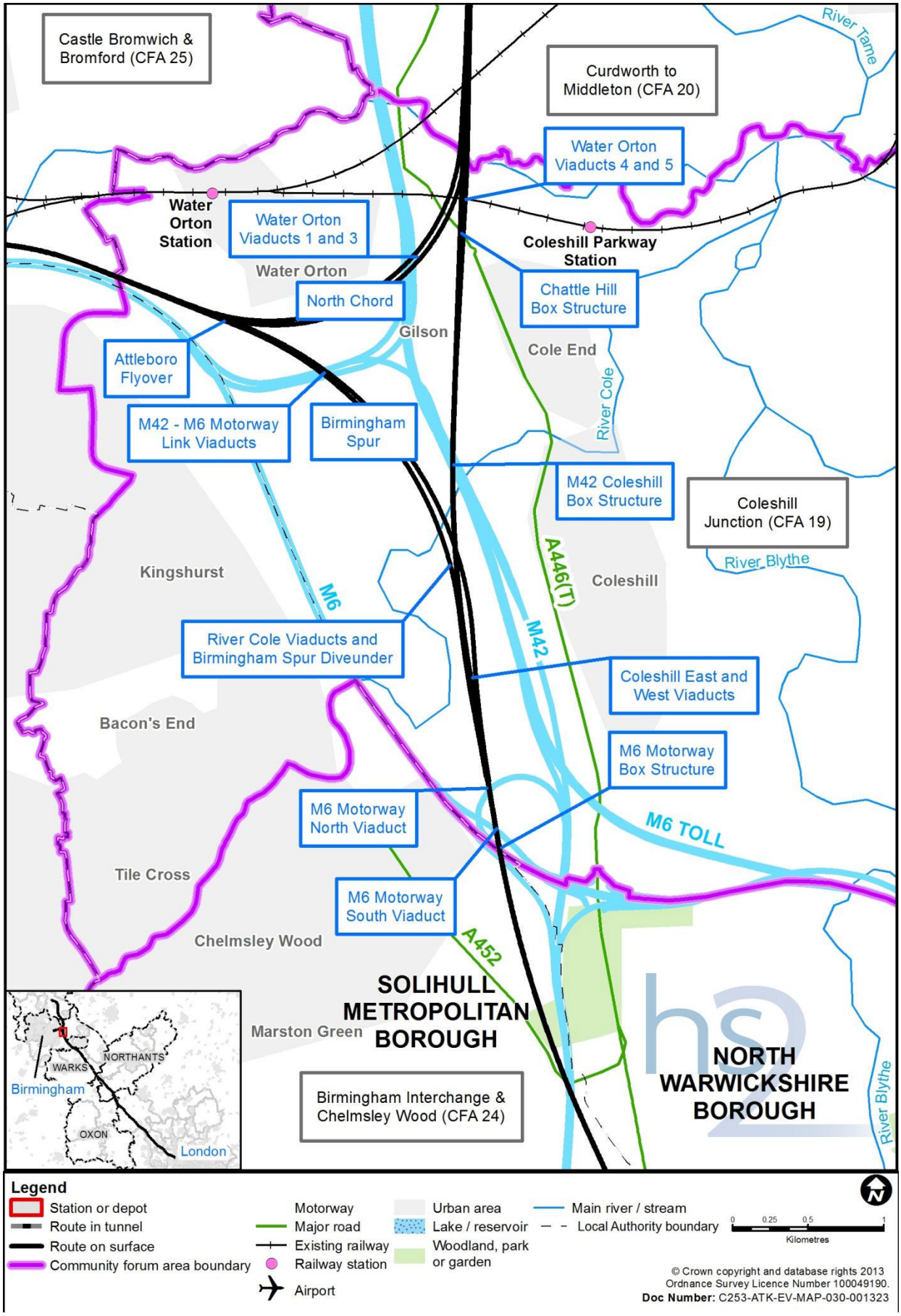
2.1.3 As shown in Figure 2, the area sits between the neighbouring areas of Birmingham Interchange and Chelmsley Wood (CFA24) to the south; Curdworth to Middleton (CFA20) to the north; and Castle Bromwich and Bromford (CFA25) to the west.

Settlement, land use and topography

2.1.4 The area is predominantly urban and urban fringe in character, separated by small linear strips of green belt that flank the major roads in the area. Kingshurst is more than 1km west of the Proposed Scheme; and Chelmsley Wood, in the neighbouring Birmingham Interchange and Chelmsley Wood area (CFA24), is south-west of the Coleshill Junction area (Figure 2). The western part of the area is more densely developed and urban in character, comprising predominantly residential areas interspersed with local centres forming part of the eastern fringe of the Birmingham conurbation, including the Smith's Wood area, which is to the south of Water Orton, with the M6 running between the two settlements.

2.1.5 Coleshill, to the east of the Proposed Scheme, is the main town serving the rural settlements in the area. The small hamlet of Gilson is located to the west of the M42/M6 Toll and will be bisected by the Proposed Scheme, and the village of Water Orton lies to the north of the Proposed Scheme (Figure 2).

Figure 2: Area context map



2.1.6 The River Cole flows into Coleshill from the south-west, having passed through Kingshurst, flowing away from Birmingham towards the River Tame. In addition to the linear tree belts adjacent to roads, a few small pockets of woodland are retained within the urban parks and in the landscape around Coleshill Manor. The sparse and dispersed nature of tree cover and the gentle slope of the landform down to the M6 create a sense of openness in longer distance views from vantage points at Coleshill in the east towards Smith's Wood and Birmingham in the west. Land between the motorways west of Coleshill is predominantly agricultural grazing, with the office campus of Coleshill Manor situated in the centre, along with Coleshill Hall Farm, commercial buildings along Birmingham Road and Woodlands Cemetery and Crematorium just east of the M6.

Key transport infrastructure

2.1.7 The M42, M6 Toll and M6 run north-south through the area with a major west-east interchange arrangement, termed the M42-M6 link, to the south of Water Orton and west of Gilson. The M6 and A452 Chester Road run broadly parallel towards the west of the area. Despite the proximity of Coleshill, Water Orton and the edge of Birmingham, the M42, M6 Toll, M6 and M42-M6 link reinforce a sense of separation between the distinct communities and limit routes for local west-east and east-west journeys to the following crossing points over the motorways:

- Coleshill Heath Road, which crosses the M6 and the M42 providing access to the south of Coleshill, east of the motorways; and Chelmsley Wood and Birmingham Airport to the west and south-west, respectively;
- the B4114 Birmingham Road, which crosses the M42 and M6 Toll at a point to the west of Coleshill town centre and crosses the M6 just to the west of Woodlands Cemetery. At a roundabout to the west of the M6, the road meets the A452 Chester Road, which runs parallel to the M6 and serves as a local distributor road for Smith's Wood; and to the east of the M42 there is a roundabout junction with the A446 Stonebridge Road;
- Gilson Drive, which crosses the M42/M6 Toll to provide access to ten residential properties in Gilson that are situated to the west of the motorway. This road also has a gated secondary access to the Coleshill Manor Office Campus, but is not open to general traffic as a through-route;
- the B4117 Watton Lane, which passes beneath the M42/M6 Toll to the east of Water Orton and north of Gilson to join the A446 Lichfield Road; and
- the B4118 Birmingham Road/Water Orton Road, which crosses the M6 just to the west of Water Orton and continues past Park Hall Academy towards Birmingham (into the Castle Bromwich and Bromford area (CFA25)).

2.1.8 Water Orton and Coleshill Parkway railway stations provide access, between them, to rail services to Birmingham in the west and Nuneaton approximately 15km to the east. Hams Hall Industrial Estate, immediately north of Coleshill, also forms a major multi-modal freight interchange with facilities for rail/road transfer.

2.1.9 There is a network of public rights of way (PRoW) within the Coleshill Junction area that provide connections between the edge of Birmingham (in Solihull) and both

Coleshill and Water Orton, linking to the hamlet of Gilson. Green Lane (Footpaths M77 and M72) provides the main east-west/west-east route between Coleshill and Chelmsley Wood. Hall Walk (Footpath M76) links Coleshill with the B4114 Birmingham Road area over a distance of approximately 1.5km via an existing bridge over the M42 and M6 Toll carriageways and a subway beneath the M6. In the north of the area, recreational routes for walking and cycling traverse the area at Coleshill Road/Gypsy Lane in Water Orton. There are also local PRoW that skirt around the edge of fields to provide circuitous connections to Smith's Wood from Gilson and Coleshill (Footpaths M54 and M56).

Socio-economic profile

2.1.10 To provide a socio-economic context for the area, data is presented for the demographic character areas (DCA) of Water Orton, Coleshill and Smith's Wood. A DCA represents a community which, depending on the area, may consist of a local ward, neighbourhood or village(s)[1]. The populations of the three DCA are 5,150 in Water Orton, 4,800 in Coleshill and 12,100 in Smith's Wood – the figures for Water Orton and Coleshill reflect the relatively rural nature of the DCA in comparison to the more urbanised Smith's Wood.

2.1.11 The labour market in the Water Orton DCA has an unemployment level of 4.2% of the economically active population and the Coleshill DCA has an unemployment level of 5.5%, both of which are lower than the national average of 7%. In contrast, unemployment in the Smith's Wood DCA is 14.7%, which is significantly higher than the national level.

Notable community facilities

2.1.12 Coleshill is a small market town with a good range of day-to-day services and facilities, providing a choice of convenience and comparison retail, leisure, recreation, healthcare, essential services and schools for all ages from pre-school to secondary. The town also has a range of employment opportunities, including at the Hams Hall Industrial Estate to the north (within the Curdworth to Middleton area (CFA20)), which is a regionally important focus for business.

2.1.13 The hamlet of Gilson lies to the west of Coleshill, adjacent to the M42/M6 Toll, and is partly on the line of route of the Proposed Scheme. It comprises a small grouping of houses and a farmstead, with the Grimstock Country House Hotel on the eastern edge of the village and the Old Saltleians Rugby Football Club (RFC) to the north. Gilson has no day-to-day services and residents are reliant upon neighbouring settlements for the provision of essential services and facilities, the closest of which are Coleshill and Water Orton.

2.1.14 The village of Water Orton has a range of day-to-day facilities including a small parade of shops, two public houses, several community venues, active sports clubs with indoor and outdoor facilities, two churches and Water Orton Primary, which has a

[1] A DCA represents an area of settlement concentration for which demographic data is collected and analysed.

nursery school and an afterschool club, and which is used by a number of organised community groups during evenings and at weekends.

2.1.15 Smith's Wood is a medium to high-density area of predominantly suburban residential development, situated on the south and west side of the M6 as it curves towards Birmingham. The area is currently the focus of regeneration and development and falls within the East Birmingham and North Solihull Regeneration Zone. Recent redevelopment has delivered consolidated and modern educational provision at primary and secondary levels, as well as the special educational needs sector. The recently developed Smith's Wood Community Primary School is notable for its shared community provision comprising a pre-school, gym, library and council contact point. Park Hall Academy, which lies just on the edge of the neighbouring Castle Bromwich and Bromford area (CFA25) also makes its sports facilities available to the local community of Smith's Wood for hire. The centre of Smith's Wood is currently subject to a European funded regeneration project to create a new central focus for shopping and community services and facilities, centred on Smith's Wood Community Primary School.

Recreation, leisure and open space

2.1.16 Coleshill has a good range of open spaces, the largest of which are Cole End Park and Memorial Park Recreation Ground in the town centre, which provide sports pitches, tennis courts, a cricket pitch, a skate park and children's play facilities. There are outdoor sports facilities at the schools, a bowling green to the rear of the high street, a public playing field adjacent to the Coleshill Community Centre in the north of the town and a network of amenity green spaces and corridors.

2.1.17 Old Saltleians RFC, which lies on the northern edge of Gilson and will be bisected by the Proposed Scheme, is a well-established club with seven pitches (three senior full-size pitches, one junior pitch and three mini pitches), a floodlit training area and room for expansion. The club's adult team plays league matches against teams from Birmingham, Solihull and Tamworth; the junior teams play in local leagues and the club also runs a programme of social events at the club house. There are also allotments close to Gilson, accessible to users from Gilson and Coleshill via the entrance on Gilson Road, next to its junction with Lichfield Road.

2.1.18 Water Orton has a range of outdoor sports and recreation provision encompassing football, cricket, bowls, tennis and informal recreation and play at the equipped playing fields off Vicarage Lane and the village green off Attleboro Lane.

2.1.19 The Water Orton Primary School buildings are located approximately 150m to the north of the edge of the Proposed Scheme. The school playing fields lie to the south of the school buildings, partly within the area of temporary and permanent land take for the Proposed Scheme. The playing fields are hired regularly for football at the weekends and there is shared community use of school buildings by a number of regular leisure clubs and groups during evenings and at weekends.

2.1.20 Cole Bank Park is the eastern-most of the linear network of spaces following the River Cole through Solihull that together form Kingfisher Country Park. It passes beneath the M6 between Smith's Wood and Chelmsley Wood, straddling the boundary between CFA19 and CFA24, supporting informal recreation and opportunities for

wildlife watching. There are also small areas of amenity green space within the various residential areas within Kingshurst/Smith's Wood, as well as formal sports and playing fields linked to educational facilities.

Policy and planning context

Planning framework

2.1.21 Given that HS2 is being developed on a national basis to meet a national need it is not included or referred to in many local plans. Nevertheless, in seeking to consider the Proposed Scheme in the local context, relevant local plan documents and policies have been considered in relation to environmental topics.

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

- North Warwickshire Local Plan (NWBC Local Plan)[2]; and
- the saved policies of the Solihull Unitary Development Plan (SUDP) 2006[3].

2.1.23 Emerging policy documents for NWBC and SMBC have been submitted to the Secretary of State for examination and the following have therefore been considered within this report:

- the North Warwickshire Local Plan Core Strategy – Submission Version February 2013 (NWBC Core Strategy)[4]; and
- The Solihull Draft Local Plan: Shaping a Sustainable Future (SMBC Local Plan)[5].

2.1.24 There are a number of key planning designations in the area, which include conservation areas, listed buildings and ancient woodland. These are shown on the maps in Volume 2: map series CT-10.

2.1.25 All of the undeveloped land surrounding local settlements falls within designated green belt, as does the hamlet of Gilson. Adopted Local Plan and SUDP policies strictly limit development in the green belt to maintain the openness of the landscape and prevent coalescence between the settlements and, in the Solihull area, the parishes of Smith's Wood and Chelmsley Wood.

2.1.26 The historic cores of Coleshill and Water Orton are both designated conservation areas and there are numerous listed buildings in and around these settlements including at Gilson. The closest area of designated ancient woodland lies just beyond the boundary of the Coleshill Junction area, namely Parkhall Wood, to the west of Water Orton. Cole Bank Park is designated as a Local Nature Reserve.

[2] North Warwickshire Borough Council (2006), *North Warwickshire Local Plan 2006*.
[3] Solihull Metropolitan Borough Council (2006), *Solihull Unitary Development Plan 2006*.
[4] North Warwickshire Borough Council (2012), *North Warwickshire Local Plan Core Strategy Submission Version*, forming part of the Local Plan. for North Warwickshire, February 2013. This document has been submitted to the Secretary of State for examination.
[5] Solihull Metropolitan Borough Council (2012), *The Solihull Draft Local Plan: Shaping a Sustainable Future, Local Development Framework. Submission Document, September 2012*. Solihull Metropolitan Borough Council submitted this document to the Secretary of State for examination on 14 September 2012.

Committed development

2.1.27 Developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme, are shown on map series CT-13 and listed in Volume 5 Appendix CT-004-000. Except where noted otherwise in Appendix CT-004-000, it has been assumed that these developments will have been completed by 2017. These are termed 'committed developments' and are treated as potential receptors from the Proposed Scheme. Where these developments have a particular relevance to an assessment topic, this is noted in the future baseline section for that topic.

2.1.28 Where such developments lie wholly or partly within the land required for the Proposed Scheme it is assumed that these will not be commenced or completed in their proposed form. These are noted in Volume 5: Appendix CT-004-000 and referred to in the relevant topic sections.

2.1.29 No developments have been identified that are likely to have cumulative effects, when considered together with the Proposed Scheme.

2.1.30 Planning applications yet to be determined and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These are listed in Volume 5: Appendix CT-004-000. They are not included in the assessment. The progress of these proposals is being monitored by HS2 and appropriate action will be taken if they are approved.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Coleshill Junction area, including the main environmental mitigation measures. Further generic information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is set out in Volume 1, Section 9.

2.2.2 The Proposed Scheme will require some land on a permanent basis, key features of which are illustrated on map series CT-06 (Volume 2). Land that will also be required, but only on a temporary basis for construction, is set out in Section 2.3.

2.2.3 In general, features are described from south to north along the route (and east to west for features that cross HS2).

2.2.4 Since the draft ES was published, the following changes have been introduced to permanent features of the Proposed Scheme:

- reduction in viaduct lengths and the provision of flood compensation areas, informed by more detailed flood modelling work;
- refinement of utilities works required as a result of the Proposed Scheme, including the diversion of electricity transmission lines;
- relocation of a construction compound and haul route access away from the Coleshill Hall Farm Local Wildlife Site, reducing impact on ecological receptor and neighbouring residential properties near the B4114 Birmingham Road;
- realignment of the River Cole to reduce shadowing of the watercourse and

deliver more effective flood compensation measures to the south of Coleshill Manor Office Campus;

- extension of the ecological area beneath the Coleshill east and west viaducts;
- an additional demolition at Coleshill Manor Office Campus (known as phase 2 building) (Volume 2: CFA19 Map Book, Map CT-05-133, F6), with corresponding design changes to Green Lane embankment;
- introduction of a second span to the Chattle Hill box structure to allow the highway authority to provide a dual carriageway in the future, should it consider this necessary;
- the inclusion of an area of land to replace land lost from the playing field at Water Orton Primary School, adjoining the existing school grounds to the south-east;
- additional noise screening of the Proposed Scheme around the southern side of Water Orton;
- retention of a greater amount of agricultural land between the Proposed Scheme and the M42-M6 link, to the south of Water Orton; and
- relocation of a construction compound to reduce impacts on a flooded lagoon to the west of the wastewater treatment works, in the north of the Coleshill Junction area.

2.2.5 Further details of utility diversions, road and PRoW realignments in the Coleshill Junction area are described in the following section relating to the construction of the Proposed Scheme.

2.2.6 The Birmingham Interchange and Chelmsley Wood area (CFA24) lies to the south and south-west, the Castle Bromwich and Bromford area (CFA25) lies to the west and the Curdworth to Middleton area (CFA20) lies to the north.

Overview

2.2.7 The Proposed Scheme in this area comprises three sections of railway line – the main line, the Birmingham spur and the north chord, which together comprise the triangular 'Delta' junction. The main line will be four tracks wide through this area; the Birmingham spur and the north chord will each be two tracks wide. Most of the railway will be raised above existing ground levels, in order to pass over existing roads, railways and rivers. There will be three locations where two levels of railway are required to provide the junctions for the Delta, at each point of the triangle. The main line will be up to six tracks wide as the route leaves the Coleshill Junction area to the north. The main line will run on a gentle downward gradient north through the area, whilst the levels of the Birmingham spur and north chord will vary to create the track levels required for the three junctions.

2.2.8 The railway will enter the area by crossing the M6, M6 slip road to the A446 Lichfield Road and M6/M42 junction on box structures and viaducts (Volume 2: CFA19 Map Book, Map CT-06-108, F5 and F6). The main line will then proceed north, predominantly on embankment and viaduct apart from a cutting near Gilson. The

route will pass over the B4114 Birmingham Road, the River Cole, the M42/M6 Toll, the B4117 Gilson Road, the A446 Lichfield Road, an existing railway referred to as the Birmingham to Nuneaton Line and the River Tame.

2.2.9 The southbound line of the Birmingham spur separates from the main line south of Coleshill Hall Farm (Volume 2: CFA19 Map Book, Map CT-06-109, E6) and the Birmingham-bound line of the Birmingham spur leaves the main line between the B4114 Birmingham Road and the River Cole (Volume 2: CFA19 Map Book, Map CT-06-109, C6). The two separate tracks of the Birmingham spur curve west from the main line on a combination of viaduct and embankment to pass over the River Cole, which will be realigned within an area of broader ecological mitigation works. The parallel lines of the Birmingham spur will pass immediately to the east of Coleshill Manor Office Campus, then rise over the M42-M6 link on two separate viaducts, before descending to converge with the north chord, to the south of Water Orton, (Volume 2: CFA19 Map Book, Map CT-06-133, B6, B7, C6, D5, D6, E6 and F6) then continue west towards central Birmingham alongside the M6.

2.2.10 From the Birmingham spur, the two parallel lines of the north chord will curve north-east around the south of Water Orton, rising to pass over the M42/M6 Toll and the Birmingham to Nuneaton Line, before joining the main line as it passes out of the area by crossing the River Tame (Volume 2: CFA19 Map Book, Map CT-06-111a, C4).

The main line

M6/M42 junction to the River Cole

2.2.11 The main line will enter the area in the south as it passes over the M6 at junction 4 on a box structure and then on viaduct across the eastbound M6 off slip (Volume 2, Map CT-06-108, E5, F5 and F6). It will continue on a short embankment before another viaduct across a loop slip road that exits the M42 at junction 7a to join the eastbound M6. The main line will then run on a landscaped and vegetated embankment before crossing part of the floodplain of the River Cole on viaduct. It will then pass onto embankment at Coleshill Hall Farm, including a bridge over the B4114 Birmingham Road, before passing over the Birmingham spur southbound track and then back onto embankment.

2.2.12 Key features of this section will include:

- a box structure and viaduct, approximately 270m long in total, over the M6 and M6 off slip to the A446 Lichfield Road, respectively, with integral noise barriers on the west side;
- an embankment, approximately 160m long, with a height of between 13m and 17m, with a noise barrier on the west side;
- a drainage pond to the east of the embankment, with access from Coleshill Heath Road;
- a viaduct, approximately 90m long, over the slip road joining the M42 northbound with the M6 eastbound, with a noise barrier on the west side;
- an embankment, approximately 450m long, with a height of between 14m and 16m, with raised, landscaped and vegetated embankments on both sides to

provide noise and visual screening of the railway (Volume 2: CFA19 Map Book, Map CT-06-108, B5 and C5) and a drainage pond on the west side with access from the A446 Stonebridge Road;

- a viaduct, approximately 460m long, carrying four main line tracks and the Birmingham-bound Birmingham spur track, which is adjacent to a separate viaduct, also approximately 460m long, carrying the southbound Birmingham spur track, over the River Cole floodplain (Volume 2, CFA19 Map Book, Map CT-06-109, F5 and F6). The viaducts will be up to 16m above ground level with a noise barrier on the west side of the western (main line) viaduct;
- realignment of Footpath M77/M72 under the new viaducts crossing the River Cole floodplain (Volume 2: CFA19 Map Book, Map CT-06-109, G5 and G6);
- an embankment, approximately 600m long, with a height of between 7m and 15m; near the southern end of the embankment, an underbridge will be provided to maintain the B4114 Birmingham Road on its existing alignment (Volume 2: CFA19 Map Book, Map CT-06-109, E5);
- diversion of Footpath M76 to maintain a connection to the B4114 Birmingham Road (Volume 2: CFA19 Map Book, Map CT-06-109, E5);
- a drainage pond and pumping station immediately to the east of the embankment (Volume 2: CFA19 Map Book, Map CT-06-109, B5);
- a crossing of the skew underpass structure carrying the southbound Birmingham spur track under the main line, with retaining walls to allow the different heights of track to run close together (Volume 2: CFA19 Map Book, Map CT-06-109, E5);
- an embankment, approximately 320m long, with a height of between 12m and 17m, extending up to the viaduct that crosses the River Cole (Volume 2: CFA19 Map Book, Map CT-06-110, H6); and
- diversion of Manor Drive and Footpath M58 to skirt the west side of the route (the main line and then the Birmingham spur), to join the B4114 Birmingham Road at a new junction just east of where it crosses the River Cole and extend to a point 400m south-east of Coleshill Manor Office Campus (Volume 2: CFA19 Map Book, Map CT-06-133, H6 and H7).

River Cole to River Tame

2.2.13 The main line will cross the River Cole on viaduct. The River Cole will be realigned for approximately 730m to pass through the piers of the main line and adjacent Birmingham spur viaducts.

2.2.14 The main line will then cross the M42/M6 Toll on a box structure before continuing on viaduct to cross the B4117 Gilson Road, which will be realigned to the south of its present route. The main line will then run onto a short length of embankment before passing through the higher ground in cutting at Gilson, then returning to embankment before crossing the A446 Lichfield Road on a box structure. After a short embankment through the Coleshill Industrial Estate, the main line will then cross the

Birmingham to Nuneaton Line on viaduct and the sewage treatment works on embankment, before leaving the area at the viaduct crossing of the River Tame.

2.2.15 Key features of this section of the route will include the following:

- a viaduct, approximately 130m long, over the River Cole and its floodplain (Volume 2: CFA19 Map Book, Map CT-06-110, H6), with the river realigned to ensure that at least as much open water channel will be provided as existing and that the speed of flow is not increased downstream, forming part of a broader area of ecological mitigation and flood compensation area extending along the revised river corridor;
- three box structures to support approximately 130m of the main line across the M42/M6 Toll carriageways (Volume 2: CFA19 Map Book, Map CT-06-110, G6), followed by another viaduct approximately 320m long (Volume 2: CFA19 Map Book, Map CT-06-110, E6 and F6) – north of the River Cole towards Gilson these structures will include integral noise barriers on the west side;
- realignment of the B4117 Gilson Road approximately 250m south to pass under the northern part of the new viaduct with a relocated junction with Gilson Drive (Volume 2: CFA19 Map Book, Map CT-06-110, E6 and E7). New planting will be provided to the east and south of the diverted length of road;
- a drainage pond to the east with access from the realigned B4117 Gilson Road (Volume 2: CFA19 Map Book, Map CT-06-110, E5);
- an embankment, approximately 260m long, with noise barriers on both sides and a retaining wall on the west side, decreasing from approximately 11m high to ground level; an auto-transformer station will be located to the east, with access off the redundant length of the B4117 Gilson Road (Volume 2: CFA19 Map Book, Map CT-06-110, D6);
- a cutting, approximately 580m long and up to 8m deep, immediately to the east of the core area of Gilson (Volume 2: CFA19 Map Book, Map CT-06-110, B6 and C6);
- an embankment, approximately 250m long, increasing in height to approximately 7m, with a noise barrier on the east side, on the approach to the A446 Lichfield Road;
- a box structure, approximately 110m long over the A446 Lichfield Road, with a noise barrier on the east side; this includes a second span that allows sufficient clearance and flexibility for future widening of the A446 Lichfield Road (Volume 2: CFA19 Map Book, Map CT-06-111, F4);
- a drainage pond to the west with access from the A446 Lichfield Road (Volume 2: CFA19 Map Book, Map CT-06-111a, F5);
- an embankment, approximately 160m long and approximately 8m high, with a noise barrier on the east side; the southbound Leeds spur starts to split from the main line towards the northern end of this embankment;

- a pair of viaducts carrying the main line tracks over the Birmingham to Nuneaton Line. The tracks diverge to enable the north chord lines to join the main line at the boundary of Coleshill Junction and the Curdworth to Middleton area (CFA20);
- an embankment, approximately 220m long, carrying the main line tracks, approximately 9m high with the north chord line into Birmingham passing over the main line on viaduct; and
- an access road from the A446 Lichfield Road to a second drainage pond on the west side and for railway maintenance (Volume 2: CFA19 Map Book, Map CT-06-111a, D5).

2.2.16 Footpath M62, which links Coleshill to Gilson, will be realigned over a new footbridge to cross the railway where it is in cutting, approximately 90m south of its current location (Volume 2: CFA19 Map Book, Map CT-06-110, C6). Footpath M60 will be diverted to join Footpath M62 to the east of the railway and therefore pass over the same footbridge and back along the B4117 Gilson Road, with the redundant length of Footpath M60 stopped up to the west of the main line.

The Birmingham spur

2.2.17 The Birmingham spur will start to leave the main line at approximately 500m south of the point where the route crosses the B4114 Birmingham Road, with the southbound spur line on the east of the main line reducing in level to then curve north-west and pass under the main line within a 'diveunder' structure. The Birmingham-bound spur line will split to the west from the main line north of the B4114 Birmingham Road onto its own embankment, before both lines pass over the realigned length of the River Cole on two viaducts separated by approximately 50m.

2.2.18 The Birmingham spur lines will pass onto separate landscaped and vegetated embankments curving around to the north-west, through the east side of the Coleshill Manor Office Campus. The Birmingham spur lines will rise to cross the M42-M6 link roads on two separate viaducts, then two further embankments will take the Birmingham spur lines around the southern side of Water Orton towards Birmingham. The southbound Birmingham spur line will stay higher to pass over the Birmingham-bound line of the north chord on a flyover, while the Birmingham-bound line of the Birmingham spur will drop into cutting where it will be joined by the Birmingham-bound line of the north chord. Both lines will then continue westwards in cutting to the boundary with the Castle Bromwich and Bromford area (CFA25).

2.2.19 Key features of this Birmingham spur section of the route differ with the direction of travel, with two parallel alignments – one for the southbound lines (on the eastern side); and one for the Birmingham-bound lines (on the western side). The features of the two lines are described in turn (see Volume 2: CFA19 Map Book, Map CT-06-108, B5 to CT-06-136b, B4):

Southbound Birmingham spur from main line to Water Orton

- a widening to the main line embankment north of the M42 northbound to M6 eastbound slip road loop (as described previously in relation to the main line), to accommodate the diverging southbound Birmingham spur track;

- a viaduct, approximately 460m long, carrying the single track of the southbound Birmingham spur over the River Cole floodplain (Volume 2: CFA19 Map Book, Map CT-06-109, E5, F5 and G5);
- an embankment, approximately 330m long, parallel with the main line embankment, with a height reducing from approximately 8m, carrying the southbound Birmingham spur track and incorporating an underbridge for the B4114 Birmingham Road (Volume 2: CFA19 Map Book, Map CT-06-109, D5 and E5);
- a cutting, approximately 270m long, up to approximately 7m deep carrying the southbound Birmingham spur track down to a lower level than the adjacent main lines (Volume 2: CFA19 Map Book, Map CT-06-109, B6, C5 and C6);
- a skew diveunder structure to allow the southbound Birmingham spur track to pass under the main line tracks (Volume 2: CFA19 Map Book, Map CT-06-109, B6), followed by an embankment, approximately 140m long, leading to the realigned River Cole (Volume 2: CFA19 Map Book, Map CT-06-110, I6 and I7);
- a viaduct, approximately 140m long over the realigned River Cole and its floodplain (Volume 2: CFA19 Map Book, Map CT-06-110, H7 and I7);
- an embankment, just over 1km long and varying in height between 6m and 11m. Some raised earthworks will be provided on the east side, offering noise and visual screening of the railway from Gilson and surrounding areas to the east;
- a viaduct, approximately 160m long, running parallel to the Birmingham spur Birmingham-bound line, over the M6/M42 link (Volume 2: CFA19 Map Book, Map CT-06-133, B7);
- an embankment, approximately 600m long, varying in height from 8m to 13m. The track will stay above the level of the adjacent Birmingham-bound line to be able to pass over the north chord Birmingham-bound line, with a retaining wall between the tracks at the northern end of the embankment (Volume 2: CFA19 Map Book, Map CT-06-134a, F6);
- a skew flyover structure carrying the track over the Birmingham-bound line of the north chord (Volume 2: CFA19 Map Book, Map CT-06-134a, F6); and
- a cutting, approximately 600m long, increasing in depth to the west, with raised embankments provided on the north side that will provide noise and visual screening of the railway for residents in Water Orton. The track will run adjacent to the Birmingham-bound Birmingham spur track in this cutting. The tracks will be separated by a retaining wall until they attain the same level, which will be as they exit the area to the west (passing into the Castle Bromwich and Bromford area (CFA25)).

Birmingham-bound Birmingham spur from main line to Water Orton

- the Birmingham-bound Birmingham spur diverges from the main line embankment and descends towards the River Cole on a lower embankment than the main line (Volume 2: CFA19 Map Book, Map CT-06-109, B6 and C6);

- a viaduct, approximately 110m long over the realigned River Cole and its floodplain (Volume 2: CFA19 Map Book, Map CT-06-110, H7 and I7), running parallel to the viaduct carrying the southbound Birmingham spur;
- an embankment, just over 1km long and varying in height between 6m and 13m with a drainage pond to the west of the embankment, at the southern end, and raised earthworks for noise and visual screening of the railway;
- a viaduct, approximately 160m long, running over the M6/M42 link (Volume 2: CFA19 Map Book, Map CT-06-133, B7);
- an embankment, approximately 300m long, carrying the Birmingham-bound line of the Birmingham spur, reducing in height from 9m to ground level (Volume 2: CFA19 Map Book, Map CT-06-134a, G6);
- a cutting, 1.7km long and extending into the neighbouring Castle Bromwich and Bromford area (CFA25). This cutting increases in depth up to 11m in this area as the track drops to join the lower level of the junction with the north chord (Volume 2: CFA19 Map Book, Map CT-06-134a, F6). There are raised embankments provided on part of the north side of the cutting to provide noise and visual screening. A retaining wall will be provided on the south side, starting approximately 100m before the western boundary of the area; and
- retaining walls between the different levels of the tracks on the Birmingham spur and north chords, near their junction (Volume 2: CFA19 Map Book, Map CT-06-134a, E6 and F6).

2.2.20 The route will leave the area in the west as it heads into Birmingham in cutting.

Key works to highways, PRoW and woodland around the Birmingham spur

2.2.21 The secondary gated access to Coleshill Manor Office Campus from Gilson Drive will be closed (Volume 2: CFA19 Map Book, Map CT-06-133, F4). Access to Coleshill Manor Office Campus will be via the diverted Manor Drive as described previously in relation to the main line. Footpath M54 will be realigned to pass under the viaducts carrying the Birmingham spur over the M6/M42 link, then across the earthworks providing screening on the north side of the Proposed Scheme; Footpath M57 will be diverted to join the realigned Footpath M54.

2.2.22 Attleboro Lane will be realigned approximately 250m to the west of its existing alignment to cross over the Birmingham spur as it goes into cutting (Volume 2: CFA19 Map Book, Map CT-06-134a, D6 and D7). Footpath M43 will be closed with the route instead of being via Attleboro Lane. A drainage pond and pumping station will be constructed in the angle between the existing and proposed Attleboro Lane alignments, north of the Birmingham spur (Volume 2: CFA19 Map Book, Map CT-06-134a, E5 and E6).

2.2.23 Planting will be undertaken on both sides of the Birmingham spur to provide visual screening and to tie into the area of woodland known as The Belt, which will be crossed by the Proposed Scheme, and other existing planting around Coleshill Manor Office Campus, including another woodland known as 'The Catmore' (Volume 2: CFA19 Map Book, Map CT-06-133).

North chord

2.2.24 The north chord makes the link between Birmingham in the west and the main line to the north of Coleshill. From west to east, the northbound line of the north chord, which is the line closest to Water Orton, will start to diverge from the Birmingham spur lines on embankment (Volume 2: CFA19 Map Book, Map CT-06-134a, E6) and then curve around Water Orton to head north. The Birmingham-bound line of the north chord runs parallel, but splits from the Birmingham spur in cutting, allowing it to pass under the Birmingham spur southbound line, before rising up onto embankment as it curves to the north.

2.2.25 At the eastern edge of Water Orton, both of the north chord lines pass onto two curved viaducts to cross the M42 and M6 Toll carriageways and slip roads, the B4117 Gilson Road, the A446 Lichfield Road and the Birmingham to Nuneaton Line. The northbound line will then go onto embankment before crossing the River Tame and leaving the area on viaduct, parallel to the main line (as described previously). The Birmingham-bound line will stay on viaduct after crossing the Birmingham to Nuneaton Line, rising higher than the adjacent northbound line and crossing over the main lines, then drop down as it crosses the River Tame and ties in with the main line after leaving the Coleshill Junction area.

2.2.26 Key features of this north chord section of the route also differ with the direction, with parallel alignments – one for the northbound lines (closest to Water Orton); and one for the Birmingham-bound lines (on the southern side). The features of the two lines are described in turn (see Volume 2: CFA19 Map Book, Map CT-06-134a and CT-06-136a):

Northbound north chord line from Water Orton to the River Tame

- the track starts to separate from the Birmingham spur just east of the bridge carrying the realigned Attleboro Lane (Volume 2: CFA19 Map Book, Map CT-06-134, E6);
- an embankment, approximately 1.5km long and between ground level and 13m high, carrying the northbound line; raised earthworks will be constructed on the north side to provide visual screening for residents in Water Orton;
- realignment of parts of the watercourses crossed by the Proposed Scheme to the south of Water Orton, which will be integrated with the ecological mitigation areas, including the land between the north side of the embankment and the southern edge of Water Orton (Volume 2: CFA19 Map Book, Map CT-06-134a, G4, G5, H3, I2 and I3);
- a viaduct approximately 630m long over the M42/M6 Toll, the land currently occupied by Old Saltleians RFC rugby pitches, the A446 Lichfield Road and the Birmingham to Nuneaton Line; this viaduct will carry the northbound line; and
- an embankment approximately 200m long up to 15m high will carry the track to the point where it exits the Coleshill Junction area and passes over the River Tame on viaduct, parallel to the main line (as described previously) and on into the Curdworth to Middleton area (CFA20).

Birmingham-bound north chord line from Water Orton to the River Tame

- in the same way as the northbound line, the track starts to separate from the Birmingham spur just east of the bridge carrying the realigned Attleboro Lane (Volume 2: CFA19 Map Book, Map CT-06-134a, E6);
- a skew flyover structure will enable the track to pass under the southbound line of the Birmingham spur (Volume 2: CFA19 Map Book, Map CT-06-134a, E6 and F6);
- a cutting, approximately 300m long and up to 5m deep, carrying the track around the southern side of Water Orton, running parallel to the northbound north chord, which will be on an adjacent embankment and separated from the track by a retaining wall (Volume 2: CFA19 Map Book, Map CT-06-134a, G5, G6 and H5);
- the Birmingham-bound line will continue onto embankment up to 13m high over a length of approximately 850m; this embankment will be screened from Water Orton by the northbound line and its screening (Volume 2: CFA19 Map Book, Map CT-06-136a, C6 and C7); and
- a viaduct, adjacent to the northbound north chord viaduct, spanning a distance of approximately 1.5km to carry the line over the M42/M6 Toll, B4117 Gilson Road, the land currently occupied by the Old Saltleians RFC rugby pitches, the A446 Lichfield Road, the Birmingham to Nuneaton Line, the main line and the River Tame; this viaduct will carry the Birmingham-bound line across the boundary with the neighbouring Curdworth to Middleton area (CFA20).

Key works around the north chord

2.2.27 Two drainage ponds will be constructed, one on the north side of the route west of Coleshill Road (Volume 2: CFA19 Map Book, Map CT-06-136a, B5) and the other to the west of the railway, adjacent to the Birmingham to Nuneaton Line and east of the A446 Lichfield Road (Volume 2: CFA19 Map Book, Map CT-06-136a, G5 and G6).

2.2.28 Planting will be undertaken, mainly on the north side of the north chord, to provide visual screening for residents in Water Orton and integration with the existing pattern of woodland and hedgerows. Areas for ecology, which will incorporate realigned watercourses and mitigate habitats lost to the construction of the railway, are included in the area south and east of Water Orton, between the railway and Vicarage and Gypsy Lanes.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the strategy for the construction of the Proposed Scheme in the Coleshill Junction area, including:

- overview of the construction process;
- description of the advance works;
- description of the engineering works to build the railway;
- construction waste and material resources;

- commissioning the railway; and
- indicative construction programme (see Figure 5).

2.3.2 The assessment presented in this ES is based on the construction arrangements as described in this section.

2.3.3 In addition to the land that will be required permanently by the Proposed Scheme (see Section 2.2), land will be required on a temporary basis for construction. Key temporary construction features are illustrated on the construction maps series CT-05 (Volume 2). Following construction works, land required temporarily will be prepared for its eventual end use, which will include being returned to its pre-construction use wherever appropriate.

2.3.4 A guide to standard construction techniques is provided in Volume 1, Section 6. In instances for which more than one possible construction technique might be possible, this section specifies which technique has been assumed for the purposes of the assessment.

Overview of the construction process

2.3.5 Building and preparing the railway for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; site preparation and enabling works; main earthworks and structure works and site restoration;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities and changes to the existing rail network; and
- rail system testing and commissioning.

2.3.6 General provisions relating to the construction process are set out in more detail in Volume 1: Section 6.4 and Section 4 of the draft CoCP (see Volume 5, Appendix CT-003-000) including:

- the approach to environmental management during construction and the role of the Code of Construction Practice;
- working hours;
- the management of construction traffic; and
- the handling of construction.

Advance works

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

- further detailed site investigations and surveys;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, and built heritage survey and investigation;
- highways works;
- demolitions;
- site establishment with temporary fence construction; and
- utility diversions.

Engineering works

2.3.8 Construction of the railway will require engineering works along the entire length of the route and within land adjacent to the route. This will comprise two broad types of engineering work:

- civil engineering works such as earthworks and erection of bridges and viaducts; and/or
- railway installation works such as laying ballast or slabs and tracks and/or installing power supply and communications features.

2.3.9 The construction of the Proposed Scheme will be subdivided into sections, each of which will be managed from compounds. The compounds will act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds will either be main compounds or satellite compound, which are generally smaller. Some compounds will be used for civil engineering works and others for railway installation works, and in some cases for both.

2.3.10 In the Coleshill Junction area there will be one main compound and 18 civil engineering satellite compounds and three railway installation satellite compounds. Two of the railway installation compounds will use satellite compounds previously established for civil engineering works.

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

General overview of construction compounds

2.3.12 Main compounds will be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These management teams will directly manage some works and/or coordinate satellite compounds, which will manage other works. In general, main compounds will contain:

- space for the storage of bulk materials (aggregates, structural steel and steel reinforcement);

- space for the receipt, storage and loading/unloading of excavated material either onto or off the site;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage;
- necessary operational parking; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

2.3.13 Satellite compounds will be used as the base to manage specific works along a section of the route. They will usually provide office accommodation for limited numbers of staff, local storage for plant and materials, limited car parking for staff and site operatives, and welfare facilities.

2.3.14 Some compounds will also accommodate additional functions as listed below. Where this is the case they will be included in the description of the compound:

- railheads will connect with the existing railway network for the delivery of materials for the construction of the rail systems, further details are provided in Section 2.3.40;
- construction sidings will connect with the existing railway network to enable loading and unloading to and from trains delivering material to the HS2 site or removing excavated material, further details are provided in the relevant area reports;
- roadheads will require an area of land for the storage and loading and unloading of bulk earthworks materials which are moved to and from the site on public highways; and
- living accommodation for the construction workforce.

2.3.15 In addition, areas adjacent to some compounds will be used for the storage of topsoil stripped as part of the works prior to it being used when the land is reinstated to its former use.

2.3.16 Further information on the function of compounds, including general provisions for their operation, including security fencing, lighting, utilities supply, site drainage and codes of worker behaviour are set out in Volume 1, Section 6.3, and the draft CoCP, Section 5.

Figure 3: Schematic of construction compounds for civil engineering works

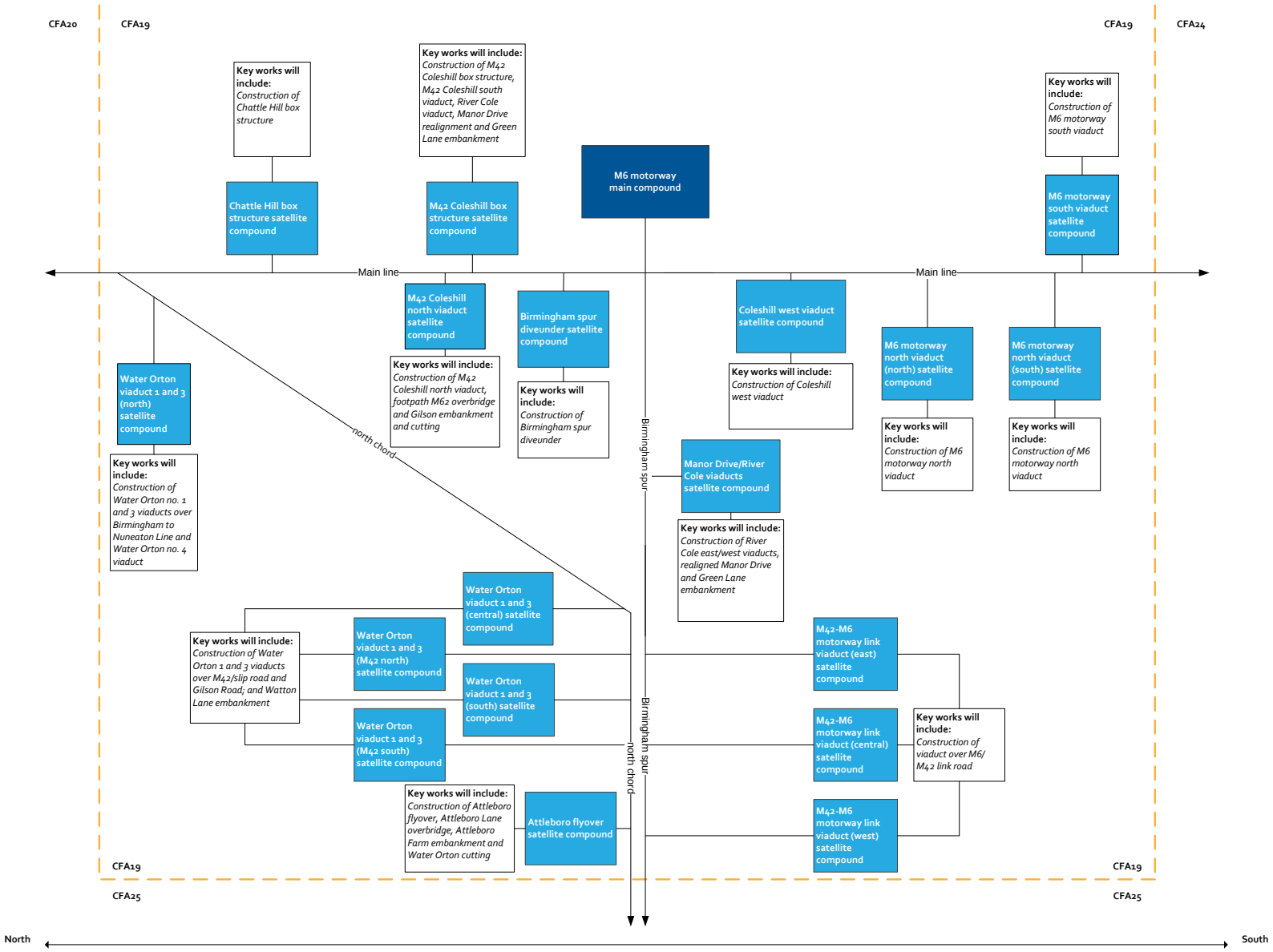
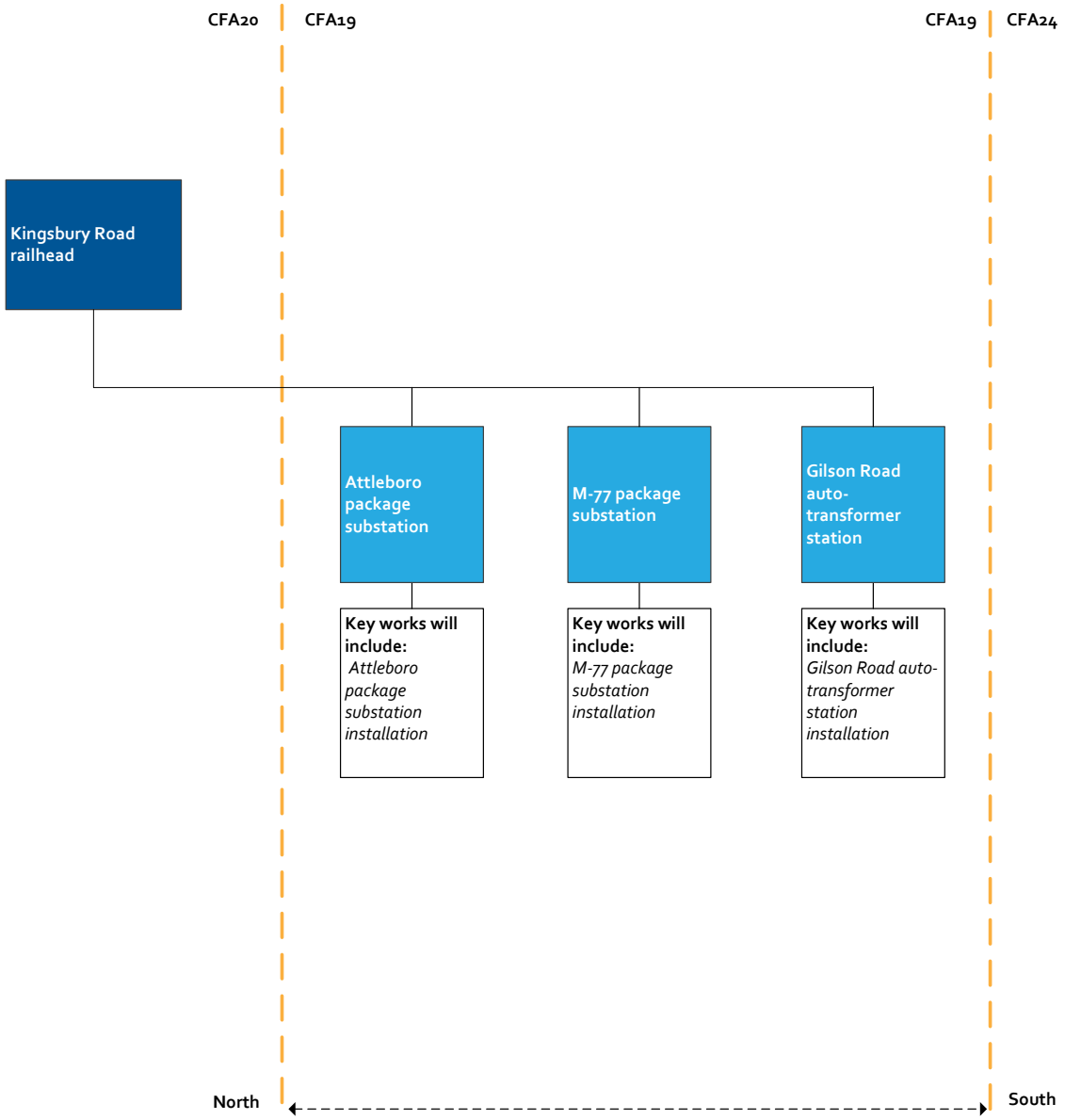


Figure 4: Schematic of construction compounds for railway installation works



Construction traffic routes

2.3.17 The movement of construction vehicles carrying materials, plant, other equipment and workforce (or moving empty) will take place both within the construction sites, on public roads and via the rail network. The construction compounds and roadheads will provide the interface between the construction works and the public highway or rail network, and the likely road routes to access compounds are described in subsequent sections below.

2.3.18 Movements between the construction compounds and the work sites will be on designated haul roads within the sites, often along the line of the Proposed Scheme or running parallel to it.

M6 motorway main compound

2.3.19 This compound will comprise the main area administration and support for all of the construction compounds in the Coleshill Junction area. It will also be used to manage the following works:

- earthworks (embankments and cuttings);
- mitigation planting and landscape earthworks; and
- River Cole diversion.
- Works in this section of the Proposed Scheme will be carried out in the following broad phases:
- site clearance and enabling works;
- building demolition;
- cutting, embankment and landscaping earthworks;
- drainage and culvert works;
- viaduct and bridge construction;
- retaining wall construction;
- highway and footpath reinstatement;
- topsoiling and landscape planting; and
- track bed preparation.

2.3.20 The M6 motorway main compound will be operational for approximately five years and will be subject to the contractor's standard working hours, as described in the draft CoCP. The compound will be accessed from Coleshill Heath Road (traffic will cross the M42 to the Coleshill Heath Road/A446 Stonebridge Road junction. From here it will travel south joining the M6 at the M6/A446 Lichfield Road junction. Approximately 115 workers on average and 200 workers at peak times will be based at the compound.

Demolitions

2.3.21 The buildings that will need to be demolished to accommodate the Proposed Scheme are listed in Table 1.

Table 1: Demolition works

Description of structure	Location
The Old Barn Guest House and Capitol Joinery manufacturer, shed and chalet factory outlet (2 dwellings, total buildings: 9)	Volume 2: CFA19 Map Book, Map CT-05-109, E6, south of B4114 Birmingham Road
Coleshill Hall Farm disused barn site (total buildings: 3). One Grade II listed building.	Volume 2: CFA19 Map Book, Map CT-05-109, E5, E6, north of B4114 Birmingham Road
Coleshill Manor Office Campus: phase 2 building (office) (total buildings: 2)	Volume 2: CFA19 Map Book, Map CT-05-133, F6, west of M42/M6 Toll

Description of structure	Location
Garage building in field to the north-east of Gilson Hall (total buildings: 1)	Volume 2: CFA19 Map Book, Map CT-05-110, B6, land adjoining Gilson Hall
Greenwoods Communications Ltd., outbuilding (total buildings: 1)	Volume 2: CFA19 Map Book, Map CT-05-111, E4, 100m south of Water Orton No. 4 viaduct
Board Cottages and Coleshill Cottages, four pairs of semi-detached houses and eight outbuildings (8 dwellings, total buildings: 12)	Volume 2: CFA19 Map Book, Map CT-05-111, D4 and D5, E4 and E5, north of Birmingham to Nuneaton Line
The Homestead (1 dwelling, total buildings: 2)	Volume 2: CFA19 Map Book, Map CT-05-111, E5, south of B4117 Watton Lane and west of A446 Lichfield Road
87 Attleboro Lane and outbuilding (1 dwelling, total buildings: 3)	Volume 2: CFA19 Map Book, Map CT-05-134a, E6 off Attleboro Lane
62-76 Attleboro Lane (evens), four pairs of semi-detached houses and eight outbuildings (8 dwellings, total buildings: 12)	Volume 2: CFA19 Map Book, Map CT-05-134a, E6 off Attleboro Lane

Highways and road realignments

2.3.22 Within the Coleshill Junction area, seven roads will be diverted, realigned and/or subject to traffic management measures during construction of the Proposed Scheme as follows (illustrated on the construction map series CT-05 (Volume 2: CFA19 Map Book):

- B4114 Birmingham Road (Map CT-05-109, E5 and E6) – temporary realignment to north to construct new bridge; the permanent alignment will be similar to the existing, but slightly modified to meet current highway design requirements;
- Manor Drive (Map CT-05-109, B7) – permanent diversion of Manor Drive to the west of the railway, crossing the River Cole with a tie in to the B4114 Birmingham Road via a new junction; the diverted section will be approximately 1.1km in length;
- B4117 Gilson Road (Map CT-05-110, E5 and E6) – permanent realignment of Gilson Road to cross under the M42 Coleshill north viaduct to the south of the existing alignment; the realigned section will be approximately 710m in length;
- B4117 Gilson Road (Map CT-05-110, D6) – temporarily reduced to single lane signal controlled traffic flow to enable construction of Water Orton viaducts 1 and 3;
- Gilson Drive (Map CT-05-110, E6 and F7) – temporary half-day and overnight closures to enable the construction of the diversion for Gilson Drive, to tie in with the realigned section of B4117 Gilson Road;
- the A446 Lichfield Road (Map CT-05-111a, F4) – the Chattle Hill box structure will be constructed in two phases; the southern half will be constructed first for a temporary realignment of the A446 Lichfield Road under this completed span while the northern half is constructed; the road will then be reinstated on its existing alignment after the works;

- Attleboro Lane (Map CT-05-134a, D6 and D7) – realignment to cross over the railway on an overbridge to the west of its existing alignment; the realigned section will be approximately 680m in length; and
- B4118 Water Orton Road (Volume 2: CFA25 Map Book, Map CT-05-135a, F6) – temporary closures and traffic management, including a temporary realignment of approximately 140m, of the B4118 Water Orton Road during the construction of a new online overbridge at the boundary of the Coleshill Junction area and the Castle Bromwich and Bromford area (CFA25).

2.3.23 The total duration of works does not necessarily indicate the period(s) of actual closure, which will be kept to the shortest duration possible. In most cases, this will be limited to several overnight or weekend closures to tie in the new works.

2.3.24 There are also a number of crossings of the motorway network in this area, which will be constructed using standard construction techniques. To maintain safe operation of the motorway it will be necessary to undertake the works under traffic management. The construction of all the motorway crossings in this area and the neighbouring areas of Curdworth to Middleton (CFA20), Birmingham Interchange and Chelmsley Wood (CFA24) will be coordinated to reduce the overall duration of disruption to the motorway. The traffic management will operate for a period of approximately two to three years over lengths of the M42, M6 Toll and M6, and will be likely to include periods of speed restrictions for safety, uses of the hard shoulder, and reduced lane widths. The traffic management will also extend into the Castle Bromwich and Bromford area (CFA25). The temporary closures that have been considered likely and included the assessment of the Proposed Scheme are described here.

2.3.25 For construction of the M6 motorway box structure (Map CT-05-108, F5 and F6), M6 motorway south viaduct (Map CT-05-108, E5) and M6 motorway north viaduct (Map CT-05-108, D5):

- a weekend closure of the M42 junction 7 to M6 northbound slip road for installation of the bridge deck over this carriageway; and
- overnight closures of part or all of the M6 carriageways, the M6 junction 4 southbound off slip road and the M42 junction 7a loop slip road, for installation of bridge decks over the carriageways.

2.3.26 For construction of M42 Coleshill box structure (Map CT-05-110, G6):

- a closure of one lane of the M42 southbound for a period of approximately 40 days;
- overnight closures of part of the M42/M6 Toll and M42-M6 link southbound carriageways for installation of the bridge decks;
- a weekend closure of the northbound carriageway of the M42/M6 Toll for installation of the bridge deck over this carriageway; and
- a further closure of one lane of the M42-M6 southbound link carriageway for a period of approximately one week.

2.3.27 For construction of M42-M6 link east and west viaducts (Map CT-05-133, B7):

- two weekend closures of the eastbound carriageway for installation of the bridge deck over this carriageway;
- two weekend closures of the westbound carriageway for installation of the bridge deck over this carriageway; and
- closures of part of both eastbound and westbound carriageways for periods of approximately 40 days.

2.3.28 Construction of the Water Orton viaducts 1 and 3 over the M42/M6 Toll (Map CT-05-111a, G7):

- for one weekend, night time closures of both M42/M6 Toll carriageways, plus full closure of the southbound M42-M6 link road, for installation of the bridge deck over that carriageway;
- for one weekend, night time closures of the northbound M42/M6 Toll and M42-M6 link carriageway, plus full closure of the M42/M6 Toll southbound carriageway, for installation of the bridge deck over that carriageway; and
- for one weekend, closure of the northbound M42/M6 Toll and M42-M6 link carriageway for installation of the bridge deck over that carriageway.

2.3.29 Additional night time closures of part or all of some carriageways may be required for modifications to the motorway signage.

Railways

2.3.30 There are four viaducts in the Coleshill Junction area that will cross the Birmingham to Nuneaton Line – Water Orton no. 1, 3, 4 and 5 viaducts (Volume 2: CFA19 Map Book, Map CT-05-111, E4 and E5). The design of these structures is proposed to avoid disruptive closures to the railway. Where necessary, works will take place during planned closures of the railway.

PRoW realignments

2.3.31 The following PRoW will be realigned in the Coleshill Junction area:

- permanent realignment of Footpath M77, Green Lane, to the north to cross under the Coleshill east and west viaducts (Volume 2: CFA19 Map Book, Map CT-06-109, G5 and G6), to connect to Footpath M72 to the east of the Proposed Scheme;
- permanent diversion of Footpath M76 to route around Coleshill no. 5 embankment adjacent to B4114 Birmingham Road (Map CT-06-109, E5);
- permanent diversion of Footpath M58 to route alongside the diverted Manor Drive to join B4114 Birmingham Road 350m south-west of the current connection (Volume 2: CFA19 Map Book, Map CT-06-109, E6);
- permanent realignment of Footpath M54 under the main line to avoid viaduct piers to the east of Gilson Drive (Volume 2: CFA19 Map Book, Map CT-06-110, E6);

- permanent realignment of Footpath M54 under the Birmingham spur to avoid the Green Lane embankment and pass under the south end of the two viaducts over the M42-M6 link – Water Orton no.1 and no.3 viaducts (Volume 2: CFA19 Map Book, Map CT-06-133, B6 and B7);
- permanent diversion of Footpath M57 to join the realigned Footpath M54 to avoid the Green Lane embankment and pass under the south end of the two viaducts over the M42-M6 link – Water Orton no. 1 and no. 3 viaducts (Volume 2: CFA19 Map Book, Map CT-06-133, C7);
- permanent stopping up of Footpath M56 at the point where the footpath will meet the realigned B4117 Gilson Road (Volume 2: CFA19 Map Book, Map CT-06-110, E6). Users will be able to walk alongside the B4117 Gilson Road, which will allow them to pass beneath the railway at M42 Coleshill north viaduct and meet the footpath network at Footpath M63 on Meadowbank Drive;
- permanent realignment of Footpath M62 to pass over the railway via a proposed footbridge to the north of the existing B4117 Gilson Road alignment (Volume 2: CFA19 Map Book, Map CT-06-110, C6);
- permanent stopping up of Footpath M60 at the point where it will connect to the realigned Footpath M62, to the east of the main line. Users will be able to pass over the railway via the proposed footbridge for Footpath M62 (Volume 2: CFA19 Map Book, Map CT-06-110, C6); and
- permanent stopping up of Footpath M43 and users redirected to pass over the railway via the proposed Attleboro Lane realignment and bridge (Volume 2: CFA19 Map Book, Map CT-06-134a, F4).

2.3.32 A new bridleway will be created between the B4117 Watton Lane, east of Water Orton and Attleboro Lane, to the south of Water Orton. This bridleway will run alongside the M42-M6 link and pass beneath the railway at Water Orton no. 1 and no. 3 viaducts.

Utilities

2.3.33 Numerous utilities will need to be diverted for the works, the principal diversions being:

- medium and high-pressure gas mains as follows:
  - 400mm steel National Grid high-pressure gas main near M6/M42 junction, to be diverted under the railway;
  - 450mm steel National Grid high-pressure gas main near Bromwich Court, A446 Lichfield Road, to be diverted under the railway;
  - 600mm steel National Grid high-pressure gas main near Bromwich Court, A446 Lichfield Road, to be diverted under the railway; and
  - 450mm steel high-pressure National Grid pressure reducing station diversion near Attleboro Lane.
  - 300mm steel high-pressure National Grid gas main pipeline diversion under the railway, near the M42/M6 Toll.

- Large-diameter water mains as follows:
  - 12-inch Severn Trent water main diversion (450m) alongside Coleshill Heath Road;
  - 180mm Severn Trent water main diversion under Gilson Drive;
  - 7-inch Severn Trent water main diversion (1300m) under B4117 Gilson Road and Gilson Drive;
  - 12-inch Severn Trent water main diversion (450m) from alongside B4118 Birmingham Road/Water Orton Road to alongside existing mains within B4117 Watton Lane;
  - 12-inch Severn Trent water main diversion (450m) under B4117 Watton Lane alongside existing mains within B4117 Watton Lane;
  - 300mm Severn Trent water main diversion (1000m) under the railway at B4117 Watton Lane/A446 Lichfield Road roundabout to field to the east of A446 Lichfield Road, including a crossing over River Tame; and
  - 600mm Severn Trent water main diversion (1100m) under the railway and A446 Lichfield Road at two points.
- large-diameter foul sewers as follows:
  - Severn Trent sewage 1650mm diversion under the railway north of M6/M42 junction;
  - Severn Trent sewage 1575mm diversion crossing beneath the Birmingham spur, to the west of M42/River Cole crossing;
  - Severn Trent sewage 1500mm pipe diversion under the railway near the M42, to the south of Gilson Road;
  - Severn Trent sewage 1575mm diversion crossing under the railway and A446 Lichfield Road;
  - Severn Trent sewage 1575mm diversion crossing under the north chord and heading towards the main line;
  - Severn Trent sewage 1500mm pipe diversion under the railway, just to the north of the Birmingham to Nuneaton Line; and
  - relocation of Severn Trent water assets within Coleshill sewage treatment facility.
- high voltage electricity plant as follows:
  - National Grid overhead line Feckenham to Hams Hall 400 kilovolt (kV) diversions near M6/M42 junction, requiring at least three replacement electricity pylons to divert the route over the railway (Map CT-05-111, F5, F6, G3 and G4);
  - Western Power Networks 132(kV) cable diversions to reposition overhead power lines to the east of the main line and run cables under the railway. This will involve the removal of existing electricity pylons at several locations, including to the west

of Coleshill Embankment no.1 (Map CT-05-108, D6); and alongside the existing Footpath M77 alignment (Map CT-05-109, H5);

- National Grid overhead line diversions Feckenham to Hams Hall 400kV and Berkswell to Hams Hall 275kV near M42/M6 Toll, B4117 Watton Lane/A446 Lichfield Road, including one junction and one electricity pylon to allow crossing of HS2; and
- overhead line diversions will also require temporary access for modifications to electricity pylons that are remote from the diversion.

- other services:
  - Birmingham Airport Link fuel pipeline runs underground alongside the M6 between Smith's Wood and Water Orton and there are three locations, in the vicinity of Attleboro Lane overbridge (Map CT-05-134a, D6 and D7).

Watercourse diversions

2.3.34 The Proposed Scheme includes the following changes to watercourses:

- approximately 730m of realignment to the River Cole to pass under the proposed rail viaducts, to the south-east of Coleshill Manor Office Campus (Map CT-06-109, B5 to Map CT-06-110, H6, H7, I7, J7 and J8);
- approximately 130m of culvert to carry an unnamed channel beneath the Birmingham spur earthworks and Green Lane embankment (Map CT-06-133, D5 and D6);
- approximately 130m of culvert to carry a further unnamed channel beneath the Birmingham spur earthworks and Marsh Lane embankment (Map CT-06-111a, H10), with about 900m of new channel to the north-east, south of the north chord;
- approximately 600m of unnamed channel diverted near Water Orton to join a culvert beneath proposed earthworks and embankments for the Birmingham spur and north chord (Map CT-06-134a, H6); and
- approximately 600m of unnamed watercourse realigned around Coleshill embankments 1 and 2 and beneath the M6 motorway north viaduct (Map CT-06-108, B4, C4, C5 and D5).

Finalisation works

2.3.35 Finalisation works will include landscaping and planting.

Satellite construction compounds

2.3.36 A total of 23 satellite construction compounds will be required to construct the Proposed Scheme in the Coleshill Junction area, including structures that straddle the boundaries with neighbouring areas. Eighteen of the satellite construction compounds for civil engineering works are within the Coleshill Junction area (CFA19) and five are in the adjoining areas of Castle Bromwich and Bromford (CFA25); Birmingham Interchange and Chelmsley Wood (CFA24); and Curdworth to Middleton (CFA20). Table 2 details the principal construction activity, start date and approximate duration, number of workers and highway access route for each associated satellite

construction compound in the Coleshill Junction area, with map references to Volume 2: CFA19 Map Book. Details of the five compounds operated from the Coleshill Junction area but located outside it are described in the corresponding CFA report.

Table 2: Satellite construction compounds and roadheads

Compound name	Principal construction activity	Start date (year, quarter)	Estimated duration of use	No. of workers (average/ peak)	Highways access route
The main line: south of Coleshill Junction CFA to River Cole					
M6 motorway south viaduct satellite compound (Map CT-05-108, E5 and F5)	Construction of M6 motorway south viaduct over M6 eastbound slip road to A446 Lichfield Road; and M6 motorway box structure	2019, Q4	1 year, 10 months	20/30	Haul route from Coleshill Heath Road and M6 hard shoulder closure, then same route as M6 motorway main compound
M6 motorway north viaduct (south) satellite compound (Map CT-05-108, D5)	Construction of viaduct over M42 northbound to M6 eastbound slip road	2020, Q1	1 year, 3 months	55/80	Via balancing pond access road (bridge over M42) connection from A446 Stonebridge Road
M6 motorway north viaduct (north) satellite compound (Map CT-05-108, C5)	Construction of viaduct over M42 northbound to M6 eastbound slip road	2020, Q1	1 year, 3 months	20/30	Haul route from Coleshill Heath Road, then same route as M6 motorway main compound
Coleshill west viaduct satellite compound (Map CT-05-109, C4 and C5)	Construction of floodplain viaduct (Coleshill west viaduct); and B4114 Birmingham Road underbridge	2019, Q4	2 years, 1 month	55/80	Manor Drive to B4114 Birmingham Road, continuing onto A446 Stonebridge Road
Birmingham spur diveunder satellite compound (Map CT-05-110, I6)	Construction of Birmingham spur diveunder to facilitate link to Birmingham spur, passing under the main line	2021, Q1	1 year, 4 months	20/30	Haul route, to Manor Drive, to B4114 Birmingham Road, continuing onto A446 Lichfield Road
The Main Line: River Cole to River Tame					
M42 Coleshill box structure satellite compound (Map CT-05-110, G7)	Construction of box structure over M42 and M6 Toll (M42 Coleshill box structure); River Cole east and west viaducts (on the Birmingham spur); and realigned Manor Drive	2018, Q2	4 years, 9 months	46/85	Gilson Drive, B4117 Gilson Road continuing onto A446 Lichfield Road/Stonebridge Road
M42 Coleshill north viaduct satellite compound (Map CT-05-110, F5 and F6)	Construction of floodplain viaduct (M42 Coleshill north viaduct); Footpath M62 overbridge; and B4117 Gilson Road realignment	2019, Q4	2 years, 8 months	31/50	Gilson Drive/B4117 Gilson Road, continuing onto A446 Lichfield Road/Stonebridge Road

Compound name	Principal construction activity	Start date (year, quarter)	Estimated duration of use	No. of workers (average/ peak)	Highways access route
Chattle Hill box structure satellite compound (Map CT-05-111a, G4)	Construction of viaduct over A446 Lichfield Road (Chattle Hill box structure)	2019, Q4	1 year, 5 months	20/30	A446 Lichfield Road
Water Orton viaduct 1 and 3 (north) satellite compound (Map CT-05-111a, D5, D6 and E5)	Construction of Water Orton no. 1, 2, 4 and 4 viaducts over Birmingham to Nuneaton Line, River Tame east and west viaducts and Watton House south and north embankments	2016, Q3	3 years, 3 months	79/135	A446 Lichfield Road
Birmingham spur					
Manor Drive/River Cole viaducts satellite compound (Map CT-05-110, I8)	Construction of viaducts over River Cole (River Cole east and west viaducts); Manor Drive diversion, including bridges over the River Cole and Footpath M54 realignment	2022, Q1	1 year, 2 months	20/30	Manor Drive, B4114 Birmingham Road, continuing onto A446 Lichfield Road
M42-M6 motorway link viaduct (east) satellite compound (Map CT-05-133, B6)	Construction of viaducts over M6/M42 link (M42-M6 motorway link east and west viaducts)	2018, Q2	2 years, 2 months	30/30	M42-M6 link hard shoulder closure
M42-M6 motorway link viaduct (central) satellite compound (Map CT-05-133, B8)	Construction of viaducts over M6/M42 link (M42-M6 motorway link east and west viaducts)	2018, Q2	2 years, 2 months	20/30	M6 lane one closure
M42-M6 motorway link viaduct (west) satellite compound (Map CT-05-134a, H7)	Construction of viaducts over M6/M42 link (M42-M6 motorway link east and west viaducts)	2018, Q2	2 years, 2 months	20/30	Via haul route to Coleshill Road, Gypsy Lane, B4117 Watton Lane, then A446 Lichfield Road
North chord					
Attleboro flyover satellite compound (Map CT-05-134a,F7)	Construction of Attleboro flyover, Attleboro Lane overbridge and Attleboro Lane realignment	2019, Q3	2 years, 4 months	68/85	Attleboro Lane, haul route to B4117 Watton Lane, A446 Lichfield Road

Compound name	Principal construction activity	Start date (year, quarter)	Estimated duration of use	No. of workers (average/ peak)	Highways access route
Water Orton viaduct 1 and 3 (central) satellite compound (Map CT-05-111a, F6)	Construction of Water Orton viaducts 1 and 3 over the M42/M6 slip road, B4117 Gilson Road and A446 Lichfield Road and Birmingham to Nuneaton Line	2017, Q3	2 years, 1 month	64/80	B4117 Watton Lane to A446 Lichfield Road
Water Orton viaduct 1 and 3 (M42 north) satellite compound (Map CT-05-111a, F6)	Construction of Water Orton viaducts 1 and 3 over the M42/M6 slip road, B4117 Gilson Road and A446 Lichfield Road and Birmingham to Nuneaton Line	2017, Q3	2 years, 1 month	20/30	B4117 Watton Lane to A446 Lichfield Road
Water Orton viaduct 1 and 3 (south) satellite compound (Map CT-05-111a, F7 and F8)	Construction of Water Orton viaducts 1 and 3 over the M42/M6 slip road, B4117 Gilson Road and A446 Lichfield Road and Birmingham to Nuneaton Line	2017, Q3	2 years, 1 month	20/30	B4117 Watton Lane to A446 Lichfield Road
Water Orton viaduct 1 and 3 (M42 south) satellite compound (Map CT-05-111a, G7 and H7)	Construction of Water Orton viaducts 1 and 3 over the M42/M6 slip road, B4117 Gilson Road and A446 Lichfield Road and Birmingham to Nuneaton Line	2017, Q3	2 years, 1 month	20/30	M42/M6 link hard shoulder closure

2.3.37 There will also be a compound adjacent to Pool Farm to the north-east of M6 junction 4 (Map CT-05-108-R1, G7), with access off the A446; the M6 junction 4 satellite compound. This will support works to the adjacent roundabout and approaches and is, therefore, included in the report for the Birmingham Interchange and Chelmsley Wood area (CFA24).

Roadheads

2.3.38 Roadheads are areas for the storage and loading and unloading of bulk earthworks material which is moved to and from the site on public highways.

2.3.39 There are three roadheads within the Coleshill Junction area:

- the M6 motorway slip road roadhead is to the north of the M42 northbound to M6 eastbound slip road (Volume 2: CFA19 Map Book, Map CT-05-108, B4-6 and C4-6);
- the Birmingham Road eastbound roadhead is to the east of the route, north of the B4114 Birmingham Road (Volume 2: CFA19 Map Book, Map CT-05-109, B5, C5 and D5); and

- the Lichfield Road north and south bound roadhead is to the north of Gilson and south of the A446 Lichfield Road (Volume 2: CFA19 Map Book, Map CT-05-111a, E4, E5, F4, G4 and H5).

2.3.40 Material arriving at the roadheads in this area will arrive from either the north or south via the A446 Lichfield Road. The M6 motorway slip road roadhead will be accessed from the west via Coleshill Heath Road and a temporary site access beneath the motorway slip road. The Birmingham Road eastbound roadhead will be accessed via Birmingham Road to the west; and the Lichfield Road north and south bound roadhead will be accessed directly from the A446 Lichfield Road.

2.3.41 Roadheads will be operational for the duration of the civil engineering works.

Temporary worker accommodation sites

2.3.42 One temporary worker accommodation site will be located within this section of the Proposed Scheme. The site will be adjacent to the M6 motorway main compound (Map CT-05-108, E2, E3 and E4) and will comprise living accommodation, welfare facilities and car parking for approximately 40 workers over a period of approximately five years. Temporary worker accommodation will adhere to the mitigation measures set out within the CoCP

Railhead at Kingsbury Road

2.3.43 Kingsbury Road railhead, in the neighbouring Curdworth to Middleton area (CFA20) is the main compound for the rail systems installation from Long Itchington Wood tunnel to Handsacre connection; and Birmingham Curzon Street.

2.3.44 The railway systems installation works will include track, overhead line equipment, communications equipment and traction power supply. The installation of track in open areas will be of standard ballasted track configuration, comprising principally of ballast, rail and sleepers.

2.3.45 The railhead compound will facilitate the following activities:

- permanent way (ballast and track) installation;
- overhead line electrification installation;
- train control;
- signalling;
- telecommunication fit-out; and
- low-voltage line side power fit-out.

Rail systems satellite compounds

2.3.46 The Kingsbury Road railhead will provide main compound support to three satellite compounds required for rail systems installation works within the Coleshill Junction area, as shown in Table 3, with map references to Volume 2: CFA19 Map Book.

Table 3: Satellite rail systems compounds

Compound name	Principal construction activity	Start date (year, quarter)	Estimated duration of use	Number of workers (average/ peak)	Highways access route
M-77 package substation satellite compound (using the M6 motorway north viaduct (north) satellite compound (Map CT-05-108, C5))	Facilitate the M-77 package substation fit out	2023, Q1	4 weeks	2/4	Via balancing pond access road (bridge over M42) connection from A446 Stonebridge Road
Gilson Road autotransformer station satellite compound (using the M42 Coleshill north viaduct satellite compound (Map CT-05-110, F5 and F6))	Facilitate the Gilson Road autotransformer station fit-out	2022, Q1	1 year, 3 months	15/25	Gilson Road
Attleboro package substation satellite compound (Map CT-05-134a, E6)	Facilitate the Attleboro package substation fit-out	2023, Q1	4 weeks	2/4	Via balancing pond access route from Attleboro Lane

Construction waste and material resources

2.3.47 Forecasts of the amount of construction, demolition and excavation waste (CDEW) and worker accommodation site waste that will be produced during construction of the Proposed Scheme in the Coleshill Junction area have been prepared and are presented in Volume 5: Appendix WM-001-000.

2.3.48 The majority of excavated material that will be generated across the Proposed Scheme will be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, either with or without treatment.

2.3.49 Based on the mitigation earthworks design approach adopted for the Proposed Scheme, local excess or shortfall of excavated material within the Coleshill Junction area will be managed with the aim of contributing to an overall balance of excavated material on a route-wide basis. This overall balance of excavated material is presented in Volume 3, Section 14.

2.3.50 The quantity of surplus excavated material originating from the Coleshill Junction area that will require off-site disposal to landfill as excavation waste is shown in Table 4. This is the forecast quantity of contaminated excavated material that is chemically unsuitable for reuse within the Proposed Scheme.

2.3.51 The quantities of demolition, construction and worker accommodation site waste that will be reused, recycled and recovered (i.e. diverted from landfill) have been based on the landfill diversion performance of similar projects as follows:

- demolition waste: 90%;
- construction waste: 90%; and
- worker accommodation site waste: 50%.

2.3.52 The quantities of demolition, construction and worker accommodation site waste that will require off-site disposal to landfill are shown in Table 4.

Table 4: Estimated construction, demolition and excavation waste

Waste type	Estimated material quantities that will be generated (tonnes)	Estimated quantity of waste for off-site disposal to landfill (tonnes)
Excavation	9,149, 821	0
Demolition	43,399	4,340
Construction	87,066	8,707
Worker accommodation site	76	38
TOTAL	**9,280,362**	**13,085**

2.3.53 The assessment of the likely significant environmental effects associated with the disposal of CDEW and worker accommodation site waste has been undertaken for the Proposed Scheme as a whole (see Volume 3, Section 14).

Commissioning of the railway

2.3.54 Commissioning is the process of testing the infrastructure to ensure that it operates as expected, and will be carried out in the period prior to opening. Further details are provided in Volume 1, Section 4.

Construction programme

2.3.55 A construction programme that illustrates indicative periods for the construction activities in this area is provided in Figure 5.

Figure 5: Indicative construction programme

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advance works																																				
Advance works																																				
Civil engineering works																																				
M6 motorway main compound and Temporary Workers Accommodation Site 5																																				
Coleshill no. 1 embankment																																				
Coleshill no. 2 embankment																																				
Coleshill no. 3 embankment																																				
Manor Drive embankment																																				
Gilson cutting																																				
Watton House south embankment																																				
Green Lane embankment																																				
Attleboro Farm embankment																																				
Water Orton cutting																																				
Marsh Lane embankment																																				
MAIN LINE																																				
M6 motorway south viaduct satellite compound																																				
M6 motorway south viaduct																																				
M6 motorway north viaduct (north) satellite compound and M6 motorway north viaduct (south) satellite compound																																				
M6 motorway north viaduct																																				
Coleshill west viaduct satellite compound																																				
Coleshill west viaduct																																				
Coleshill east viaduct																																				
B4114 Birmingham Road underbridge																																				
Birmingham spur diveunder																																				
Birmingham spur diveunder																																				

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
M42 Coleshill box structure satellite compound																																				
M42 Coleshill box structure																																				
M42 Coleshill south viaduct																																				
M42 Coleshill north viaduct satellite compound																																				
M42 Coleshill north viaduct																																				
Footpath M62 overbridge																																				
Chattle Hill box structure satellite compound																																				
Chattle Hill box structure																																				
BIRMINGHAM SPUR																																				
Manor Drive/River Cole viaducts satellite compound																																				
River Cole east viaduct																																				
River Cole west viaduct																																				
M42-M6 motorway link viaduct satellite compound (west); M42-M6 motorway link viaduct satellite compound (central); M42-M6 motorway link viaduct satellite compound (east)																																				
M42-M6 motorway link east viaduct																																				
M42-M6 motorway link west viaduct																																				
NORTH CHORD																																				
Water Orton viaduct 1 and 3 (central) satellite compound; Water Orton viaduct 1 and 3 (M42 north) satellite compound; Water Orton viaduct 1 and 3 (south) satellite compound; Water Orton viaduct 1 and 3 (M42 south) satellite compound (M42 South)																																				
Water Orton viaduct 1																																				
Water Orton viaduct 3																																				
Water Orton viaduct 4																																				
Water Orton viaduct 5																																				
Attleboro flyover satellite compound																																				
Attleboro flyover																																				
Attleboro Lane overbridge																																				
Rail infrastructure and systems works																																				
Rail installation works (From Kingsbury Road railhead)																																				
Gilson Road ATS satellite compound (163-S1)																																				

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Attleboro Package sub-station satellite compound																																				
M-77 Package substation compound																																				
Commissioning																																				
Commissioning																																				

Key: Construction works Compound duration

2.4 Operation of the Proposed Scheme

Operational specification

2.4.1 Volume 1, Section 4.4 describes the envisaged operational characteristics of Phase One of HS2 as a whole and how they may change when Phase Two is also operational.

HS2 services

2.4.2 It is anticipated that, initially, there will be 11 trains per hour each way on the main line south of the Birmingham spur in the morning and evening peak hours and fewer during other times; three trains per hour each way will use the Birmingham spur and the remaining eight trains per hour each way will use the main line north of the Birmingham spur. The first trains of the day will leave the terminus stations no earlier than 05:00 Monday to Saturday or 08:00 on Sundays and the last will arrive no later than midnight.

2.4.3 It is anticipated that, with Phase One in place, the frequency could rise to 14 trains per hour each way during peak hours on the main line south of the Birmingham Interchange station, with three trains per hour each way continuing onto the Birmingham spur and eight trains per hour each way continuing onto the main line north of the Birmingham Interchange station. The north chord will not be used for passenger services in this phase.

2.4.4 It is anticipated that, with Phase Two in place, the frequency could rise to 18 trains per hour each way during peak hours on the main line south of Birmingham Interchange, with three trains per hour each way continuing onto the Birmingham spur, and up to 16 trains per hour each way continuing onto the main line north of Birmingham Interchange. Up to six trains per hour each way will use the north chord and up to 22 trains per hour each way will use the main line north of the north chord. The assessment of sound, noise and vibration has taken into account the frequency during Phase Two.

2.4.5 In this area, trains will run at speeds up to 360kph (225mph) on the main line, 230kph (143mph) on the Birmingham spur and, in Phase Two, 170kph (106mph) on the north chord. The trains will be either single 200m long trains, or two 200m long trains coupled together, depending on demand and time of day.

Maintenance

2.4.6 Volume 1, Section 4.4 describes the maintenance regime for HS2.

2.4.7 The intention is that maintenance staff will access the railway to carry out inspections and maintenance on a regular basis. This will be at night when the railway is not operating. There will be routine preventative maintenance, including grinding and milling of the rails to keep them in good condition, and more periodic heavy maintenance as necessary.

2.4.8 Railway maintenance vehicles will be parked either at the Calvert infrastructure maintenance depot, which lies a considerable distance to the south of the Coleshill Junction area, or in the defined maintenance loops along the route, of which there are none in the Coleshill Junction area. The maintenance loops could also be used in the case that a passenger train could not continue unassisted to its destination.

Operational waste and material resources

2.4.9 Forecasts for the amount of operational waste that will be produced annually during operation of the Proposed Scheme have been prepared and are presented in Volume 5: Appendix WM-001-000.

2.4.10 Railway station and train waste refers to waste that will arise at each station. It will include waste from station operations and passenger waste removed from trains at terminating stations. This has only been reported for areas along the route in which these stations will be located.

2.4.11 Rolling stock maintenance waste is that which will be generated by the relevant train operating company at rolling stock maintenance facilities. This has only been reported for the areas along the route in which these facilities will be located.

2.4.12 Track maintenance waste and ancillary infrastructure waste (for example waste from depots, signalling locations, operations and maintenance sites) has been estimated using an average waste generation rate per kilometre length of total track. For this reason, both track maintenance waste and ancillary infrastructure waste has been reported for each area along the route.

2.4.13 The quantity of operational waste that will be reused, recycled and recovered (i.e. diverted from landfill) has been based on landfill diversion performance information from Network Rail and other sources as follows:

- railway station and trains: 60%;
- rolling stock maintenance: 80%;
- track maintenance: 85%; and
- ancillary infrastructure: 60%.

2.4.14 On this basis, approximately 275 tonnes of operational waste will be reused, recycled and recovered during each year of operation of the Proposed Scheme in the Coleshill Junction area. Approximately 56 tonnes will require disposal to landfill (see Table 5).

Table 5: Operational waste forecast for the Proposed Scheme

Waste source	Estimated quantity of waste generated per annum (tonnes)	Estimated quantity of waste for disposal to landfill per annum (tonnes)
Railway station and trains	0	0
Rolling stock maintenance	0	0
Track maintenance	305	46
Ancillary infrastructure	26	10
TOTAL	**331**	**56**

2.4.15 The assessment of the likely significant environmental effects associated with the disposal of operational waste has been undertaken for the Proposed Scheme as a whole (see Volume 3, Section 14).

2.5 Community forum engagement

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

2.5.2 The engagement undertaken within this community forum area is summarised below. A series of community forum meetings and discussions with individual landowners, organisations and action groups were undertaken. Community forum meetings were held on:

- 10 April 2012 at the Old Market Hall;
- 22 June 2012 at Coleshill Town Hall;
- 6 September 2012 at the Old Market Hall;
- 15 November 2012 at The Pavilion;
- 27 February 2013 at The Link community venue; and
- 16 September 2013 at The Pavilion.

2.5.3 In addition to HS2 Ltd representatives, attendees at these community forum meetings typically included local residents (and residents groups), public representatives, representatives of local authorities and parish and district councils, action groups, affected landowners and other interested stakeholders.

2.5.4 The main themes emerging from these meetings were:

- design process, number of tracks, identification of land requirements for different options, impacts of the north chord connection, viaducts over embankments and motorways;
- overall impacts to ecology and sensitive Local Wildlife Sites (LWS), the green belt between Coleshill and Birmingham and the Coleshill and Bannerly Pools and River Blythe Site of Special Scientific Interest (SSSI);
- impacts on Water Orton Primary School and impacts to Old Saltleians Rugby Football Club;
- visual impacts;
- cumulative impacts due to the proximity of nearby highways;
- impacts of highway modifications, road maintenance, connectivity, traffic flows around car parks and permanent road diversions;
- fiscal/business impacts;
- water quality impacts;
- impacts due to construction, construction vehicle movements and traffic, disposal of excavated materials, track work at Coleshill, Gilson and Water Orton and location and size of construction worksites;
- maintenance impacts;

- noise/vibration effects;
- property issues, specifically at Gilson and Chattle Hill; and
- provision of electricity diversions and substations.

2.5.5 In addition to the engagement through the community forums, the draft ES and Design Refinement consultations were launched on 16 May 2013 for a period of eight weeks, closing on 11 July 2013. As part of these consultations, members of local communities and other interested parties were notified, provided within information and invited to engage on issues pertinent to the draft Environmental Statement and the development of the scheme. Details of the local consultation events were provided on the HS2 Ltd website, social media, posters at local venues, national and regional advertising and to properties within 1km of the Proposed Scheme. In the Coleshill Junction area, consultations on the draft ES and on the Design Refinement were held on Saturday 01 June 2013 at The Link in Water Orton.

2.5.6 HS2 Ltd staff attended the consultation events, including engineers and environmental specialists, for members of the public to speak to.

2.5.7 Responses from the draft ES consultation have been analysed and an overview of those received and how the Environmental Statement has taken account of responses is contained in the draft ES Consultation Summary Report (Volume 5: Appendix CT-008-000).

2.6 Route section main alternatives

2.6.1 The main strategic alternatives to the Proposed Scheme are presented in Volume 1 and in Appendix CT-002-000. The main local alternatives considered for the Proposed Scheme within the local area are described in this section.

2.6.2 Since April 2012, as part of the design development process, a series of local alternatives have been reviewed within workshops attended by engineering, planning and environmental specialists. During these workshops, the likely significant environmental effects of each design option have been reviewed. The purpose of these reviews has been to ensure that the Proposed Scheme draws the appropriate balance between engineering requirements, cost and potential environmental impacts.

Layout of the Delta junction

Initial optioneering work

2.6.3 The proposed Delta junction lies between Birmingham International Airport in the south and the M42 junction 9 to the north. Chelmsley Wood lies to the west of the main line, Water Orton is to the north-west and Coleshill is to the east. The overall arrangement consists of three grade-separated junctions, forming a triangle. It provides the Birmingham spur between the main line and Birmingham city centre and includes the two tracks of north chord, providing a connection between Birmingham and the main line, then on towards the Leeds spur.

2.6.4 The Delta junction is one of the major constraint points on the HS2 network. Up to twenty-two trains per hour each way will need to pass through parts of the Delta

junction. Consequently, the track layout must be such that it provides a feasible solution to permit the operation of the assumed service pattern, but it must also offer a sufficient degree of flexibility such that alternative timetables and a degree of operational flexibility can be provided for.

2.6.5 The design aims to strike an appropriate balance between the following key factors:

- journey time;
- layout (including land required for the construction and operation of the Proposed Scheme, environmental impact and cost); and
- operational flexibility.

2.6.6 The following options were developed for the arrangement of the Delta junction:

- Option A developed the January 2012 announced scheme with the addition of a grade-separated link to the Leeds route north of the River Tame crossing. This option provided four tracks from the approach to Birmingham Interchange Station through to the M42 junction 9. The Birmingham spur diverged from the outer of the four tracks with an underpass providing grade-separation. The north chord separated from the outer tracks of the main line with a grade-separated junction over the four track main line. A grade-separated junction to the west of Water Orton allowed the Birmingham spur and north chord routes to merge and continue towards Birmingham City Centre;
- Option B was developed to overcome the operational constraints in Option A. To achieve this, direct connections were provided from the inner and outer tracks of the main line to both the Birmingham spur and the north chord. In addition, a direct link was provided between the southbound route from Leeds to the north chord. To achieve all connections, the alignment geometry was constrained and the design speeds were reduced through the various junctions;
- Option C was a separate development of Option A. This introduced additional lengths of track to overcome constraints in the design. These were provided from the southbound Leeds route onto the outer main line track to the south of the grade-separated junction for the north chord; and between the eastbound north chord and the outer track of the main line north of the grade-separated junction for the Leeds route;
- Option D was developed as an adaptation of Option C by providing a direct connection between the southbound Leeds route and the inner track of the main line. This required a shorter length of additional track to connect the southbound Leeds route to the outer track of the main line;
- Option E provided a similar arrangement to Option D, but by separating some of the tracks vertically, it reduced the width of the land required for the operation of the Proposed Scheme; and
- Options F and G each looked at a different arrangement for connecting the main line and Birmingham spur, but were both discounted on the basis that

although they provided enhanced operational flexibility, this was at the expense of increased journey times, cost and environmental impacts.

2.6.7 Option A provided the minimum footprint size and amount of land required for the operation of the Proposed Scheme by limiting the number of tracks to a maximum of six. This option provided the least operational flexibility and was demonstrated to compound the effects of delays on the network.

2.6.8 Option B provided a very high degree of future operational flexibility by providing direct connections from all four of the main line tracks to all destinations, offering the greatest amount of operational flexibility of all of the options considered. The increased flexibility was achieved through a much larger footprint and would result in reduced journey times compared to other options.

2.6.9 Option C provided improved operational flexibility over Option A, delivered through a large layout with up to eight tracks required. However, this width was concentrated to the north of the Delta junction, near Hams Hall Industrial Estate. Throughout the remainder of the junction, the width was similar to Option A. The option included larger and more complex structures than Option A, as well as more track length and was considered more expensive than Option A, but less than Option B. The journey times were slightly greater than those achieved by Option A.

2.6.10 Option D provided some improvement in operational flexibility and journey time over Option C. However, land required for the construction and operation of the Proposed Scheme around the north end of the junction was increased as a result of a requirement for nine tracks. The additional track and land required for the construction and operation of the Proposed Scheme equated to a higher cost compared to Option C.

2.6.11 Option E offered no change in journey times or operational flexibility compared to Option D. In addition, Option E also required a greater number of structures, resulting in a higher overall cost. However, overall land required for the construction and operation of the Proposed Scheme was less than Option D and will potentially have resulted in a lesser impact on the environment.

2.6.12 Option C, which provided acceptable journey times, operational flexibility to reduce delays and a level of future proofing should the service specification change, was taken forward for further development within the Proposed Scheme for the layout of the Delta junction.

Design development and value engineering – Option C-VE

2.6.13 Subsequent design development was undertaken to achieve further rationalisation of the track layout. The design of Option C-VE included the following amendments, which have been incorporated into the design:

- the position of crossover points between the tracks was reviewed and resulted in the removal of two lengths of track without adversely affecting the operational performance of the junction, reducing the number of tracks to a maximum of six;
- the junction between the main line and Birmingham spur was adjusted to allow the B4114 Birmingham Road to remain on its existing alignment and to

reduce the complexity of the structures; and

- the junction between the Birmingham spur and the north chord was rearranged to reduce the complexity of the structures.

Water Orton curve

2.6.14 The scheme announced in January 2012 positioned the north chord approximately 150m away from the residential area of Water Orton and the grounds of a primary school – this formed Option A, which was the baseline for assessing alternative options against. The following further two options were considered for the Water Orton curve:

- Option B would include the southern track of the north chord being moved approximately 30m further away from Water Orton (south); and
- Option C would include both tracks of the north chord being moved up to a maximum of 30m further away from Water Orton (south).

2.6.15 Option B provided some minor environmental benefits over Option A, but had a significantly higher cost and was therefore discounted.

2.6.16 Option C was taken forward for further development within the Proposed Scheme for Water Orton curve. This option realigned both the northern and southern track of the north chord up to 30m further to the south, away from Water Orton in order to reduce environmental impact, improve constructability of associated structures at both ends of the curve and provide a small cost saving.

Alternatives proposed by the community

2.6.17 During the engagement process, proposals were received from members of the community for changes to the design. In this area, the following alternatives were developed and compared against Option A, the January 2012 announced route.

2.6.18 Option B would have relocated the western junction of the Delta further west to seek to reduce the impacts of the junction on Water Orton and particularly Water Orton Primary School. Although a small change in position would have been possible, it would have required a significant reduction in the design speed on the Birmingham spur. As this option would only have partially met the community's objectives and would have imposed a significant constraint on the operation of HS2, a full assessment of this option was not developed further.

2.6.19 Option C proposed a lowering of the north chord to cross beneath the M42/M6 toll and reconnect with the main line from beneath. However, the connection of the north chord in its current position would not have been feasible as there would have been insufficient clearance over the existing roads, railways and watercourses without significantly raising the main line section of the route, which is in opposition to the intent of the proposal. Consideration was also given to crossing under the M42/M6 toll but still crossing over the HS2 main line. However, the gradient required to change from a level beneath the motorway to over the main line would exceed the design parameters of the railway alignment. As a viable solution to this proposal was not found, it was not developed further.

2.6.20 Option D would have introduced a green tunnel as the route passes through the village of Gilson. The proposal would have used landscape earthworks to extend the green tunnel to a length of approximately 1km. The four track alignment through this green tunnel would have required additional lateral separation to separate the tracks.

2.6.21 The engineering appraisal of Option D demonstrated that this option would have had a greater cost than Option A and would have imposed a restriction on the maintenance of trackwork in this key section of the HS2 network. The environmental assessment indicated that there could be minor improvements following construction, but this was countered by increased impacts due to energy use and impacts during construction of the works. As no overall environmental benefit was identified and the proposal constrained the ability of HS2 to maintain the railway, this option was not included in the design.

2.6.22 Option E reconsidered a previous proposal to relocate the north chord between Water Orton and Curdworth, just to the north of an existing high voltage power line. The proposal would have relocated the western grade separated junction of the Delta further towards Birmingham. The tracks would have risen to cross the existing railway lines known as the Birmingham and Derby Line and Birmingham to Nuneaton Line, the River Tame and its associated flood plain on viaduct. This route would have continued on viaduct running above the sewage works channel before passing over the M42/M6 toll. From this point, the track to Leeds would have descended to an underpass under the main line, while the line to Manchester would have connected to the main line at grade. The line from Manchester to Birmingham would have crossed over the HS2 main line while the line from Leeds would have run at the highest level above all of the other routes. The vertical divergence of the two tracks would have resulted in the potential closure of Marsh Lane. As a result of this proposal the arrangement of the tracks on the main line section would have been simplified, which would have resulted in a slightly narrower width of construction through the Hams Hall and Coleshill sewage works area.

2.6.23 Option E would have potentially reduced journey times from Birmingham to the north but would have been significantly more expensive and complex to construct. The environmental assessment of this option indicated localised reduced impacts where the north chord would have been relocated further from residential properties in Water Orton, but an overall increase in impacts due to the additional 1km of railway construction. In particular it would have required the demolition of the listed buildings at Dunton Hall and impacts to a scheduled monument. Overall, Option E incurs a net cost after considering journey time improvements and increases the environmental impacts. It was not included in the design for these reasons.

2.6.24 Option F would have lowered the Birmingham spur element of the Delta junction below the M6/M42 link roads. The lowered alignment under the motorway would have changed the arrangement of the grade separated junction to the south-west of Water Orton. To construct the route under the motorway link would have been likely to require temporary or permanent diversions of the motorway link roads for a length of approximately 750m, with a construction duration of about 18 months.

2.6.25 Option F was assessed to understand the potential impact on traffic flows on the motorway network in this area, identifying adverse effects to both the M6 and M42.

The cost of this option was also significantly greater than Option A. The environmental assessment of this option indicated a positive improvement over option A as a result of the lowered alignment close to Water Orton. Overall, it was assessed that the environmental merits of this option did not outweigh the significant increased cost and disruption of the motorway network during construction

Chelmsley Wood

2.6.26 The horizontal and vertical alignment of the route as it passes Chelmsley Wood has been amended, affecting the alignment of the main line and the Birmingham spur in the southern part of the area, as it passes from the Birmingham Interchange and Chelmsley Wood area (CFA24) into the Coleshill Junction Area. A description of the alternatives considered is reported in the Birmingham Interchange and Chelmsley Wood CFA report (CFA24), which is where the majority of the alternatives were located.

3 Agriculture, forestry and soils

3.1 Introduction

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

3.1.2 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC) system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of the impacts on agricultural land is the extent to which land of best and most versatile (BMV) agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

3.1.3 Forestry is considered as a land use feature and the impacts have been calculated quantitatively. The qualitative effects on forestry land and woodland are addressed principally in the ecology and landscape and visual assessments (see Sections 7 and 9).

3.1.4 Soil attributes, other than for food and biomass production, are identified in this section but the resulting function or service provided is assessed in other sections, notably cultural heritage, ecology and landscape and visual assessment (see Sections 6, 7 and 9).

3.1.5 The main issue for farm holdings is the disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both its construction and operational phases. Key engagement has been undertaken with farmers and landowners affected by the Proposed Scheme to obtain factual information on the scale and nature of the farm and forestry operations and related farm-based uses.

3.1.6 Details of published and publically available information used in the assessment, and the results of surveys undertaken within the Coleshill Junction area, are contained in Volume 5: Appendix AG-001-019.

3.2 Scope, assumptions and limitations

3.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

3.2.2 The study area for the agriculture, forestry and soils assessment covers all of the land that will be required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils; together with farm and rural holdings. The assessments of the

impacts on agricultural land quality and forestry land are made with reference to the prevalence of BMV land and forestry in the general locality, taken as 2km either side of the centre line of the Proposed Scheme.

3.2.3 Common assumptions that have been applied to the Proposed Scheme, such as the restoration of agricultural land to pre-existing quality, the handing back of land used temporarily to the original landowner and the non-replacement of capital items demolished, are set out in Volume 1.

3.3 Environmental baseline

Existing baseline

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

Soils and land resources

Topography and drainage

3.3.2 The main topographical features within the study area are described in detail in the landscape and visual assessment (Section 9). All water bodies within the study area fall within the Tame, Anker and Mease management catchment, which includes Coleshill Brook, the River Cole and the River Tame.

3.3.3 The River Tame flows from the west through Birmingham then turns and continues northwards to Tamworth and the Trent. The River Cole enters the arterial drainage system from the south-west and passes through Coleshill, crossing the valley in broad meanders, while the River Blythe drains the Arden region in the south. The 300m to 600m wide floodplains of the rivers are at 75m above Ordnance Datum (AOD), while the interfluves reach 75m to 100m AOD.

Geology and soil parent materials

3.3.4 The main geological features are described in detail in Land quality (Section 8) and summarised in Volume 5: Appendix AG-001-019.

3.3.5 Superficial Deposits intermittently underlie the areas traversed by the north chord and Birmingham spur lines, as well as the main line. The Proposed Scheme will pass through the following:

- granular material in the form of Glaciofluvial Deposits, which is generally present in areas of higher elevation with River Terrace Deposits occupying the river valley formed by the meandering course of the River Cole;
- Glaciolacustrine deposits, comprising predominantly cohesive material, which are present predominantly in areas of higher elevation; and Alluvium, comprising clay, silt, sand and gravel, which is present on the floodplain of the River Cole; and

- Head Deposits, comprising clay, silt, sand and gravel resulting from downslope movement, which are present around Green Lane and at the western end of the Birmingham spur.

3.3.6 Bedrock of the Mercia Mudstone Group underlies the whole of the Proposed Scheme in the study area. The Mercia Mudstone Group is described as red and green-grey, mudstones and subordinate siltstones with widespread thin beds of gypsum/anhydrite. Intermittent layers of sandstone are also present within the Mercia Mudstone, including the Arden Sandstone that outcrops towards the south of the study area.

Description and distribution of soil types

3.3.7 The characteristics of the soils are described by the Soil Survey of England and Wales[6] and shown on the National Soil Map[7]. The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5 and their distribution is shown on Map AG-02-019. (Volume 5: Agriculture, Forestry and Soils Map Book). The National Soil Map shows four principal soil types within this community forum area.

3.3.8 The Arrow association is mapped on the river terrace and glaciofluvial deposits; the dominant soil type has deep permeable sandy loams variably affected by groundwater with sands and gravels at depth; they experience slight seasonal waterlogging (Wetness Class (WC) II)[8] with lower areas of more prolonged waterlogging (WC III), but are potentially well drained (WC I) where they respond to drainage with suitable outfalls.

3.3.9 Much of the land contained within the junction 'triangle' and to its west has soils of the Brockhurst 1 association developed on mudstones and glaciolacustrine deposits; topsoils and upper subsoils tend to be medium clay loams or, sometimes, silty clay loams, but the slowly permeable clayey lower subsoils cause the dominant soils to be seasonally waterlogged (WC III).

3.3.10 Soils on the floodplains are mapped as Fladbury 1 and Midelney associations which comprise mainly stoneless clays and silty clays overlying peat locally in the Midelney; they are affected by groundwater and can be wet for long periods (WC III-IV).

Soil and land use interactions

Agricultural land quality

3.3.11 The principal soil/land use interaction in the study area is the quality of the agricultural land resource. The Agricultural Land Classification (ALC)[9] is based on the

[6] Soil Survey of England and Wales (1984), *Soils and their Use in Midland and Western England*, Bulletin 12.
[7] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*, National Soil Resources Institute, Cranfield University, UK.
[8] The Wetness Class (WC) of a soil is classified in Appendix II of Hodgson, J.M. (1977), The Soil Survey Field Handbook. Soil Survey and Land Research Centre, Technical Monograph No.5, according to the depth and duration of waterlogging in the soil profile and has six bands ranging from Wetness Class I (well drained) to Wetness Class VI (permanently waterlogged).
[9] Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.*

identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate and the site.

3.3.12 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. There are three distinct soil characteristics within the Coleshill Junction area. The main soil characteristics are light loamy textures, in some places stony, over sand and gravel on river terraces (Arrow association); poorly structured slowly permeable subsoils on mudstones (Brockhurst 1 association); and clayey, slowly permeable soils on floodplains (Midelney and Fladbury 1 associations).

3.3.13 Climate in this part of England does not in itself place any limitation upon land quality but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the land. The influence of climate on soil wetness is assessed by reference to median field capacity days (FCD) when the soil moisture deficit is zero, soil WC and topsoil texture. Droughtiness is determined by comparing the available water capacity of the soil, adjusted for the crop, with the moisture deficit for the locality for two crops; winter wheat and potatoes.

3.3.14 The local climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at two points within the community forum area, set out in Appendix 5: Appendix AG-001-019. There is only small variation across the CFA. FCDs range from 153 to 158 days, which is just above the average for lowland England (150 days). This is considered to be quite favourable for providing opportunities for agricultural cultivations and soil handling.

3.3.15 The assessment of site factors is primarily concerned with the way in which topography influences the use of agricultural machinery and, hence, the cropping potential of land. Gradient and micro relief, with complex changes of slope angle or direction over short distances, are not considered limiting. As described in Section 13, the main areas at risk from surface water flooding are associated with the River Cole, the River Tame and tributaries associated with these watercourses. However, historical records show there have been no incidents of surface water flooding either at the location of the route or within 1km of the route centre line. Agricultural land quality has not been downgraded as a result of an annual flood risk in this CFA.

3.3.16 The principal limiting factors determining agricultural land quality in this area are soil wetness and soil droughtiness. Overall, the assessment of agricultural land required for constructing and operating the Proposed Scheme indicates that there is a high percentage (71%) of agricultural land in the best and most versatile (BMV) category (i.e. ALC grades 1, 2 and 3a), divided between Grade 2 (17%) and Subgrade 3a (54%).

3.3.17 Grade 2 land occurs on some of the sandy loam soils of Arrow association where the soils are thicker over gravels and the droughtiness limitation due to a moderately small available water capacity is less severe.

3.3.18 Other sandy loams within the Arrow association which are shallower over sands and gravels, or have stony topsoils, or have a wetness limitation due to groundwater, are classed as Subgrade 3a. In the Brockhurst 1 association, soils have a slowly permeable subsoil. Where this occurs below 42 cm depth and where soil wetness is accompanied

by medium clay loam topsoil textures, the land is classed as Subgrade 3a. These features become the main limitation restricting the range of crops.

3.3.19 For the seasonally waterlogged soils of parts of the Brockhurst 1, Fladbury 1 and Midelney associations, where the slowly permeable layer is at shallow depth and/or the topsoil texture is a heavy clay loam or clay, the wetness/texture limitation is more restrictive and the safe working period shorter, the land is classed as Subgrade 3b.

3.3.20 Department for Environment, Food and Rural Affairs (Defra) mapping[10] shows that there is generally a moderate likelihood of encountering BMV land in the locality, which makes such land a resource of medium sensitivity in this study area.

Other soil interactions

3.3.21 Soil fulfils a number of functions and services for society in addition to those of food and biomass production which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[11] and The Natural Choice: securing the value of nature[12], and include:

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

3.3.22 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. The value and sensitivity of the resources are assessed in Section 7, Ecology.

3.3.23 The floodplains of the Rivers Cole and Tame represent the functional flood environment, as set out in (Section 13, Water resources and flood risk assessment). Flood Zone mapping shows there to be a significant risk of flooding in this area, with the soils functioning as water stores for flood attenuation, as well providing a habitat for ecology.

3.3.24 The presence of soil-borne cultural assets is detailed in Section 6. There is little evidence for archaeological remains that date to before the medieval period, although the remains of settlement dating to the prehistoric and Roman periods have been found north of Coleshill. It is possible that further remains exist within the area of land required for the construction and operation of the Proposed Scheme, notably in the

[10] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land.*
[11] Defra (2009), *Soil Strategy for England.*
[12] Defra (2011), *The Natural Choice: securing the value of nature.*

alluvial areas of the Rivers Cole and Tame. There are also undated cropmarks and earthworks.

Land use

Land use description

3.3.25 Local agricultural land use is dominated by arable crops based on wheat, barley and oil seed rape in rotation. Some holdings also grow potatoes. Arable cropping is common on heavy land of good to moderate quality in the Midlands, with spring-sown arable crops and potatoes possible on loamy soils, such as those in the south of the study area. Interspersing the arable farms are smaller areas given over to cattle and sheep.

3.3.26 A number of environmental designations potentially influence land use within the study area. The whole area is a nitrate vulnerable zone (NVZ), which is an area in which nitrate pollution is a potential problem. Statutory land management measures apply which seek to reduce nitrogen losses from agricultural sources to water. Some agricultural land is also subject to management prescriptions associated with the Environmental Stewardship Scheme which seeks either generally (the Entry Level Scheme) or specifically (the Higher Level Scheme) to retain and enhance the landscape and biodiversity qualities and features of farm land. Holdings which have land entered into an agri-environment scheme are identified in Table 6.

3.3.27 The areas of woodland include The Belt north of Coleshill Manor Office Campus, a plantation woodland belt adjacent to the Old Saltleians Rugby Football Club, and an area of secondary woodland and scrub Jack O'Watton industrial estate, between the A446 Lichfield Road and the Birmingham and Derby Line. Woodland covers 5% of land in the study area, compared to the national average of 10%.Therefore the sensitivity of the forestry land resource is high.

Number, type and size of holdings

3.3.28 There are 13 holdings in the study area, as set out in Table 6. Four are mainly livestock (cattle and sheep), three are mixed arable and livestock, and two are mainly arable. The remainder comprise two non-commercial equestrian holdings, and areas of grassland and woodland. The size of holdings range from under 1ha to 170ha. The larger farms are the mixed arable and livestock enterprises. The smallest holding is grassland for sheep and cattle. The woodland is 1.6ha in size. The boundaries of the holdings are shown on Maps AG-01-054 to AG-01-066 in Volume 5 along with the location of the main farm buildings. The larger farm businesses support a wide variety of diversified activities including kennels, commercial equestrian services, agricultural contracting and a residential let.

3.3.29 Table 6 sets out the sensitivity of individual holdings to change, which is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) and irrigation systems are less able to accommodate change and have a higher sensitivity. Smaller (less intensively used) units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 6: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA19/1 Land at Wheeley Moor Farm	Mixed arable and livestock	149.7	Equestrian (commercial); kennels; storage; car-boot	ELS	Medium
CFA19/2 Windmill Farm	Mixed arable and livestock	170.0	Farm shop	ELS	Medium
CFA19/3* Land around Coleshill Manor	Mainly arable	88.5	None	None	Medium
CFA19/5* Land off Gilson Drive and B4114 (Birmingham Road)	Grassland	4.6	None	ELS	Medium
CFA19/6* Three land parcels at Gilson	Mainly livestock (cattle and sheep)	55.1	None	ELS	Medium
CFA19/7 Land adjacent to Gilson	Mainly livestock (cattle and sheep)	35.0	None	ELS	Medium
CFA19/8 Newlands Farm	Mixed arable and livestock	93.1	Residential let; trading; storage; agricultural contracting	ELS	Medium
CFA19/9 Gilson Hall	Mainly livestock (cattle and sheep)	25.9	None	ELS	Medium
CFA19/10 Land lying on S of Vicarage Lane	Woodland	1.6	None	None	Medium
CFA19/11 Land lying on SW of Coleshill Road Water Orton	Mainly arable	7.3	None	None	Medium
CFA19/13* Land lying to the south of Gilson Road	Equestrian (non-commercial)	1.3	None	None	Low
CFA19/14* Land adjoin Grimstock Country House Hotel	Mainly livestock (cattle and sheep)	0.8	None	None	Medium
CFA19/15 Land lying to the south of Gilson Road	Equestrian (non-commercial)	1.9	None	None	Low

* No farm impact assessment interview conducted; data estimated.

Future baseline

Construction (2017)

3.3.30 No committed developments have been identified in this area that will materially alter the baseline conditions in 2017 for agriculture, forestry and soils.

3.3.31 The future of agri-environment schemes is uncertain at present due to on-going reform of the Common Agricultural Policy. The majority of schemes seem likely to cease over the next two to three years and replacements are uncertain. Whilst this will remove a level of support from the agricultural industry that has been used to offset

some of the costs incurred in managing land in an environmentally responsible manner, it is unlikely to materially alter the way agricultural land is managed in the future. Whilst some field margins may be cropped closer to hedgerows and stocking rates may increase in some locations, the stocking and cropping baseline set out in the previous section is unlikely to change significantly.

Operation (2026)

3.3.32 No committed developments have been identified in the Coleshill Junction area that will materially alter the baseline conditions in 2026 for agriculture, forestry and soils.

3.4 Effects arising during construction

Avoidance and mitigation measures

3.4.1 During the development of the design, the following measures have been incorporated to avoid or mitigate impacts on agriculture, forestry or soils during construction:

- overbridges at Attleboro Lane, B4117 Gilson Road and B4114 Birmingham Road have sufficient clearance to allow their use by agricultural traffic; and
- viaducts, namely the M6 motorway north, Coleshill east and west and M42-M6 Motorway Link structures are of sufficient height and width to allow the movement of agricultural machinery underneath.

3.4.2 In addition, there is a need to avoid or reduce environmental impacts to soils during construction. It is an essential element of the construction process that the soil resources from the areas required temporarily and permanently are stripped and stored so that land required temporarily for construction purposes which is currently in agricultural use can be returned to that use, where agreed, and to its pre-existing agricultural condition.

3.4.3 Subject to the adoption of good practice techniques in handling, storing and reinstating soils on land where agricultural or forestry uses are to be resumed, there will be no reduction in the long term capability which would downgrade the quality of disturbed land. Some land with heavier textured soils may require careful management during the aftercare period to ensure this outcome.

3.4.4 Compliance with the CoCP will avoid or reduce environmental impacts during construction. Of particular relevance to agriculture, forestry and soils are the following measures (see Volume 5: Appendix CT-003-000/1):

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

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

Assessment of impacts and effects

3.4.5 The cessation of existing land uses will be required in the area to construct and operate the Proposed Scheme. This includes not only the land on which permanent works will be sited, but also that required temporarily to facilitate the delivery of those permanent works.

3.4.6 All of the land required to implement the Proposed Scheme will, therefore, be affected during the construction phase. The land required for the construction and operation of the Proposed Scheme will, in places, sever and fragment individual fields and operational units of agricultural and forestry land. This will result in potential effects associated with the ability of affected agricultural interests to continue to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The scheme design seeks, however, to minimise this structural disruption, and to incorporate inaccessible severed land as part of environmental mitigation works. Structural disruption is disruption to the existing structure of farm holdings principally from severance and the loss of key farm infrastructure.

3.4.7 The timing and duration of various construction elements are set out in Section 2.3. Where land is restored to agricultural use it will be subject to a further period of five years of managed aftercare to ensure stabilisation of the soil structure, where appropriate.

3.4.8 Land used for the construction of the Proposed Scheme will fall into a number of categories when work is complete, as follows:

- part of the operational railway and kept under the control of the operator;
- returned to agricultural use (with restoration management);
- used for drainage or flood compensation which may also retain some agricultural use; or
- used for ecological mitigation.

Temporary effects during construction

Impacts on agricultural land

3.4.9 During the construction phase, the total area of agricultural land used will be 263.9ha as shown in Table 7. Of this total, 77.4ha will be restored and available for agricultural use following construction.

Table 7: Agricultural land required for the construction of the Proposed Scheme

Agricultural land quality	Area required (ha)	Percentage of agricultural land	Area to be restored (ha)
Grade 1	0.0	0%	0.0
Grade 2	44.9	17%	5.1
Subgrade 3a	143.3	54%	47.5
BMV SUBTOTAL	188.2	71%	52.6
Subgrade 3b	75.7	29%	24.8
Grade 4	0.0	0%	0.0
Grade 5	0.0	0%	0.0
TOTAL AGRICULTURAL LAND	263.9	100%	77.4

3.4.10 The disturbance during construction to 188.2ha of land of BMV quality is assessed as an impact of high magnitude, comprising more than 60% of the overall agricultural land requirement. Considering BMV land in this local area is a receptor of medium sensitivity, the effect on BMV land is assessed as a major/moderate adverse effect of the Proposed Scheme, which is significant.

3.4.11 Following completion of the construction project, all temporary facilities will be removed and the topsoil and subsoil will be reinstated in accordance with the agreed end use for the land. Overall, it is estimated that there will not be any significant surplus of topsoil or subsoil material arising from the Proposed Scheme in the area.

Nature of the soil to be disturbed

3.4.12 The sensitivity of the soils is greatest in relation to those which will be disturbed by construction activity and returned to an agricultural or other rural land-based use upon completion of the Proposed Scheme. The quantum of each disturbed soil type is less important than the sensitivity of particular soils to the effects of handling during construction and reinstatement of land.

3.4.13 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[13]. These principles will be followed throughout the construction period. The heavier (clayey and silty) Brockhurst 1, Fladbury 1 and Midelney associations are least able to retain their structure when moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing which could impede successful reinstatement.

Impacts on holdings

3.4.14 Land may be required from holdings both permanently and temporarily (i.e. the latter just during the construction period). In most cases, the temporary and permanent land requirement will occur simultaneously at the start of the construction period and it is the combined effect of both that will have the most impact on the holding. In due course some agricultural land will be restored and the impact on individual holdings will reduce, but the following assessment focuses on the combined effect during the construction phase. The residual permanent effects are described at the end of this section.

3.4.15 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 8. This table shows the total area of land required on a particular holding in absolute terms and as a percentage of the total area farmed. It also shows the area of land that will be returned to the holding following the construction period. The degree of impact is based on the proportion of the holding required rather than the absolute area of land. The holding/reference name provides a unique identifier and relates to map series AG-01 and Appendix AG-001-019, Volume 5.

Table 8: Summary of temporary effects on holdings during construction

Holding reference/name	Total area required	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA19-1 Land at Wheeley Moor Farm	60.2ha – 40% High	Medium	Medium	Major/moderate adverse	23.9ha
CFA19-2 Windmill Farm	39.2ha – 23% High	Medium	Low	Major/moderate adverse	4.8ha
CFA19-3* Land around Coleshill Manor	29.4ha – 33% High	Low	Low	Major/moderate adverse	3.7ha
CFA19-5* Land off Gilson Drive and B4114 (Birmingham Road)	3.3ha – 72% High	Negligible	Low	Major/moderate adverse	1.9ha
CFA19-6* Three land parcels at Gilson	14.4ha – 26% High	Negligible	Low	Major/moderate adverse	2.9ha
CFA19-7 Land adjacent to Gilson	20.2ha – 58% High	Negligible	Low	Major/moderate adverse	11.7ha

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

Holding reference/name	Total area required	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA19-8 Newlands Farm	78.4ha – 84% High	High	Medium	Major/moderate adverse	32.6ha
CFA19-9 Gilson Hall	26.2ha – 101% High	Negligible	Low	Major/moderate adverse	12.1ha
CFA19-10 Land lying on S of Vicarage Lane	1.5ha – 92% High	Negligible	Negligible	Major/moderate adverse	0.0ha
CFA19-11 Land lying on SW of Coleshill Road Water Orton	7.3ha – 100% High	Negligible	Negligible	Major/moderate adverse	0.0ha
CFA19-13* Land lying to the south of Gilson Road	0.4ha – 32% High	Negligible	Low	Moderate adverse	0.4ha
CFA19-14* Land adjoin Grimstock Country House Hotel	0.1ha – 9% Low	Negligible	Low	Minor adverse	0.1ha
CFA19-15* Land lying to the south of Gilson Road	1.5ha – 82% High	Negligible	Medium	Moderate adverse	0.1ha

* No farm impact assessment interview conducted; data estimated.

3.4.16 The effects of severance during construction are judged on the ease and availability of access to severed land. For the most part these will be the same during and post construction but occasionally they will differ between the two phases. The disruptive effects, principally of construction noise and dust, are assessed according to their effects on land uses and enterprises. Full details of the nature and significance of effects are set out in Volume 5: Appendix AG-001-019. Where the total sum of the land required by ALC grade (as shown in Table 7) differs from the total sum of the land required by holding (as shown in Table 8), the difference is because some holdings are affected in more than one CFA and some holdings include non-agricultural land. The combined impact on holdings is reported once in the CFA report where the main holding is located.

3.4.17 Overall, it is considered that 12 holdings will experience major or moderate temporary adverse effects during construction, which are significant. All but one of these enterprises experiences a significant effect because a high proportion of the holding is required for construction.

3.4.18 The close proximity to the Proposed Scheme of paddocks and stables at Wheeley Moor Farm (CFA19/1) and residences and stock at Newlands Farm (CFA19/8) to construction is considered to make both these holdings potentially sensitive to construction noise, but this will be controlled by measures in the draft CoCP. No farm enterprises which are sensitive to dust generated by construction have been identified near to the Proposed Scheme.

Cumulative effects

3.4.19 No significant cumulative effects on agriculture, forestry and soils have been identified for the construction of the Proposed Scheme.

Permanent effects from construction

Impacts on agricultural and forestry land

3.4.20 Land used for the construction of the Proposed Scheme will fall into a number of categories when work is complete, as follows:

- part of the operational railway and kept under the control of the operator;
- returned to agricultural use (with restoration management);
- used for drainage or flood compensation which may also retain some agricultural use; or
- used for ecological and landscape mitigation.

3.4.21 Following construction and restoration, the area of agricultural land that will remain permanently required will be 186.5ha, as shown in Table 9.

Table 9: Agricultural and forestry land required permanently

Agricultural land quality	Total area required (ha)	Percentage of agricultural land
Grade 1	0.0	0%
Grade 2	39.7	21%
Subgrade 3a	95.9	51%
BMV SUBTOTAL	135.6	73%
Subgrade 3b	50.9	27%
Grade 4	0.0	0%
Grade 5	0.0	0%
TOTAL AGRICULTURAL LAND	186.5	100%
Forestry land	10.4	n/a

3.4.22 The permanent loss of 135.6ha of land of BMV quality is assessed as an impact of high magnitude, comprising more than 60% of the overall agricultural land requirement. As stated previously, BMV land in this area is a receptor of medium sensitivity so that the permanent effect on BMV land is assessed as a major/moderate adverse effect of the Proposed Scheme, which is significant.

3.4.23 Areas proposed for ecological and landscape mitigation, which will be removed from mainstream agricultural production, includes species-rich wet grassland near Coleshill East Viaduct (164-L3), woodland and scrub planting near the River Cole East Viaduct (161-L6), great crested newt habitat and provision of ponds near Water Orton, and grassland and provision of ponds near the B4118 Water Orton Road Overbridge (165-S1).

3.4.24 Areas engineered to provide additional flood compensation capacity will be subject to marginal downgrading in land quality and includes agricultural land adjacent to the River Cole near the M42 Coleshill South Viaduct (161-L3) and adjacent to the River Tame, near the River Tame West Viaduct (164-L3).

3.4.25 Areas of woodland that will be permanently affected includes The Belt north of Coleshill Manor Office Campus, a plantation woodland belt adjacent to the Old Saltleians Rugby Football Club, and an area of secondary woodland and scrub at Jack O'Watton industrial estate, between the A446 Lichfield Road and the Birmingham and Derby Line. Overall, the total amount of forestry land required to implement the Proposed Scheme will be 10.4ha, out of a total permanent land requirement of 237.1 ha (4%). The extent of the forest cover in the study area is less than the average national woodland cover (i.e. high resource sensitivity) and so, quantitatively, the loss of this woodland (i.e. low impact magnitude) is considered as a moderate adverse effect, which is significant. The qualitative assessment of loss is addressed in other relevant sections.

Impacts on holdings

3.4.26 The permanent residual effects from the construction of the Proposed Scheme on individual agricultural and related interests is summarised in Table 10. The land required column refers to the area of land permanently required to operate the Proposed Scheme (in absolute terms and as a percentage of the overall area farmed). The degree of impact is based on the proportion of land required. The effects of severance are judged on the ease and availability of access to severed land once construction is completed and the impact on farm infrastructure refers mainly to the loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises. Full details of the nature and scale of effects are set out in Volume 5: Appendix AG-001-019.

Table 10: Summary of permanent effects on holdings from construction

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA19-1 Land at Wheeley Moor Farm	36.2ha – 24% High	Medium	Low	Major/Moderate Adverse
CFA19-2 Windmill Farm	34.4ha – 20% High	Medium	High	Major/Moderate Adverse
CFA19-3 Land around Coleshill Manor	25.7ha – 29% High	Low	Negligible	Major/Moderate Adverse
CFA19-5 Land off Gilson Drive and B4114 (Birmingham Road)	1.5ha – 31% High	Negligible	Low	Major/Moderate Adverse
CFA19-6 Three land parcels at Gilson	11.5ha – 21% High	Negligible	Low	Major/Moderate Adverse
CFA19-7 Land adjacent to Gilson	8.6ha – 25% High	Medium	Negligible	Major/Moderate Adverse
CFA19-8 Newlands Farm	45.8ha – 49% High	Medium	Medium	Major/Moderate Adverse
CFA19-9 Gilson Hall	14.0ha – 54% High	Negligible	Medium	Major/Moderate Adverse
CFA19-10 Land lying on S of Vicarage Lane	1.5ha – 92% High	Negligible	Negligible	Major/Moderate Adverse

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA19-11 Land lying on SW of Coleshill Road Water Orton	7.3ha – 100% High	Negligible	Negligible	Major/Moderate Adverse
CFA19-13 Land lying to the south of Gilson Road	0.0ha – 0% Negligible	Negligible	Negligible	Negligible
CFA19-14 Land adjoin Grimstock Country House Hotel	0.0ha – 1% Negligible	Negligible	Negligible	Negligible
CFA19-15 Land lying to the south of Gilson Road	1.5ha – 79% High	Negligible	Negligible	Moderate Adverse

* No farm impact assessment interview conducted; data estimated.

3.4.27 Overall, it is likely that 11 holdings will experience major or moderate permanent adverse effects from the construction of the Proposed Scheme, which are significant. These effects principally result from a high proportion of the enterprise being required by the Proposed Scheme. A total of four holdings are likely to be rendered unviable for agricultural use: Newlands Farm (CFA19/8) and land lying to the south of Vicarage Lane, to the south-west of Coleshill Road Water Orton and the South of Gilson Road (CFA19/10, CFA19/11 and CFA19/15). Agricultural buildings will need to be demolished at Windmill and Newlands Farms (CFA19/2, CFA19/8).

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

Cumulative effects

3.4.29 No significant cumulative effects on agriculture, forestry and soils have been identified for the construction of the Proposed Scheme.

Other mitigation measures

3.4.30 No other mitigation measures for agriculture, forestry and soil are necessary for this CFA.

Summary of likely residual significant effects

3.4.31 Once the construction process is complete and land required temporarily has been restored, the residual permanent loss of agricultural land will be 186.5ha, of which 135.6ha is BMV. This is assessed as a major/moderate adverse residual effect which is significant.

3.4.32 A total of 11 holdings have been identified that will experience major or moderate permanent adverse effects, which are significant. Of these four are unlikely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects to not significant, if chosen.

3.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

3.5.3 The potential for significant effects on sensitive livestock receptors from noise has been assessed. No likely significant effects have been identified.

3.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is not only a consequence of the management of the highway and railway land, but also of the readiness of weed spread onto such land from adjoining land, which could be exacerbated with the effects of climate change. The presence of noxious weeds, ragwort in particular, will be controlled through the adoption of an appropriate management regime which identifies and remedies areas of weed growth which might threaten adjoining agricultural interests.

Summary of likely residual significant effects

3.5.5 No residual significant effects on agriculture, forestry and soils have been identified for the operation of the Proposed Scheme.

4 Air quality

4.1 Introduction

4.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme, covering nitrogen dioxide (NO_2), fine particulate matter (PM_{10} and $PM_{2.5}$)[14] and dust.

4.1.2 With regard to air quality the main issues are anticipated to result from emissions of dust from the demolition, the construction of new structures and earthworks and possible transfer of dust and mud on to public highways from vehicles travelling to and from construction areas. In addition, there may be changes in concentrations of NO_2 and particulate matter due to changes in road traffic emissions during the construction and operation of the Proposed Scheme.

4.1.3 Detailed reports on the air quality data and assessments for this area, as well as relevant maps are contained within Volume 5. These include:

- Appendix AQ-001-019;
- Volume 5: Map Book – Air quality, Map AQ-01-019; and
- Volume 5: Map Book – Air quality, Map AQ-02-019.

4.1.4 Maps showing the location of the key environmental features can be found in the Volume 2: CFA19 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the air quality assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1), the SMR Addendum (Volume 5: Appendix CT-001-000/2) and appendices presented in Volume 5: Appendix AQ-001-019.

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

4.2.3 The assessment of impacts arising from construction dust emissions has been undertaken using the methodology based on that produced by the Institute of Air Quality Management (IAQM)[15]. It is important to note that this methodology provides a means of assessing the scale and significance of effects that is partly dependent on the approximate number of receptors within close proximity to the dust-generating activities. In doing so, it assigns a lower scale of effect to cases where the number of

[14] $PM_{2.5}$ and PM_{10} describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 micrometres in diameter.
[15] Institute of Air Quality Management (2012), *Guidance on the assessment of the impacts of construction on air quality and the determination of their significance*.

properties is small, e.g. fewer than ten properties. Thus, a single property cannot experience a 'significant effect' as defined by this methodology. The assessment presented here reaches a conclusion that incorporates this concept of significance being proportional to the number of people affected. However, in cases where less than 10 properties are within 20m of the construction activity, it will be the case that mitigation in accordance with the CoCP will be applied.

4.2.4 The assessment of construction traffic impacts has used traffic data that is based on the highest predicted monthly flows throughout the construction period (2017-2026). However, the assessment assumes 2017 vehicle emission rates and 2017 background pollutant concentrations. The reason for this is because both pollutant emissions from exhausts and background pollutant concentrations are expected to reduce year by year as a result of vehicle emission controls, and so the year 2017 represents the worst case for the assessment. Furthermore, it has been assumed that the changes in construction traffic would occur for the whole year. In many cases, this represents a pessimistic assumption as the duration of the proposed construction works may be much shorter.

4.3 Environmental baseline

Existing baseline

4.3.1 The environmental baseline reported in this section represents the environmental conditions identified within the study area. The main sources of existing air pollution in the Coleshill Junction area are road traffic emissions from the M42, M6 and M6 Toll.

4.3.2 Estimates for NO_2, PM10 and PM2.5 concentrations have been obtained from UK-wide modelled pollution maps for 2012, published by the Department for Environment and Rural Affairs (Defra)[16] in 2010. These data provide estimates of background concentrations of NO_2, PM10 and PM2.5 for 1km grid squares across the UK.

4.3.3 The Coleshill Junction area lies within the West Midlands region, within the boundaries of the administrative area of Warwickshire County Council (WCC) and the local authority areas of North Warwickshire Borough Council (NWBC) and Solihull Metropolitan Borough Council (SMBC).

4.3.4 One continuous air quality monitoring site was operating until 2012 within the Coleshill Junction area. This was a roadside site located at the Highways Agency and Warwickshire maintenance depot on Coleshill Heath Road, 580m to the east of the centre line of the Proposed Scheme. Annual mean NO_2 concentrations are measured by NWBC using a network of 17 passive diffusion tubes. Six diffusion tubes are located within the Coleshill Junction area: three in the town of Coleshill, one in Water Orton, one close to the B4117 Gilson Road in Gilson Village and one at Coleshill Cottages off the A446 Lichfield Road. Diffusion tube monitoring is undertaken by SMBC at five locations, but none are within the Coleshill Junction area. Further details of the

[16] Defra; 2010 Based Background Maps for NOx, NO_2, PM10 and PM2.5; http://laqm.defra.gov.uk/maps/maps2010.html; Accessed: 30 July 2013.

monitoring sites and the five year trends in concentrations are available in Volume 5: Appendix AQ-001-019.

4.3.5 The continuous monitoring site at the Highways Agency and Warwickshire maintenance depot on Coleshill Heath Road is considered to be representative of air quality at isolated properties that lie close to the motorways. In 2011, the most recent year of data, concentrations were within the relevant air quality standard thresholds. The diffusion tube sites are representative of the built up areas of Coleshill, Gilson and Water Orton. Data for these sites indicates than concentrations were within the relevant air quality standard thresholds in these areas for the 2008 to 2012 period. The Defra background concentrations maps have been used to characterise the baseline air quality for the rural areas along the Proposed Scheme within the Coleshill Junction area. These maps indicate that average background concentrations in the rural parts of the Coleshill Junction area are less than the relevant air quality standards.

4.3.6 There are no AQMAs within the Coleshill Junction area.

4.3.7 Human receptors that could potentially be affected by changes in air quality as a result of the Proposed Scheme have been identified. Air quality at these receptors could potentially be affected, due to their proximity to construction activities, to roads with vehicle flows that may change or to roads that will be subject to realignment during the construction or operational phases of the Proposed Scheme. These locations are residential properties at; New Cottages, B4114 Birmingham Road, Coleshill; on Gilson Drive, Coleshill; on B4117 Gilson Road west of Coleshill; on B4117 Gilson Road in Gilson; the A446 Lichfield Road, Coleshill; on the B4117 Watton Lane, Water Orton; and on Attleboro Lane, Water Orton.

4.3.8 There are no ecological receptors with statutory designations within the Coleshill Junction area. There are four local wildlife sites (LWS) within the Coleshill Junction area that could potentially be affected by changes in air quality as a result of the Proposed Scheme. These are Coleshill Hall Farm LWS, south-east of Coleshill Hall Farm and the B4114 Birmingham Road; Wheeley Moor Farm Meadows LWS, south-west of Coleshill Hall Farm and the B4114 Birmingham Road; Coleshill Park Belt LWS, north and west of Coleshill Manor Office Campus between the M6 and the M42, and Coleshill Sewage Works Grassland LWS, between the M42 and the sewage works adjacent to the A446 Lichfield Road, Water Orton. Further details of these sites are provided under the ecology topic in Section 7.

Future baseline

4.3.9 Section 2.1, Volume 5: Appendix CT-004-000 and Volume 5: Map Book – Cross Topic Maps, Maps CT-13-054, CT-13-055 and CT-13-066 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the future baseline for the assessment of effects from the construction and operation of the Proposed Scheme. In this area, there are no 'committed developments' that are considered to introduce new receptors requiring air quality assessment.

4.3.10 The data used for the air quality assessment take account of predicted changes in traffic, which are derived from a combination of national traffic growth factors and consideration of major locally consented schemes, as described in Section 12.3.

Construction (2017)

4.3.11 Future background pollutant concentrations have been sourced from Defra background maps for 2017, which predict NO2 and PM10 levels in 2017 to be lower than in the 2012 baseline.

Operation (2026)

4.3.12 Future background pollutant concentrations have been sourced from Defra background maps for 2026, which predict NO2 and PM10 levels in 2026 to be lower than in the 2012 baseline.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the CoCP, where appropriate. The draft CoCP (Volume 5: Appendix CT-003-000) includes a range of mitigation measures that are accepted by the IAQM as being suitable to reduce impacts to as low a level as reasonably practicable. It also makes provision for the preparation of Local Environmental Management Plans (LEMP) which will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

4.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP (Volume 5: Appendix CT-003-000) will be implemented. These include:

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

Assessment of impacts and effects

Temporary effects

4.4.3 Impacts from the construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for human receptors sensitive to dust and exposure to NO_2 and PM10, as well as ecological receptors sensitive to dust.

4.4.4 An assessment of construction traffic emissions has been undertaken for two scenarios: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario.

4.4.5 In the Coleshill Junction area, dust-generating activities will comprise demolition in several locations including: near New Cottages, the B4114 Birmingham Road; off Manor Drive, Gilson; off the A446 Lichfield Road, Water Orton; and Attleboro Lane, Water Orton; and the construction of new structures and earthworks, as well as possible transfer of dust and mud deposited onto public highways from vehicles travelling to and from construction areas.

4.4.6 A construction dust assessment was undertaken for receptors at seven locations where residential properties are present and four LWS, due to their close proximity to the dust-generating activities associated with the Proposed Scheme. The residential locations are; New Cottages on the B4114 Birmingham Road, Coleshill; on Gilson Drive, Coleshill; on Gilson Road, west of Coleshill; on Gilson Road in Gilson; on Chattle Hill, off the A446 Lichfield Road, Coleshill; on the B4117 Watton Lane, Water Orton and on Attleboro Lane, Water Orton. The LWS are: Coleshill Hall Farm LWS; Wheeley Moor Farm Meadows LWS; Coleshill Park Belt LWS; and Coleshill Sewage Works Grassland LWS.

4.4.7 Given the application of the mitigation measures contained within the draft CoCP, the construction dust assessment determined that for the locations where residential properties are present, the magnitude of impact will be slight adverse at Gilson Road, west of Coleshill; Gilson Road in Gilson; B4117 Watton Lane, Water Orton and Attleboro Lane, Water Orton due to the presence of residential properties within 20m of dust-generating activities. The magnitude of impact will be negligible at the other locations, where residential properties are present, which lie beyond 20m from construction activities. For the LWS, the magnitude of impact will be negligible, as the sites are only of local importance, despite being within 20m of dust-generating construction activities.

4.4.8 Overall, the construction dust assessment has determined that air quality effects will not be significant. The basis for this conclusion is presented in full at Volume 5: Appendix AQ-001-019.

4.4.9 The movement of excavated material along the line of the Proposed Scheme is not anticipated to have significant effects on local air quality, as the background air quality is good. There are no receptors very close to the Proposed Scheme and the predicted vehicle emissions are very small.

4.4.10 Construction activity could also affect local air quality through the emissions associated with additional traffic generated on roads as a result of construction traffic

routes, temporary road realignments and changes to traffic patterns arising from temporary road diversions. Screening was undertaken to identify locations requiring assessment.

4.4.11 Two locations within the Coleshill Junction area met the criteria for assessment of change in traffic emissions during the construction phase. These locations are the B4114 Birmingham Road, Coleshill; and the A446 Lichfield Road, Coleshill. At both of these locations, the increase in construction traffic was sufficient to require an assessment of changes in concentrations at receptors around these roads. This assessment found that the magnitude of impact will be slight adverse for NO_2 at New Cottages on the B4114 Birmingham Road and at properties along the A446 Lichfield Road. For PM10 the magnitude of impact will be negligible for all receptors assessed.

4.4.12 The effect on air quality due to construction traffic emissions will not be significant. The basis for this conclusion is presented in full at Volume 5: Appendix AQ-001-019.

Permanent effects

4.4.13 There are no permanent effects anticipated to arise during construction of the Proposed Scheme.

Cumulative effects

4.4.14 There are no cumulative effects anticipated to arise during construction of the Proposed Scheme.

Other mitigation measures

4.4.15 No other mitigation measures during construction are proposed in relation to air quality in this area.

Summary of likely residual significant effects

4.4.16 The methods outlined within the draft CoCP to control and manage potential air quality effects are considered effective in this location and no residual significant effects are considered likely.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No mitigation measures are proposed during operation in relation to air quality in this area.

Assessment of impacts and effects

4.5.2 There are no direct atmospheric emissions from the operation of trains that will cause an impact on air quality; these have therefore not been assessed. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

4.5.3 The assessment of operational traffic emissions has been undertaken for two scenarios in the operation year 2026: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario. The traffic data includes the additional traffic from future committed developments.

4.5.4 Traffic data in the Coleshill Junction area have been screened to identify roads that required an assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2026.

4.5.5 Two locations within the Coleshill Junction area met the criteria for an assessment of emissions from traffic during the operational stage, following completion of the Proposed Scheme. These locations are the B4117 Gilson Road, in Gilson, due to permanent realignment of the B4117 Gilson Road, and Attleboro Lane, Water Orton, due to permanent realignment of Attleboro Lane. The assessment at receptors around these roads found that the magnitude of impact will be negligible at all receptors assessed for NO_2 and PM_{10}.

4.5.6 Therefore, the effect on air quality due to traffic following completion of the Proposed Scheme will not be significant. The basis for this conclusion is presented in full at Volume 5: Appendix AQ-001-019.

Cumulative effects

4.5.7 There are no cumulative effects anticipated to arise during operation of the Proposed Scheme.

Other mitigation measures

4.5.8 No other mitigation measures are proposed in relation to air quality in this area during operation.

Summary of likely residual significant effects

4.5.9 No residual significant effects are anticipated for receptors as a consequence of changes to air quality in this area during operation of the Proposed Scheme.

5 Community

5.1 Introduction

5.1.1 This section reports the impacts and likely significant effects on local communities resulting from the construction and operation of the Proposed Scheme.

5.1.2 Key issues concerning the community assessment for this study area comprise:

- the demolition of a number of residential properties at Coleshill and at Water Orton;
- the impacts on the amenity of residents living close to the Proposed Scheme, temporary construction compounds, work sites or construction traffic routes, particularly those at Gilson and on the southern edge of Water Orton;
- the isolation impacts on the residents of Gilson due principally to the hamlet being effectively islanded by the Proposed Scheme main line and Birmingham spur;
- the isolation impacts on the residents of Water Orton due principally to the anticipated delay caused by road works associated with construction activities;
- multiple impacts on Water Orton Primary School; and
- the loss of land from the Old Saltleians Rugby Football Club (RFC).

5.1.3 Further details of the community assessments undertaken for resources within the CFA are contained in Volume 5: Appendix CM-001-019.

5.1.4 Community assessment maps are provided in Volume 5: Community Map Book, series CM-01-112 to CM-01-113.

5.1.5 The assessment draws on information gathered from a combination of desktop studies, site surveys and through engagement with local organisations, including Warwickshire County Council, Water Orton Primary School, Water Orton Parish Council and Coleshill Town Council.

5.2 Scope, assumptions and limitations

5.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

5.2.2 In this area there are a number of individual and small groups of residential properties which fall within the land identified as potentially required for construction. However, it is envisaged that construction activities will not require land from their curtilages. These properties are nos. 1-3 New Cottages on the B4114 Birmingham Road; and The Cottage on B4117 Gilson Road

5.2.3 Construction worker accommodation will be located at Coleshill Heath Road, to the south of Coleshill. Construction worker impacts on community resources are considered at a route-wide level in Appendix CM-002-000. The assessment takes

account of the number of workers, the type and location of accommodation, working hours, facilities provided on construction compound, experience from other large projects (such as HS1) and the measures contained in the draft CoCP. On this basis it is concluded that there will be no significant effects associated with construction worker accommodation.

5.3 Environmental baseline

Existing baseline

5.3.1 Baseline data on community resources was collected up to 1km from the centre line of the Proposed Scheme and, additionally, up to 250m from the boundary of land required for construction.

5.3.2 The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme, together with a wider corridor within which receptors or resources could be affected by a combination of residual significant effects, such as noise, vibration, construction dust, poor air quality and visual intrusion. In addition, the study area has regard to the proposed routeing of construction traffic and takes account of catchment areas for community facilities which could be affected where crossed by the Proposed Scheme. Overall, the study area is taken as the area of land which encompasses the likely significant effects of the Proposed Scheme. The focus of the study area is around Gilson and the edge of the settlements of Coleshill and Water Orton.

Coleshill

5.3.3 Coleshill is a modest sized market town which lies to the east of the route of the Proposed Scheme. It has a range of local shopping, healthcare, schooling, banking and leisure facilities. Whilst the centre of Coleshill is beyond the study area, the boundary of land required for the construction and operation of the Proposed Scheme extends to include land at the very north of Coleshill, to the west of the industrial estate at Coleshill Parkway. Properties on the western edge of the town, particularly in the Chattle Hill area, just off the A446 Lichfield Road, have also been included within the study area given their proximity to the Proposed Scheme.

5.3.4 The B4114 Birmingham Road to the west of Coleshill is the main highway linking the centre of the town with the outer edge of Birmingham at Fordbridge to the west. This road is crossed by the Proposed Scheme and a number of properties along this road are either within or close to the boundary of land required for construction. The Woodlands Cemetery and Crematorium is also located on the B4114 Birmingham Road to the west of the Proposed Scheme. The site, which is owned and managed by Solihull Metropolitan Borough Council (SMBC), serves the requirements of both Solihull Borough and Coleshill.

5.3.5 The catchment areas for some community facilities at Coleshill serve a relatively wide rural hinterland, extending some distance beyond the town itself. The Coleshill School (secondary school) catchment extends to include Wishaw and Lea Marston to the north (in the neighbouring Curdworth to Middleton area (CFA20)) and Water Orton and Gilson to the north-west.

Gilson

5.3.6 Gilson is a small residential hamlet that lies approximately 1km to the north-west of Coleshill town centre. The hamlet, which comprises of approximately 50 residential properties, is surrounded by the boundary of land required for the construction and operation of the Proposed Scheme. The Grimstock Country House Hotel has a public bar, restaurant and function room – it lies partly within the area required for the construction and operation of the Proposed Scheme. Gilson has no essential services and facilities and residents are reliant upon neighbouring settlements for schools, convenience shopping and healthcare.

5.3.7 Gilson falls within the priority catchment areas for infant, primary and secondary schools at Coleshill. The Old Saltleians Rugby Football Club (RFC) is situated on the northern edge of the hamlet and falls mostly within the area of land required for the construction and operation of the Proposed Scheme. The Club is a well-used facility with over 100 playing members drawn from the local area and the edge of Birmingham. There are allotment gardens on the south-east edge of the hamlet, close to the junction between the B4117 Gilson Road and the A446 Lichfield Road. These allotments are owned and managed by Coleshill Town Council, but for the purposes of this report are described as being geographically located within the Gilson area. The allotments are fully subscribed and a waiting list is maintained.

Water Orton

5.3.8 Water Orton is located to the north and west of the Proposed Scheme, bounded to the south by the M6 and the east by the M42 and M6 Toll. The village has a good range of facilities including a small parade of shops, a doctor's surgery, a library, several community halls, two churches and a primary school. The centre of Water Orton lies outside of the study area due to its distance from the Proposed Scheme. Water Orton does not have a secondary school and the village falls within the priority catchment area for the Coleshill School, which is located about 3.5km away, on the southern edge of Coleshill. There are also a number of public open spaces on the south side of Water Orton, including Water Orton Green at Attleboro Lane, Water Orton Bowls Club, Water Orton and District Tennis Club and Vicarage Lane playing field, all on the southern edge of the settlement. These spaces lie outside the study area, but serve the local community.

5.3.9 Properties and facilities on the south side of the village, including Water Orton Primary School, at Vicarage Lane and residential properties at Attleboro Lane are included within the study area and some fall wholly or partly within the boundary of land required for the construction and operation of the Proposed Scheme. The Water Orton Primary School has about 315 pupils and its priority catchment area includes the entire village. The priority catchment also extends just to the east of the M42, to include a small number of properties either side of the A446 Lichfield Road to the north of Coleshill. Facilities at the school, including its playing fields, are also hired on evenings, weekends and during holiday periods by other community groups and organisations. The playing fields at the school fall partly within the boundary of land required for the Proposed Scheme. There is also a day nursery that operates from the site, The Tree House of Water Orton, which is currently attended by about 170 children.

Future baseline

Construction (2017)

5.3.10 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017.

5.3.11 Within the study area, little change is anticipated in the baseline conditions described above, with one very minor exception at Gilson, where permission has been granted for the change of use of an ancillary residential unit at Gilson Cottage to a separate dwelling (Planning Ref: PAP/2012/0592).

Operation (2026)

5.3.12 The review of future baseline conditions has not identified any additional committed developments within the study area that will be completed by the year of operation.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 The following measures or changes have been incorporated into the scheme design as part of the design development process to avoid or reduce the environmental impacts arising during construction:

- moving the alignment of the railway (north chord) further away from the southern edge of Water Orton compared with the January 2012 announced scheme, to reduce the effects on residents of this area;
- locating the main construction compound for the Coleshill Junction works away from the residential areas of Coleshill, Gilson and Water Orton, on a site contained by existing motorway infrastructure at M42 junction 7a;
- establishing temporary construction haul routes along the line of the route, to reduce the amount of material that needs to be moved along public highways and, in turn, the amount of additional HGV construction traffic on the network;
- providing for temporary realignment of highways where necessary and practicable to limit disruption to travel and access to community facilities and residential properties in this area during the construction period;
- providing for a crossing over the railway (north chord) to maintain access to the southern end of Attleboro Lane, reducing the length of permanent road realignment required to access the three properties in this area;
- realigning the B4117 Gilson Road to pass beneath the railway (main line section) to avoid the permanent severance of the road and maintain access to the 42 residential properties on the west side of the village from Coleshill;
- modifying the design and alignment of the B4117 Gilson Road in the vicinity of The Grimstock Country House Hotel, to reduce the loss of land from the hotel and nearby residential properties;
- providing for replacement land to mitigate the loss of land required for construction at Water Orton Primary School;

- providing a range of acoustic screening and construction noise attenuation measures to the south of Water Orton Primary School, to reduce noise levels within the school grounds during the construction of the Proposed Scheme; and
- profiling the design of earthworks to avoid or reduce the need for encroachment into the boundaries of residential properties at a number of locations, including at B4117 Gilson Road and Gilson Drive at Gilson; and at Vicarage Lane and Attleboro Lane at Water Orton.

5.4.2 The draft CoCP includes a range of provisions that will also help mitigate community effects associated with construction within this area (see Volume 5 Appendix CT-003-000), including:

- appointment of community relations personnel (draft CoCP, Section 5);
- community helpline to handle enquires from the public (draft CoCP, Section 5);
- sensitive layout of construction sites to minimise nuisance (draft CoCP, Section 5);
- where reasonably practical, maintenance of PRoW for pedestrians, cyclists and equestrians around the perimeter of construction sites and across entry and exit points (draft CoCP, Section 5);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (draft CoCP, Sections 7 and 13); and
- where practicable, the avoidance of large good vehicles operating adjacent to schools during drop off and pick up periods (draft CoCP, Section 14).

Assessment of impacts and effects

5.4.3 Details of the assessments of community resources are included in Volume 5: Appendix CM-001-019. Each assessment form presents information that explains the rationale for determining the rating for sensitivity of the affected community resource, magnitude of impact and the assessment of significance.

Coleshill

Temporary effects

5.4.4 No temporary construction effects have been identified for the Coleshill part of the study area.

Permanent effects

Residential properties

5.4.5 Construction of the Proposed Scheme will require the demolition of residential properties at three locations within the Coleshill area.

5.4.6 At the north of Coleshill, the Proposed Scheme will require the demolition of a group of eight residential properties situated to the east of the A446 Lichfield Road and

alongside the Birmingham to Nuneaton Line. The loss of this entire row of semi-detached houses, known as Board Cottages and Coleshill Cottages, is assessed as giving rise to a moderate adverse effect, which is significant.

5.4.7 Elsewhere in the Coleshill area, the Proposed Scheme will require the demolition of three residential properties: two are situated at The Old Barn Guest House complex on the B4114 Birmingham Road; and a single residential property called The Homestead is further north, situated at the junction of the B4117 Watton Lane and the A446 Lichfield Road. These demolitions are assessed as a minor adverse community effect at each location, and are not significant at a community level.

Cumulative effects

5.4.8 No temporary or permanent cumulative or community wide effects have been identified for the Coleshill part of the study area during construction.

Gilson

Temporary effects

Residential properties

5.4.9 Construction of the Proposed Scheme will give rise to a combination of significant amenity effects in two areas of Gilson, namely at Gilson Drive and in the vicinity of Meadowbank Drive.

5.4.10 The residents of 10 properties, nos. 1-10 Gilson Drive, which are situated immediately to the west of the M42/M6 Toll, will be affected by a combination of significant noise and visual effects associated with the construction of the M42 Coleshill box structure and the M42 Coleshill north viaduct to the east, as well as the earthworks for Green Lane embankment, which will carry the Birmingham spur, to the west. In addition, there will be a significant increase in HGV traffic passing these properties because Gilson Drive will form the access route for the temporary M42 Coleshill box structure satellite construction compound. Overall, given the phasing of the works in the vicinity of Gilson Drive, these effects are likely to continue for a period of up to three years. The combination of significant noise and visual effects together with the impacts associated with the additional HGV traffic using Gilson Drive during this time is assessed as giving rise to a major adverse amenity effect on residential occupiers of these properties, which is significant.

5.4.11 A second grouping of 13 residential properties in the centre of Gilson is also likely to be affected by a combination of significant noise and visual effects during the construction of the Proposed Scheme. Works to build the M42 Coleshill north viaduct and earthworks to the north are likely to last for about three years. In addition, nine of these properties will also experience significant vibration effects. The combination of significant noise and visual effects will result in a major adverse effect on the amenity of those residents at Meadowbank Drive and at Gilson Road that live closest to the works, which is significant. The affected properties are:

- 1 and 2 Gilson Hall at Meadowbank Drive;
- nos. 2-8 Meadowbank Drive; and
- Gilson Lodge, Fenicia, The Nortons and Stonehaven at B4117 Gilson Road.

5.4.12 Four of the properties identified above, together with an additional property to the east of the main line, will also be affected by a slight temporary loss of land during construction. It is anticipated that the land will be required for a period of about three months and, upon completion of the works, will be reinstated back for domestic use. These temporary losses of land are assessed as giving rise to a minor adverse effect on residential occupiers, which is not significant. The properties that will be affected are:

- four properties at Meadowbank Drive, namely nos. 1 and 2 Gilson Hall and nos. 5 and 6 Meadowbank Drive; and
- Adria, which is a property situated on the B4117 Gilson Road, immediately to the east of the route.

5.4.13 Residents of the properties that will be situated to the west of the main line at Gilson, which represents the majority of the hamlet, are likely to experience a number of impacts that will contribute to the isolation of the community during the construction period. Works to permanently realign the B4117 Gilson Road to the south of its current position, to route beneath the M42 Coleshill north viaduct, will have a prominent presence in the centre of the hamlet for approximately four months. The properties that will be situated to the west of the main line will also be entirely surrounded by construction working areas that, when combined with the visual impacts of construction plant and machinery and the prominence of construction site hoardings, will create a strong sense of enclosure and a heightened perception of isolation, over and above the severance effects already caused by adjacent motorway infrastructure. Works in this area undertaken from the M42 Coleshill box structure construction compound are anticipated to last in excess of five years.

5.4.14 The B4117 Gilson Road and Gilson Drive will be used by construction traffic. The predicted increase in HGV traffic using these local roads to access the M42 Coleshill box structure satellite construction compound and some of the associated work sites, which is assessed as significant adverse for both roads (see Section 12.4), will noticeably alter the character of road usage through the hamlet for the duration of construction in the area. It is forecast that there will be significant increases in delay and congestion at the junction of the B4117 Gilson Road and the A446 Lichfield Road caused by construction activities. Once open to traffic, the realigned B4117 Gilson Road will increase the distance between the east and west of the hamlet by approximately 400m. Whilst this is a relatively minor change for road traffic, the additional distance combined with the increase in HGV traffic that will continue to access the construction compound south of Gilson Drive are likely to act as a deterrent to making journeys on foot or by bicycle. The increase in journey length and potential delay in crossing the roads between Gilson and the edge of Coleshill will particularly affect people living in properties that will be located to the west of the Proposed Scheme along B4117 Gilson Road, at Meadowbank Drive and Gilson Drive. Residents wishing to walk towards Coleshill via the footway along the B4117 Gilson Road, including families walking children to the closest primary school – High Meadow Infant School in Coleshill – will be particularly affected. There are no other convenient alternative routes that can be taken by residents to avoid using the B4117 Gilson Road to travel to Coleshill.

5.4.15 To the north of Gilson, the section of the B4117 Gilson Road that will be to the west of the main line provides a link from the hamlet to Water Orton and the industrial estates to the west of Coleshill Parkway and beyond. This section of the B4117 Gilson Road will be affected by one planned full weekend closure. As a consequence of the significant increase in delay and congestion predicted at the junction of the B4117 Watton Lane and A446 Lichfield Road (see Section 12.4), drivers using the B4117 Gilson Road could also experience delay at the junction with the B4117 Watton Lane. This section of the B4117 Gilson Road will also be crossed by Water Orton viaducts 1 and 3, which will carry the north chords. Works to construct the viaducts are scheduled to last for about three years in total, will have a prominent visual presence and will require temporary road closures, typically overnight or at weekends, to enable the installation of beams over the road. Whilst this route is not the principal route for journeys to secondary school that need to be made on a daily basis, it is nevertheless a key route to other facilities including the GP surgery at Water Orton and for pupils of Water Orton Primary School and is the only other alternative route out of the hamlet.

5.4.16 The disruption to the B4117 Gilson Road at both entry points to the hamlet, combined with the islanding of much of the hamlet by construction activities is assessed as giving rise to a major adverse isolation effect on the residents of approximately 42 properties at Gilson during the construction period.

5.4.17 Properties that will be located to the east of the Proposed Scheme will not be isolated to the same degree during construction. Access to the A446 Lichfield Road and Coleshill to the east via the B4117 Gilson Road will be subject to significant driver delay and congestion. For the local community, this may be particularly noticeable when the M42 southbound will be reduced to three lane running, when some more localised users of the motorway may choose to use the A446 Lichfield Road as an alternative route and key junctions could become more congested in peak periods; however, this reduction in motorway capacity is anticipated to be less than six weeks of the construction period. There will be no increase in journey length or alteration to the route between the properties and Coleshill for those wishing to walk between the two; however, Section 12.4 notes that there may be considerable delay in crossing the A446 Lichfield Road. There will also be some disruption for people wishing to visit other residential properties within Gilson that will be situated to the west of the Proposed Scheme, as described previously. In addition, the construction activities within the hamlet will create a visual barrier between the two sides of the hamlet. On this basis and recognising the relatively small number of properties affected in this eastern part of the hamlet, the isolation effects on the residents of these properties have been assessed as moderate adverse and are significant.

Community infrastructure

5.4.18 The Grimstock Country House Hotel, which is situated on the north side of the B4117 Gilson Road, to the east of the main line, will be affected temporarily during the construction period. The Proposed Scheme includes slight amendments to the access/egress to the hotel to connect it with the realigned section of the B4117 Gilson Road. These works mean that a small area of land will be required temporarily from the hotel's vehicular access/egress for a period unlikely to exceed three months. Temporary arrangements will allow access to the hotel to be maintained throughout and the works will be managed in accordance with the mitigation measures set out in

the draft CoCP. Given the short duration of the disruption, the effects of this temporary loss of land on access/egress for the hotel are assessed as minor, which is not considered to be significant.

5.4.19 Works to construct the M42 Coleshill north viaduct, along with earthworks to the north and the realignment works for the B4117 Gilson Road will result in significant adverse visual effects on guests, visitors and other users of the Grimstock Country House Hotel. The B4117 Gilson Road outside the hotel premises will experience a significant increase in use by HGV construction traffic accessing the M42 Coleshill box structure satellite construction compound. The combination of significant visual and HGV traffic effects will give rise to an adverse change in amenity at the hotel. Whilst alternative hotel facilities are available relatively locally at Coleshill and on the edge of the Birmingham metropolitan area, the hotel's bar, restaurant and function room is the only community facility within the hamlet of Gilson. Given the combination of a significant visual effect and disruption due to additional passing HGV traffic, the change in amenity at the hotel, which could last for up to three years, is assessed as giving rise to a moderate adverse effect on its users, which is significant.

Permanent effects

Residential properties

5.4.20 The main line will pass through the hamlet creating a physical barrier between the seven residential properties and the Grimstock Country House Hotel on the east side of the hamlet and the rest of the community on the west side. The realignment of the B4117 Gilson Road to pass beneath the M42 Coleshill North viaduct will represent a permanent diversion of approximately 600m for journeys between the parts of the hamlet that will be separated by the railway, adding 400m to journey length. The surrounding railway structures, which will comprise a combination of viaducts, embankments and cutting, as well as the B4117 Gilson Road bridge, will also have a prominent visual presence. The PRoW network connecting the various parts of the hamlet will also be altered by the insertion of the railway, including the provision of the Footpath M62 footbridge over the main line. Overall, these changes in the character and means of moving through the hamlet will contribute to a sense of enclosure and separation, resulting in a major adverse and permanent isolation effect on the residents of the hamlet, particularly those living in the 42 properties that will be positioned to the west of the Proposed Scheme at B4117 Gilson Road, Meadowbank Drive and Gilson Drive.

Community infrastructure

5.4.21 The playing pitches belonging to the Old Saltleians RFC, which are situated to the north of Gilson, will be crossed by Green Lane embankment, carrying the main line of the Proposed Scheme; and Water Orton viaducts 1 and 3 will pass over the land. The land required for the construction and operation of the Proposed Scheme covers approximately 80% of the rugby club's site. More than half of the land will be required permanently and the area of land required temporarily also includes the car park and the Club's training and storage areas, although the actual club house will not need to be demolished. Given the extent of land required from the site, both permanently and temporarily, this loss of land will effectively preclude continued use of the site by the rugby club as it will not be possible to reinstate a comparable number of playing

pitches in the remaining areas. The construction of the Proposed Scheme will therefore lead to the permanent loss of this facility and the displacement of the Club. As a well-attended club, which has about 100 playing members together with a further 100 social members, the loss of land currently used as playing pitches and the displacement of the rugby club is assessed as a major adverse and permanent effect, which is significant.

Cumulative effects

5.4.22 The combination of a significant loss of land (permanent and temporary from multiple properties and Old Saltleians RFC), significant amenity impact (Grimstock Country House Hotel, properties along Gilson Road and Meadowbank Drive, and properties along Gilson Drive) and significant isolation (the majority of properties in the hamlet) will result in multiple community-wide effects on residents of Gilson during the construction of the Proposed Scheme.

Water Orton

Temporary effects

Residential properties

5.4.23 Construction works to the south of Water Orton will generate a combination of significant noise and visual effects on the occupiers of seven residential properties at Attleboro Lane, which are situated just to the north of the Proposed Scheme. Works in this area will involve the demolition of properties to the south, construction of the Attleboro flyover, the Attleboro Lane realignment and overbridge, Water Orton cutting and Attleboro Farm embankment and associated earthworks and retaining structures. These works are expected to take about three years to complete and the combination of significant effects during this time will give rise to a major adverse and significant amenity effect of the occupiers of nos. 47-57 (odds) and 55a Attleboro Lane.

5.4.24 Water Orton has a good range of services and facilities; residents are therefore less dependent upon travel outside of the village to meet basic day to day needs. However, it is recognised that the village lies within the catchment of the Coleshill School and that some residents will need to travel out of the village via the B4117 Watton Lane on a daily basis. Works to construct Water Orton viaducts 1 and 3 to the east of Water Orton to carry the north chord over the M42/M6 Toll, B4117 Gilson Road and the A446 Lichfield Road will disrupt journeys being made to Coleshill. Whilst no road closures are anticipated during the three year construction period, the B4117 Watton Lane will also be used as a construction traffic route and drivers using the junction with the A446 Lichfield Road are predicted to experience a significant increase in delay and congestion as a result of construction activities (see Section 12.4).

5.4.25 Works to the B4118 Birmingham Road/Water Orton Road to the west of Water Orton will also impact travel in and out of the village in this direction. Section 12.4 of the Castle Bromwich and Bromford area (CFA25) Volume 2 report, which is the area from which the works will be managed, indicates that the construction works will require temporary roadworks during the off-line replacement of the B4118 Water Orton Road overbridge, which is likely to result in reduced road capacity and delays, albeit that

these are not expected to be significant and there are no temporary road closures or diversions proposed in the area. The changes in traffic flows will not result in significant effects on congestion. It is recognised that residents of the village may not be dependent upon this route for access on a day to day basis to primary schools and health facilities; however, there are no secondary schools or supermarkets within Water Orton and the disruption to regular daily journeys into and out of the village at both the east and west ends could create psychological barriers for a substantial proportion of the community. The B4117 and the B4118 are also both identified as construction traffic routes and will experience an increase in the proportion of HGV through traffic. There are limited options for residents to take alternative routes to avoid these works and, when the duration of the works is also taking into account, the impacts are assessed as giving rise to a moderate adverse isolation effect on the community of Water Orton, which is significant.

Community infrastructure

5.4.26 Water Orton Primary School is situated approximately 200m from the centre line of the north chord section of the railway. The school currently has about 315 pupils on its roll up to the age of 11. There is also a pre-school nursery called The Tree House of Water Orton, which operates from a purpose built facility within the Primary School site, both during term time and over a four week period during the summer holidays. The Nursery operates usually from 7.45am until 6pm, providing out of school hours care as well as for early years education. There are currently about 170 children using this Nursery. Facilities at the school, including the playing fields are also hired on a regular basis by community groups for sports, fitness and other activities and private functions. Out of term time, a number of play schemes are based at the school offering holiday activities for children aged between 4 and 13, using both the indoor and outdoor facilities at the site.

5.4.27 The Proposed Scheme makes provision for mitigation in the form of installing temporary acoustic screens and management and phasing of construction works to reduce noise levels at the school as far as practicable, delivering a reduction of between 10 and 14 decibels (dB) experienced at the edge of the works. Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB and guidance indicates that there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB[17]. With the mitigation in place, the predicted noise levels at the closest point of the school grounds to the construction works will be within these guidelines, will reduce with distance from the works and are therefore not anticipated to result in a significant adverse effect. During construction, which is anticipated to last for a period of about two years, an acoustic barrier will be in place, which will help screen some of the works, but views of earthworks and taller machinery may still be evident above the barrier at times during the construction works and significant adverse visual effects are anticipated. The school is not anticipated to experience significant changes in air quality during the

[17] Department for Education and Skills (2003), *Building Bulletin 93 Acoustic Design of Schools – A Design Guide.*

construction activity. No significant amenity effects are anticipated at the Water Orton Primary School.

5.4.28 About one third of pupils of Water Orton Primary School are understood to reside outside of the defined priority catchment area, with approximately 15% travelling from areas to the south-west of Water Orton within the administrative area of Solihull Metropolitan Borough Council. As these pupils are likely to depend on using the B4118 Birmingham Road to travel to school, their journeys will be affected by delays associated with works to construct the B4118 Water Orton Road overbridge extension, as described previously. Approximately 8% of the current school roll resides in Gilson and Coleshill and will be affected by significant congestion and delay associated with construction works at the junction of B4117 Watton Lane and A446 Lichfield Road; and B4117 Gilson Road and A446 Lichfield Road, as described previously. There are no other convenient alternative routes that can be taken by pupils to avoid these works at the east and west ends of the village. The construction of the Proposed Scheme is assessed as giving rise to a moderate adverse isolation effect on the school, which is significant. HS2 will work closely with Warwickshire County Council and Water Orton Primary School to identify reasonably practicable measures to mitigate the significant isolation effects, including discretionary measures identified in the draft CoCP.

Permanent effects

Residential properties

5.4.29 Construction of the Proposed Scheme (north chord and Birmingham spur) will require the demolition of nine residential properties on the south side of Water Orton at Attleboro Lane. The loss of these properties is assessed as giving rise to a moderate adverse effect, which is significant. The properties that will need to be demolished are nos. 62-76 Attleboro Lane (evens) and no. 87 Attleboro Lane.

Community infrastructure

5.4.30 Part of the playing fields and grounds belonging to the Water Orton Primary School lie within the boundary of land required permanently for the construction and operation of the Proposed Scheme. The area of land that will be lost represents approximately one third of the grounds, including areas marked for playing pitches and an area created especially for teaching pupils about nature. The playing pitches are also used by other community groups, including a local football club and a holiday club. The Proposed Scheme includes an area of agricultural land that will be offered in exchange to compensate for the permanent loss of land from the school's existing playing fields. This land is located immediately adjacent to the existing playing fields, is comparable in size to the amount of land that will be lost and is well located in relation to the configuration and orientation of school buildings and the unaffected area of playing fields on the site. Early provision of this land will avoid any temporary loss of use to the school; however, it will take time for comparable area for teaching pupils about nature to become established. The effects of the loss of land on the school community are assessed as minor adverse and not significant.

Cumulative effects

5.4.31 From a community wide perspective, the combination of residential property demolitions at Attleboro Lane, the significant amenity effects to residential properties along Attleboro Lane and significant isolation effects on the school and the residents of the village will result in multiple community-wide effects on community resources at Water Orton during the construction of the Proposed Scheme.

Other mitigation measures

5.4.32 The assessment has concluded that there are significant adverse effects arising during construction in relation to community resources.

5.4.33 HS2 Ltd will continue to work with the owners of Old Saltleians RFC to assist them with the identification of a suitable alternative site, to which the affected facility could relocate on the basis that it will be eligible for financial compensation under the National Compensation Code. If alternative land could be acquired in the same locality for the relocation of this facility this would fully mitigate the effect which would no longer be significant.

Summary of likely residual significant effects

5.4.34 The loss of the row of eight properties known as Board Cottages and Coleshill Cottages, to the north of Coleshill; and the loss of nine properties from Attleboro Lane in Water Orton will have a significant effect on their local communities. Due to land required for construction of the Proposed Scheme, the Old Saltleians RFC will also be permanently affected.

5.4.35 The amenity for the residents of approximately 10 properties at Gilson Drive, Gilson; 17 properties in the centre of Gilson; and 7 properties at Attleboro Lane, Water Orton will be affected by a range of effects arising temporarily from the construction of the Proposed Scheme. Similarly, the amenity for the users of Grimstock Country House Hotel, Gilson will be affected by the construction of the Proposed Scheme.

5.4.36 The configuration of construction activities, location of predicted driver delay and congestion on the local road network, alterations to the PRoW network and visual intrusion arising from construction activities will contribute to isolation effects experienced by the residents of Gilson and Water Orton, as well as the pupils and staff of Water Orton Primary School. The combination of residual effects will also result in community wide effects on the residents of Gilson and Water Orton.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 The following measures have been incorporated into the scheme design as part of the design development process to avoid or reduce impacts on the amenity of community resources during operation:

- the provision of a noise barrier (approximately 1km in length) along the main line as it passes between Gilson and Coleshill;
- the provision of a noise barrier (approximately 2.7km in length) to the north of the Proposed Scheme where it passes Water Orton;

- increased landscaping and planting to aid visual screening in the vicinity of Gilson and Water Orton; and
- increased profiling of earthworks to help provide enhanced visual screening and noise attenuation on either side of the railway in a number of locations, including as it passes through Gilson and around the southern edge of Water Orton.

Assessment of impacts and effects

Coleshill

Residential properties

5.5.2 No significant effects have been identified on any community resources in the Coleshill area associated with the operation of the Proposed Scheme.

Gilson

Residential properties

5.5.3 Approximately 16 properties at B4117 Gilson Road and Meadowbank Drive will be affected by a combination of both significant noise and significant visual effects. The change in amenity at these locations is assessed as giving rise to a major adverse and significant effect. The affected properties include the following:

- Gilson Lodge, Fenicia, The Nortons, Stonehaven, Vine Cottage, Rose Cottage which are situated at B4117 Gilson Road to the west of the Proposed Scheme and adjacent to the northern limit of the M42 Coleshill north viaduct structure; and
- nos. 1 and 2 Gilson Hall and Nos. 1-8 Meadowbank Drive, which are also situated to the west of the Proposed Scheme and adjacent to cutting earthworks.

Water Orton

5.5.4 No significant effects have been identified on community resources in Water Orton arising from operation.

Cumulative effects

5.5.5 No cumulative or community wide effects have been identified for any of the community in the Coleshill Junction area during operation.

Other mitigation measures

5.5.6 No further mitigation measures have been identified.

Residual significant effects

5.5.7 As no further mitigation is proposed, residual effects at year one of operation will remain the same as those described in the assessment of operational effects.

5.5.8 The amenity of residents at approximately 16 residential properties on the B4117 Gilson Road and Meadowbank Drive will be affected permanently by the location, views and expected noise arising from the operation of the Proposed Scheme.

6 Cultural heritage

6.1 Introduction

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

6.1.2 With regard to heritage assets, the main issue is the extent to which designated and non-designated assets are affected by the Proposed Scheme. Impacts on assets as a result of the Proposed Scheme will occur largely through the physical removal and alteration of assets and changes to their setting.

6.1.3 Maps showing the location of the key environmental features can be found in Volume 2: Community Forum Area (CFA) map books. Maps showing the location of all designated and non-designated heritage assets can be found in Volume 5: Map Book – Cultural heritage. Detailed reports on the cultural heritage character and surveys undertaken within the local area are contained in the Volume 5 Appendices. These include:

- Appendix CH-001-019 – Baseline report;
- Appendix CH-002-019 – Gazetteer of heritage assets;
- Appendix CH-003-019 – Impact assessment table; and
- Appendix CH-004-019 – Survey reports.

6.1.4 Throughout this section, assets within the study areas are identified with a unique reference code, COLxxx; further detail on these assets can be found in the gazetteer in Volume 5: Appendix CH-002-19.

6.1.5 Engagement has been undertaken with the Warwickshire County Council planning archaeologist with regard to the nature of the cultural heritage assets within the local area.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the cultural heritage assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

6.2.2 The setting of all designated heritage assets up to 2km of the centre line has been considered. The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out, is defined as the land required, temporarily or permanently, to construct the Proposed Scheme plus 500m.

6.2.3 The cultural heritage methodology includes the consideration of the intra-project effects of a number of technical topic assessments, for example, landscape and visual,

ecology and water resources and flood risk. Consequently, these interactions have been included in the assessment of impacts and effects.

6.2.4 In undertaking the assessment the following limitations were identified:

- the LiDAR[18] data examined did not encompass the full extent of the study area; and
- not all areas of survey as identified in the archaeological risk model[19] were available for survey.

6.2.5 However, non-intrusive field survey was undertaken in a number of areas to provide data regarding the nature of sub-surface archaeological assets. Information from other sources of data, including the Historic Environment Record and local archives was utilised to provide information relating to the potential archaeological assets that may be present.

6.3 Environmental baseline

Existing baseline

6.3.1 In compiling this assessment, documentary baseline data was collected from a variety of sources as set out in Volume 5: Appendix CH-001-019.

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

- walkover and site reconnaissance from areas of public access or in locations where access was granted. This was undertaken to understand the character and form of heritage assets and the historic landscape; to review the setting of assets; and to identify previously unknown assets;
- desk-top review of remote sensing data including LiDAR, aerial photographs and hyperspectral data (see Volume 5: Appendix CH-004-019); and
- a programme of non-intrusive surveys including geophysical surveys (see Volume 5: Appendix CH-004-019).

Designated assets

6.3.3 The following designated heritage asset is located partially or wholly within the land required, temporarily or permanently, for the construction of the Proposed Scheme (see Volume 5: Map Book – cultural heritage, Maps CH-01-054, CH-01-055 and CH-01-066):

- the Grade II listed Coleshill Hall Farmhouse and outbuildings (COL051) lies within the land required for the construction of the Proposed Scheme.

6.3.4 The following designated assets are located within the 2km study area (see Volume 5: Map Book – cultural heritage, Map CH-02-108):

[18] Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.
[19] The archaeological risk model is an approach that enables the identification of those areas of the Proposed Scheme where archaeological assets are known or suspected and provides a mechanism for the prioritisation of the programme of survey.

- two scheduled monuments: Cole Bridge (COL068), which is also a Grade II* listed building; and Water Orton Bridge which is also a Grade II* listed building (COL069);
- two grade I listed buildings: the Church of St Peter and St Paul, Coleshill (COL056); and Blyth Hall (COL072);
- two grade II* listed buildings: Cole Bridge (COL068) and Water Orton Bridge (COL069);
- 64 grade II listed buildings (Appendix CH-002-019 and Map Series CH-01 and CH-02); The majority of these are focussed on Coleshill High Street (COL054; COL055) with notable buildings to the west of the town including Coleshill Hall Farm (COL051), Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus) (COL052) and Gilson Hall (COL053);
- three conservation areas: Coventry Road, Coleshill (COL076); Coleshill (COL077); and Water Orton (COL078); and
- one area of ancient woodland at Smith's Wood (COL095).

Non-designated assets

6.3.5 The following non-designated assets of moderate value lie wholly or partially within the land required, temporarily or permanently, for the construction of the Proposed Scheme:

- enclosures, earthworks and cropmarks, south of Green Lane (COL006);
- enclosures, platforms and ridge and furrow (COL009);
- buildings at Capitol Joinery (COL011);
- the site of the former Coleshill deer park including boundary features (COL015);
- Historic hedgerows at the former Coleshill deer park (COL016);
- a cropmark enclosure (COL017); and
- an earthwork enclosure (COL033).

6.3.6 The following identified non-designated assets of low value lie wholly or partially within the land required, temporarily or permanently, for the construction of the Proposed Scheme:

- possible former field boundaries, south of Green Lane (COL004);
- ridge and furrow north of Hall Walk (COL010);
- Hall Walk (COL012);
- cropmarks east of Coleshill Manor Office Campus (COL022);
- palaeo-channels and field boundaries within former Coleshill park (COL023);

- former field boundaries and former trackway (COL037);
- ridge and furrow south of Water Orton (COL044);
- circular ditch, within a field south of Water Orton (COL045);
- the Old Barn south of the B4114 Birmingham Road (COL081);
- ridge and furrow north of Gilson Hall (COL090);
- a cropmark field system south of Water Orton (COL092);
- a second cropmark field system south of Water Orton (COL093);
- possible curvilinear ditch and pits (COL107);
- possible pits (COL105); and
- possible ditches and pits (COL106).

6.3.7 All non-designated heritage assets within 500m of the land required, temporarily or permanently, for the construction of the Proposed Scheme are listed in the gazetteer in Volume 5: Appendix CH-002-019 and identified on maps CH-01-112 to CH-01-114 and CH-01-124 in Volume 5. There are a number of built heritage assets the settings of which have been considered, for example:

- Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus; COL052);
- Gilson Hall, Gilson (COL053);
- group of non-designated cottages located in Gilson (COL082);
- group of outbuildings to the south and north of Gilson Hall, Gilson (COL084); and
- Attleboro Farm and Barns (COL087).

Cultural heritage overview

6.3.8 The underlying geology of the study area is Mercia Mudstone and siltstone. This is overlain by superficial deposits of glacio-fluvial sands and gravels, glacio-lacustrine clays and silts, along with smaller areas of glacial head deposits comprising clays, silts and gravels. The rivers Cole and Tame are associated with river terrace gravels and alluvial deposits.

6.3.9 The study area occupies a low lying landscape between 80m and 100m above Ordnance Datum (AOD) and is clearly defined to the north by the valley of the River Tame, which extends west to east. To the south of the Tame, the River Cole flows south-west to north-east. The town of Coleshill occupies a low ridge of higher ground aligned north to south, extending up to 100m AOD. North of the River Cole, a further area of higher ground is present at Grimstock Hill up to 100m AOD.

6.3.10 There is minimal evidence for earlier prehistoric activity, represented by occasional artefact finds and some flintwork from previous surveys. Any earlier prehistoric settlement is likely to have been transient with ephemeral remains. There is no

evidence for funerary and ceremonial monuments in the study area, although there may be some potential for these to have existed in the later Neolithic and Bronze Age, above the floodplains of the rivers Tame or Cole. Small watercourses may have been a focus for burnt mounds in the Bronze Age.

6.3.11 Later Prehistoric settlement has been recorded on the higher ground north of Coleshill, along with a Roman settlement and temple. There is potential, therefore, for Iron Age and Roman settlement remains in undeveloped areas to the west.

6.3.12 Alluvial deposits associated with the Rivers Cole and Tame have the potential to mask buried archaeological assets and contain palaeo-environmental data from the prehistoric period onwards.

6.3.13 There is little evidence for early medieval settlement within the study area.

6.3.14 Two principal areas of settlement existed from the medieval period at Coleshill and Water Orton, with the village of Gilson also potentially having medieval origins.

6.3.15 Coleshill and Water Orton were associated with crossing points of the Rivers Cole and Tame, respectively. The existing bridges at Coleshill and Water Orton were constructed in the 16th century (COL068; COL069). Further south, Bacon's End bridge, spanning the River Cole between Fordbridge and Chelmsley Wood, has medieval origins (COL050).

6.3.16 Coleshill was arranged around a north-south high street, with the medieval church located towards the south, the existing fabric of which dates from the 14th century (COL056). A medieval chapel was also located towards the north of the settlement at Water Orton (COL047). Ridge and furrow earthworks to the south and narrow strip fields to the south and west may indicate the extent of agriculture associated with the settlement (COL042; COL044).

6.3.17 To the west of the town of Coleshill, a former deer park may date from the medieval period (COL015). Evidence for former deer park boundaries exists, and incorporates lengths of important hedgerow (COL016). The original extent of the deer park may, however, have been larger.

6.3.18 A moat was located within the park at Coleshill, which may have been the site of the manorial hall (COL014). The hall and park are mentioned in documentary sources from the 14th century. The moat partially survives as earthworks, with historic mapping indicating the site of a hall within and partially covering the moat.

6.3.19 Land division and ridge and furrow have been identified within the former park at Coleshill (COL015). To the south of the park, south of the B4114 Birmingham Road, an undated enclosure, earthwork platforms and ridge and furrow may also date from the medieval or post-medieval period (COL0009). Further south, to the south of Green Lane, further earthwork enclosures and ridge and furrow have been identified (COL006).

6.3.20 Piecemeal landscape enclosure was taking place in the post-medieval period, with evidence for planned enclosure dating from the late 18th century.

6.3.21 An undated rectilinear banked and ditched cropmark enclosure has been identified to the north of Coleshill Hall Farm (COL017). This may be associated with the moat and

park, but may also potentially date from the later prehistoric or Romano-British periods. An undated earthwork enclosure has been recorded to the east of the park, to the east of the M42 (COL033).

6.3.22 The existing Coleshill Hall Farm dates from the later 17th century and was originally a stable block for Coleshill Hall (CO051). A group of buildings to the south of the existing Birmingham Road at the Capitol Joinery timber yard and The Old Barn may have been associated with Coleshill Hall Farm (COL011; COL081). Further north, Gilson Hall dates from the early 18th century and is also associated with a number of ancillary buildings (COL053; COL084). Further early post-medieval buildings are located over 1.5km east of the Proposed Scheme at Blyth Hall and Blyth Bridge (COL072; COL075).

6.3.23 Coleshill Hall Hospital, Coach House and Stable Block date from 1873 and replaced the earlier hall to the south at Coleshill Hall Farm (COL052). The hall also replaced a previous keeper's lodge marked on historic mapping (COL024). A possible lodge or gate structure has been recorded to the north-east of the hall (COL029), with a further possible lodge recorded on historic mapping at the north-western boundary of the park (COL025). The hall was subsequently converted into a hospital in the 1920s, with further accommodation blocks built in the 1950s. The site was converted into a small business park in the 1990s (Coleshill Manor Office Campus).

6.3.24 The majority of listed buildings at Coleshill date from the 18th and 19th century, representing commercial buildings fronting onto the high street with some larger civic buildings around Church Hill (COL055; COL058). An early 20th century Roman Catholic Church is associated with a former children's home complex at the east of the town (COL061). At Water Orton, the existing church dates from the late 19th century (COL071), with many un-designated buildings within the study area dating from the 19th and 20th century (COL083; COL085; COL099; COL100).

Future baseline

Construction (2017)

6.3.25 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. None of the identified developments affect the assessment of the Proposed Scheme's likely construction impacts on heritage assets.

Operation (2026)

6.3.26 No committed developments have been identified in this local area that will materially alter the baseline conditions in 2026.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft CoCP sets out the provisions that will be adopted to control effects on cultural heritage assets. The provisions include the following (see Volume 5: Appendix CT-003-000):

- management measures that will be implemented for assets that are to be retained within the land required for the construction of the Proposed Scheme (draft CoCP, Section 8);

- the preparation of project wide principles, standards and techniques for works affecting heritage assets (draft CoCP, Section 8);
- a programme of archaeological investigation and recording to be undertaken prior to/or during construction works affecting the assets (draft CoCP, Section 8); and
- a programme of historic building investigation and recording to be undertaken prior to modification or demolition of the assets (draft CoCP, Section 8).

6.4.2 The following measures have been incorporated into the design of the Proposed Scheme to reduce impacts on assets:

- alignment avoids Grade II listed Coleshill Hall Hospital and attached coach house and stable block (now part of Coleshill Manor Office Campus; COL052);
- alignment avoids Grade II listed Gilson Hall (COL053);
- alignment avoids non-designated historic buildings at Gilson (COL082; COL083); and
- general landscape earthworks and planting reduces impacts on the setting of designated assets within the 2km study area. Examples include mitigation planting to the east of Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus) (COL052) and surrounding Gilson Hall (COL053).

Assessment of impacts and effects

Temporary effects

6.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts will occur to assets both within the land required for the construction of the Proposed Scheme and assets in the wider study area due to the visibility of plant, cranes and equipment; and other construction factors.

6.4.4 The following significant effects will occur as a result of temporary impacts on the setting of designated or non-designated heritage assets:

- during construction the character and setting of the former Coleshill deer park, including boundary features (COL015), an asset of moderate value, will be disrupted and degraded by intensive construction activity for at least 4years and 10 months resulting in a medium adverse impact and moderate adverse effect;
- during construction the current setting of the 19th century Coleshill Hall Hospital and attached coach house and stable block (at Coleshill Manor Office Campus; COL052), an asset of moderate value, will be disrupted by construction activity for embankments and viaducts up to 15m above ground level, c.130m to the east. Coleshill embankments nos. 2 and 3 would involve approximately 5 years and 9 months and 5 years 6 months construction activity respectively, with the River Cole east and west Viaducts involving

approximately 2 years construction activity each. Temporary construction activity would include satellite construction compounds to the south-east and north-east of the hall, two of which, c.400m away, would be visible, further disrupting the setting of the hall within former parkland and agricultural fields. This will constitute a high adverse impact and a major adverse effect;

- during construction the current setting of the 18th century Gilson Hall (COL053), an asset of moderate value, will be disrupted by construction activity for a large cutting along with a temporary construction traffic route to the east. Construction activity associated with the cutting would be undertaken over a period of approximately 3 years and 4 months. The existing setting is characterised by surrounding agricultural fields between the existing motorway and the town of Coleshill. This will result in a high adverse impact and a major adverse effect;

- during construction the current setting of a group of 19th century non-designated cottages located at the south of the settlement at Gilson (COL083), an asset of low value, will be disrupted by the construction of a cutting to the east, embankment to the south-east and the realignment of B4117 Gilson Road to the south. This will result in a high adverse impact and a moderate adverse effect; and

- during construction the current rural setting of a group of 18th-19th century former outbuildings west and south of Gilson Hall (COL084), an asset of moderate value, will be disrupted by construction activity for a large cutting to the east. This will result in a medium adverse impact and a moderate adverse effect.

Cumulative effects

6.4.5 It is not considered that there will be any cumulative effects from temporary impacts on heritage assets within the study area.

Permanent effects

6.4.6 The following significant effects will occur as a result of physical impacts on heritage assets within the land required for the construction of the Proposed Scheme:

- archaeological remains associated with the cropmarks of possible post-medieval former field boundaries, south of Green Lane (COL004), an asset of low value, will be removed during the construction of embankments for the main line. This will constitute a high adverse impact and moderate adverse effect;

- archaeological remains associated with earthworks and cropmarks, south of Green Lane (COL006), an asset of moderate value, will be within the land required to construct the Proposed Scheme, including areas for planting. This will constitute a high adverse impact and major adverse effect;

- earthwork enclosures and platforms (COL009), assets of moderate value, will be removed during construction of a viaduct associated with the main line. This will constitute a high adverse impact and a major adverse effect;

- ridge and furrow earthworks north of Hall Walk (COL010), an asset of low value, will be removed during construction of embankments for the main line. This will constitute a high adverse impact and moderate adverse effect;
- buildings at Capitol Joinery timber yard, Birmingham Road (COL011), an asset of moderate value, will be demolished to enable construction of a viaduct forming part of the main line. This will constitute a high adverse impact and a major adverse effect;
- Hall Walk (COL012) an asset of low value will be removed during construction of embankments for the main line and Birmingham spur. This will constitute a high adverse impact and a moderate adverse effect;
- earthworks and archaeological remains associated with a moat and former Hall at Coleshill Hall Farm (COL014), an asset of high value, will be removed during construction of embankments for the main line, construction of the realigned Manor Drive and associated planting. This will constitute a high adverse impact and a major adverse effect;
- the former Coleshill deer park, including boundary features (COL015), an asset of moderate value, will be partially removed during construction of viaducts and embankments for the main line and Birmingham spur and the realignment of the River Cole. This will constitute a high adverse impact and a major adverse effect;
- an important hedgerow at Coleshill Park (COL016), an asset of moderate value, will be partially removed by the construction of the main line. This will result in a medium adverse impact and moderate adverse effect;
- archaeological remains associated with the cropmarks of undated rectilinear enclosures (COL017), an asset of moderate value, will be removed during construction of embankments and retaining walls for the main line and Birmingham spur, the realignment of Manor Drive and areas of planting. This will constitute a high adverse impact and a major adverse effect;
- archaeological remains associated with the cropmarks of an undated possible field system (COL022), an asset of low value, will be removed during the construction of embankments for the Birmingham spur, the realignment of the River Cole and planting. This will constitute a high adverse impact and moderate adverse effect;
- palaeo-channels and field boundaries within former Coleshill Park (COL023), an asset of moderate value, will be partially removed by the requirement for land to be used temporarily for utility diversions. This will constitute a medium adverse impact and moderate adverse effect;
- an undated earthwork enclosure (COL033), an asset of low value, will be removed during the construction of a viaduct for the main line and planting. This will constitute a high adverse impact and a moderate adverse effect;
- ridge and furrow earthworks south of Water Orton (COL044), an asset of low value, will be removed to enable construction of embankments for the north

chord. This will constitute a high adverse impact and moderate adverse effect;

- earthworks associated with former land division and ridge and furrow, south of the River Tame (COL048), an asset of low value, will be removed by utility diversions. This will constitute a high adverse impact and moderate adverse effect;
- Grade II listed Coleshill Hall Farmhouse (COL051), an asset of moderate value, will be removed during the construction of embankments for the main line. This will constitute a high adverse impact and major adverse effect;
- the Old Barn (COL081), an asset of low value, will be removed by the construction of a viaduct and embankment for the main line. This will constitute a high adverse impact and moderate adverse effect;
- ridge and furrow earthworks north of Gilson Hall (COL090), an asset of low value, will be removed for utility diversions and areas required for mitigation planting. This will constitute a high adverse impact and moderate adverse effect;
- archaeological remains associated with the undated cropmarks of a possible field system south of Water Orton (COL092), an asset of low value, will be removed by construction of embankments for the north chord and planting. This will constitute a high adverse impact and moderate adverse effect; and
- archaeological remains associated with undated cropmarks of a possible field system south of Water Orton (COL093), an asset of low value, will be removed by planting and the creation of new habitats, including ponds. This will constitute a high adverse impact and moderate adverse effect;
- archaeological remains associated with a group of possible pits at Chattle Hill (COL105), an asset of low value, will be removed by land required for the construction of the Proposed Scheme. This will constitute a high adverse impact and a moderate adverse effect;
- archaeological remains associated with possible ditches and pits (COL106), an asset of low value, will be removed as they are within land required temporarily for the construction of the Proposed Scheme. This will constitute a high adverse impact and a moderate adverse effect; and
- archaeological remains associated with a possible curvilinear ditch and pits (COL107), an asset of low value, will be removed as they are within land required temporarily for the construction of the Proposed Scheme. This will constitute a high adverse impact and a moderate adverse effect.

6.4.7 The following significant effects will occur as a result of permanent impacts on the setting of heritage assets:

- the setting of the Grade II listed Coleshill Hall Hospital and attached coach house and stable block (now part of Coleshill Manor Office Campus) (COL052), an asset of moderate value, will be altered by the presence of embankments to the east and a viaduct to the south-east. The viaducts and embankments will be up to 15m above existing ground level and will be visible to the east and

south-east of the principal façade of the building where minimal screening exists. The physical presence of the Proposed Scheme will, therefore, sever views of associated former parkland and the valley of the River Cole. This will constitute a high adverse impact and major adverse effect;

- the setting of the Grade II listed Gilson Hall (COL053), an asset of moderate value, will be substantially changed by the presence of a major cutting approximately 30m to the east. The cutting will extend directly to the south of the principal façade of the building and will be up to approximately 10m deep and approximately 70m wide. There will, therefore, be a loss of surrounding areas of agricultural landscape and the setting of the hall, located to the east of the settlement, will be significantly altered. This will constitute a high adverse impact and a major adverse effect;
- the setting of a group of non-designated cottages located towards the south of the settlement at Gilson (COL083), assets of low value, will be considerably altered by the Proposed Scheme which will be situated within approximately 50m of the asset. The cutting, landscape embankments and re-aligned Gilson Road remove the asset's surviving rural setting to the west. This will constitute a high adverse impact and a moderate adverse effect; and
- the setting of a group of outbuildings to the west and south of Gilson Hall, of moderate value (COL084), will be altered by the presence of the Proposed Scheme in cutting c.40m to the east. This will constitute a medium adverse impact and a moderate adverse effect.

Permanent cumulative effects

6.4.8 There are no inter-project effects on cultural heritage.

Other mitigation measures

6.4.9 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed design to reduce further the significant effects described above. These refinements will include the identification of:

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

6.4.10 Currently identified opportunities include the creation of an appropriate new garden boundary for the affected part of the grounds of Grade II listed Gilson Hall.

Summary of likely residual significant effects

6.4.11 The residual effects are the same as those reported above.

6.4.12 The temporary effects of construction activity on the setting of heritage assets are largely reversible in nature and last for the duration of the construction works. Residual effects will arise from the visibility of construction plant and in particular the loss of vegetation which forms part of the setting of assets. The physical impacts of

construction on heritage assets are permanent and not reversible, heritage assets will be removed. There will also be a permanent residual effect on the setting of heritage assets due to the presence of the constructed Proposed Scheme.

6.4.13 A number of archaeological assets will be permanently lost due to the construction of the Proposed Scheme; these include several prehistoric cropmark sites, earthworks at Hall Walk, earthworks and archaeological remains associated with a moat and former Hall at Coleshill Hall Farm, palaeo-channels and field boundaries within the former Coleshill Park, and archaeological remains associated with a possible curvilinear ditch and sites of possible ditches and pits. A programme of archaeological works will be prepared to investigate, analyse, report and archive these assets.

6.4.14 The Proposed Scheme will result in the demolition of a number of built heritage assets including Coleshill Hall Farmhouse (a Grade II listed building), and the non-designated Old Barn, and buildings at Capitol Joinery timber yard. A programme of built heritage works will be prepared to investigate, analyse, report and archive these assets.

6.4.15 The Proposed Scheme will sever elements of the historic landscape, for example hedgerows. Part of an important hedgerow at Coleshill Park will be permanently removed. In addition, elements of the Proposed Scheme such as cuttings and embankments will affect the setting of historic settlements and buildings such as Grade II listed Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus) and Grade II listed Gilson Hall, and several non-designated buildings and groups of buildings. Further consideration will be given to the historic vegetation and landscapes as part of the planting and landscape design plans that will be further prepared for HS2.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 The following measures have been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on assets:

- noise mitigation measures have been included within the scheme design to reduce potential impacts on identified assets; and
- landscape planting will increasingly reduce impacts on the setting of the designated assets within the study area as it matures during the operational phase. Examples include mitigation planting to the east of Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus) (COL052) and surrounding Gilson Hall (COL053).

Assessment of impacts and effects

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

the setting of an asset from the presence of the constructed scheme and its operation, this is reported in the assessment of operation.

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

- the former Coleshill deer park, including boundary features (COL015), is an asset of moderate value. There will be medium adverse impacts resulting from the visibility of passing trains upon embankments and changes in noise levels. There will also be a high adverse permanent construction impact. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and major adverse effect;
- Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus; COL052), is a listed building and an asset of moderate value. The introduction of train noise and the visibility of passing trains will alter the landscape setting of the building within agricultural land and a former park resulting in a medium adverse impact. There will also be a high adverse permanent construction impact as a result of changes to the setting of the asset. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and major adverse effect;
- Gilson Hall, Gilson (COL053), is a listed building and an asset of moderate value. There will be a high adverse operational impact as the result of the introduction of train noise, which will result in a significant noise effect; and the visibility of passing trains. There will also be a high adverse permanent construction impact as a result of changes to the setting of the asset. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and major adverse effect;
- this group of non-designated cottages are located at the south of the settlement at Gilson (COL083) and are assets of low value. There will be a high adverse operational impact as the result of the introduction of train noise, which will result in a significant noise effect, and the visibility of passing trains. There will also be a high adverse permanent construction impact as a result of changes to the setting of the asset. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a high adverse impact and major adverse effect; and
- this group of outbuildings to the west and south of Gilson Hall, Gilson (COL084) are an asset of moderate value. There will be a medium adverse operational impact as the result of the introduction of train noise and the visibility of passing trains. There will also be a medium adverse permanent construction impact as a result of changes to the setting of the asset. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the setting of this asset, resulting in a medium adverse impact and moderate adverse effect.

Cumulative effects

6.5.4 During the operational phase of the Proposed Scheme, cumulative development projects described in Section 2.1 and Volume 5: Appendix CT-004-000 include construction of HS2 Phase Two. Assessment of inter-project effects on cultural heritage assets arising from the interaction of the Proposed Scheme with cumulative development projects has been undertaken. No significant cumulative effects have been identified in relation to cultural heritage.

Other mitigation measures

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

Summary of likely residual significant effects

6.5.6 The setting of several historic settlements, buildings and landscapes will be affected visually and by noise once the Proposed Scheme becomes operational. This includes the former Coleshill deer park and boundary features, Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus), Gilson Hall, and non-designated buildings and groups of buildings. In due course some visual effects will reduce as planting matures and the new railway assimilates into the landscape. Operational noise will also be controlled through noise barriers and landscaped earthworks built up alongside the tracks.

7 Ecology

7.1 Introduction

7.1.1 This section describes the ecological baseline and identifies likely impacts and significant ecological effects that will arise from the construction and operation of the Proposed Scheme. These include impacts on species, habitats and sites designated for their importance for nature conservation.

7.1.2 The principal ecological issues in this area are: habitat loss within three Local Wildlife Sites (LWS), namely Coleshill Hall Farm LWS, Coleshill Park Belt LWS and Coleshill Sewage Works Grassland LWS; the realignment of the River Cole and shading impacts on habitats along the River Tame; loss and severance of habitat used by water vole and loss of barn owl territories.

7.1.3 Volume 5 of the ES contains supporting information to the ecological assessment reported in this section, including:

- results of ecological surveys (Volume 5: Appendix EC-001-003, EC-002-003, EC-003-003, and EC-004-003); and
- register of local/parish level effects which are not described individually in Volume 2 (Volume 5: Appendix EC-005-003).

7.1.4 As well as survey data, the assessment draws on existing information gathered from national organisations and from regional and local sources including: Warwickshire County Council (Warwickshire Biological Records Centre); Warwickshire Wildlife Trust; EcoRecord (the ecological database for Birmingham and the Black Country); and the Environment Agency.

7.2 Scope, assumptions and limitations

7.2.1 The scope and methodology of the ecological assessment are introduced in the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2). The assessment methodology is summarised in Section 8 of Volume 1 of the ES, along with route-wide assumptions and limitations. Limitations associated with particular surveys are described within the relevant baseline survey report in Volume 5: Appendices EC-001-003, EC-002-003, EC-003-003, and EC-004-003.

7.2.2 A Water Framework Directive assessment has been undertaken in conjunction with the environmental assessment. Details of this assessment are presented in Volume 5: Appendix WR-001-000.

7.2.3 Access was not obtained to all of the land area where general habitat survey (Phase 1 habitat survey) was proposed. Locations with the potential to support key ecological receptors where access could not be gained for survey include five of the ten properties within the Coleshill Junction area that are at risk of demolition and could be suitable for roosting bats. Further details are provided in Volume 5: EC-001-003, EC-002-003, EC-003-003, and EC-004-003.

7.2.4 Where data are limited, a precautionary baseline has been built up according to the guidance reported in the SMR Addendum (Volume 5: Appendix CT-001-000/2). This constitutes a 'reasonable worst-case' basis for the subsequent assessment.

7.2.5 The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the Proposed Scheme.

7.3 Environmental baseline

Existing baseline

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-003 to EC-004-003 and Volume 5: Map Book – Ecology, Maps EC-01 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5: Map Book – Ecology, Map Series EC-01.

7.3.2 Land required for the construction of the Proposed Scheme and that adjacent to it consists predominantly of arable farmland and pasture. The route is centred on the Coleshill Estate, associated with a former deer park, between the M6 and the M42. The River Cole flows south-west to north-east between the M6 and the M42 through the area and will be crossed by the route of the Proposed Scheme. There are two unnamed tributary watercourses of the River Cole and the River Tame within the area. The north chord is within agricultural land just south of Water Orton. The northern part of the main line passes through Gilson, and the route crosses the River Tame and an unnamed tributary of the River Tame to the south of Coleshill Sewage Treatment Works.

Designated sites

7.3.3 There is one statutory designated site located within 500m of the land required for construction of the Proposed Scheme; namely Coleshill and Bannerly Pools Site of Special Scientific Interest (SSSI), which lies approximately 65m east of the Proposed Scheme and to the east of the M42. The SSSI lies within the adjacent Birmingham Interchange and Chelmsley Wood area (CFA24). Designation details for this site are reported within the Volume 2 report for Birmingham Interchange and Chelmsley Wood (CFA24).

7.3.4 There are four Local Wildlife Sites (LWS) relevant to the assessment in the Coleshill Junction area; each is of county/metropolitan value. They are:

- Coleshill Hall Farm LWS – comprises two semi-improved fields that are intensively horse grazed, surrounded on three sides by hedges and small streams. The site contains several plants characteristic of marshy grassland which is now uncommon or rare in Warwickshire. The LWS lies within the land required for the construction of the Proposed Scheme just south of Coleshill Hall Farm and the B4114 Birmingham Road;
- Coleshill Park Belt LWS – comprises a 1km long belt of semi-natural woodland plus a smaller section of mixed plantation. The northern part is known as "The Belt" and the far southern end of the western belt is known as "The Catmore". The woodlands are old but are not classed as ancient. The LWS also includes

two long sections of green lane contiguous with The Belt, including a mosaic of semi-natural grassland, tall herb and scrub, as well as boundary hedges. The LWS lies north and west of Coleshill Manor Office Campus between the M6 and the M42/M6 Toll, and is within the land required for construction of the Proposed Scheme;

- Coleshill Sewage Works Grassland LWS – represents one of a series of floodplain grasslands and wetlands on this stretch of the River Tame. Swamp, wet grassland and scrub communities are present and the LWS represents a rare fragment of relatively unmodified floodplain landscape at the edge of the urban area. The LWS lies partially within the area of land required for the construction of the Proposed Scheme; and
- Wheeley Moor Farm Meadows LWS – contains an example of the MG4 Meadow Foxtail-Great Burnet grassland community as defined by the National Vegetation Classification (NVC)[20], which is now uncommon and declining in Warwickshire. The LWS supports a variety of breeding birds and invertebrates and lies within 50m of the land required for construction of the Proposed Scheme, on the western side of the River Cole.

7.3.5 There are no areas of ancient woodland within or adjacent to the land required for construction of the Proposed Scheme.

Habitats

7.3.6 The following habitat types which occur in this area are relevant to the assessment.

Woodland

7.3.7 Areas of scattered broad-leaved semi-natural woodland of mixed composition are found throughout the Coleshill Junction area and are described in this section.

7.3.8 Three contiguous woodlands form Coleshill Park Belt LWS near Coleshill Manor Office Campus: The Catmore and woodland along Green Lane are outside the area of land required for the construction of the Proposed Scheme; The Belt is partly within the area of land required for the construction of the Proposed Scheme. These contain lowland mixed deciduous woodland, a habitat of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[21]. Much of the canopy has been planted with broadleaf and conifer mixtures and rhododendron is common in the understorey as well as occasional non-native trees. The woodland community within The Catmore and The Belt is a mosaic of the oak woodland community W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland and the ash woodland communityW8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis*. The Warwickshire notable plant[22] wood millet was also identified during surveys within The Catmore and within The Belt. The vegetation community within the woodland along Green Lane is the hawthorn scrub community W21

[20] NVC is a detailed survey and classification system that is used to compare plant communities with a range of defined community types.
[21] *Natural Environment and Rural Communities Act 2006* (Chapter 16). London. Her Majesty's Stationery Office.
[22] Warwickshire Notable plants are indicative of good quality habitats within the county including some ancient woodland indicators, as identified by the Warwickshire Flora Group, although they are not rare or scarce in the county.

Crataegus monogyna-Hedera helix, which is a widespread and typical vegetation community of hedges in the British Isles. Warwickshire has one of the lowest coverage of woodland for any county in Britain [23] and woodlands of the size of The Catmore and The Belt are uncommon within the area. These habitats are collectively are of county/metropolitan value.

7.3.9 To the north of the Delta junction, within the area of land required for the construction of the Proposed Scheme near Jack O'Watton industrial estate, there is a small area of secondary woodland and scrub. This broadleaved woodland is located along the A446 Lichfield Road, between the road and the Birmingham and Derby Line. Due to its small size, isolated nature and poor quality, this habitat is considered to be of local/parish value.

7.3.10 A plantation woodland belt is adjacent to the Old Saltleians Rugby Football Club (RFC) within the area of land required for the construction of the Proposed Scheme. This habitat is considered to be of local/parish value.

7.3.11 A broadleaved woodland block adjacent to Coleshill Sewage Treatment Works lies just outside of the area of land required for the construction of the Proposed Scheme. This habitat is considered to be of local/parish value.

Grassland

7.3.12 NVC surveys were carried out on: Coleshill Hall Farm LWS, Coleshill Sewage Works Grassland LWS, Wheeley Moor Farm Meadows LWS, floodplain grasslands adjacent to the River Cole and at Curdworth Bridge Meadow south.

7.3.13 Coleshill Sewage Works Grassland LWS is part of the non-operational land within the Coleshill Sewage Treatment Works complex. About 10ha is lowland meadow established around a seasonally wet drain that had expanded, at the time of survey, to flood a large area and supported a species rich example of the mire community M23 *Juncus effusus-Galium palustre* lowland meadow, which is considered to qualify as lowland meadow, a habitat of principal importance. A number of Warwickshire notable plants were recorded during surveys to support the assessment within the LWS including: marsh willowherb, yellow loosestrife, great burnet, and bog stitchwort. The Warwickshire rare species marsh dock was also recorded[24]. The area of lowland meadow together with the seasonally flooded pool is of county/metropolitan value.

7.3.14 The remainder of the Coleshill Sewage Works Grassland LWS is tussocky, unmanaged grassland with scattered small trees and scrub. The value of the dry grassland within the site has become degraded due to lack of management, but some diversity is maintained through frequent flooding, which prevents succession to scrub. These grassland habitats are of local/parish value.

7.3.15 The predominant vegetation community identified within Coleshill Hall Farm LWS was the perennial rye grass community MG6 *Lolium perenne-Cynosurus cristatus*

[23] Steven J. Falk (2009), *Warwickshire's Wildflowers The wildflowers, shrubs & trees of historic Warwickshire*; Warwickshire County Council.
[24] Warwickshire rare plants are those found in three sites or less in the county.

grassland, very common grassland of predominantly agricultural, permanent pasture in Britain. The Warwickshire notable plant wild pansy is known to be present within Coleshill Hall Farm LWS from desk study records; this plant is also on the Near Threatened Red List of plants[25]. Although the grassland is within an LWS, it has become degraded due to over grazing by horses, and does not meet the criteria to qualify as lowland meadow habitat of principal importance. Two large fields adjacent to Coleshill Hall Farm LWS extend south and east toward Hall Walk and west toward the River Cole. The southern meadow contains the false oat grass community MG1 *Arrhenatherum elatius* grassland, which is widespread in lowland Britain. In the western corner of this field is a small low-lying area supporting a sedge swamp community (S7 *Carex acutiformis* swamp), which is locally distributed in lowland Britain. The grassland community in the western meadow was identified as a species poor example of the Yorkshire fog-tufted-hair-grass community MG9 *Holcus lanatus-Deschampsia cespitosa* grassland. The meadows have common grassland communities of damp or dry under-managed sites and do not qualify as lowland meadow habitat of principal importance. These habitats each have local/parish value.

7.3.16 The field north-east of Hall Walk is an L-shaped pasture field and supports the perennial rye grass community MG6 *Lolium perenne-Cynosurus cristatus* grassland, which is widespread and common. The grassland along the banks of the River Cole consists of five large cattle grazed pasture fields north of the B4114 Birmingham Road containing the perennial rye grass community MG6 and MG7 *Lolium perenne-Alopecurus pratensis* grassland. The meadows adjacent to the River Cole, plus the field north-east of Hall Walk had grassland communities that have reduced value due to agricultural improvement, most likely through input of artificial fertiliser or manure over the course of many years. These fields are managed as pasture and are cattle grazed, but may have been used as meadows in the past and may have had a similar community to Wheeley Moor Farm Meadows LWS. The grassland within these sites is considered to have local/parish value.

7.3.17 Curdworth Bridge Meadow south is a triangle of land between the River Tame, the Water Orton to Kingsbury rail line and the A446 Lichfield Road. The site is dominated by unmanaged grassland over 1m tall and is dominated by the false oat grass community MG1 *Arrhenatherum elatius* grassland and the open habitat community OV24 *Urtica dioica-Galium aparine* community. Both these communities are common in undisturbed open areas of high nutrient soils and are of local/parish value.

7.3.18 Grassland at Curdworth Bridge Meadow north was also surveyed on the north side of the River Tame. This grassland is within the Curdworth to Middleton area (CFA20) and is discussed in the Volume 2 report for CFA20.

7.3.19 Phase 1 habitat surveys have been carried out on frequent small areas of amenity grassland within the Coleshill Junction area. These are considered to have negligible value.

[25] IUCN, IUCN Red List Categories and Criteria: Version 3.1. 2001. IUCN Species Survival Commission, England, Switzerland and Cambridge, UK.

Watercourses

7.3.20 The River Cole and two of its unnamed tributaries, and the River Tame and two of its unnamed tributaries will be crossed by the route of the Proposed Scheme. Rivers and streams are identified as habitats of principal importance. The Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP)[26] lists rivers and streams as priority habitats. Part of the importance of these habitats across the local landscape is the provision of wildlife corridors through a largely arable and urban landscape. The watercourses in the area change noticeably at different points along their length and the valuation of the watercourses has been carried out based on different sections of the watercourses as described here.

7.3.21 South of the B4114 Birmingham Road, the River Cole adjoins Coleshill Hall Farm LWS and Wheeley Moor Farm Meadows LWS and will be crossed by the Coleshill east and west viaducts and the embankments leading to the B4114 Birmingham Road Underbridge. The River Cole in this area is flanked by vegetation of variable width dependant on whether the riverbank is fenced or livestock are allowed access to the river. The river channel supports the aquatic river water-crowfoot community A18 *Ranunculus fluitans* and has extensive stands of reed canary-grass on the river margin. River water crowfoot is scarce within Warwickshire[27]. The unnamed tributary watercourse of the River Cole, which is located on the boundary of the Coleshill Hall Farm LWS, was noted during surveys for areas of tall herb and scrub. Although not formally designated as a LWS, the River Cole and its unnamed tributary in this section have habitats and species that may fulfil the criteria for LWS selection in Warwickshire, are integral to the designated riparian and floodplain habitats in the area and are of county/metropolitan value.

7.3.22 The River Cole between Manor Drive and Gilson has been heavily modified on account of the engineered nature of the channel and the presence of major bridges and weirs. The river supports a range of common aquatic and marginal plant species including the presence of improved grassland and mixed woodland. Fish habitat surveys identified a range of habitats which were of moderate quality for coarse fish species. Even though heavily modified, the River Cole at this location supports a range of habitats that appreciably enrich the local area and the river provides a major wildlife corridor. This section of the River Cole has district/borough value.

7.3.23 Habitat surveys undertaken on the River Tame at the southern boundary of the Coleshill Sewage Treatment Works, where the route of the Proposed Scheme will cross, have identified the river as being severely modified as a result of engineering such as bank reinforcement. The habitat along the river banks is variable with sections of semi-improved grassland within Coleshill Sewage Works Grassland LWS, mixed woodland and urban development. Although not in itself designated, the River Tame adjoins the Coleshill Sewage Works Grassland LWS and is integral to the LWS designation as it supports a relatively unmodified floodplain feature, which is rare within the urban area and provides an important wildlife corridor. Aquatic, emergent

[26] Warwickshire, Coventry and Solihull Local Biodiversity Action Plan available at http://www.warwickshire.gov.uk/biodiversity.
[27] Warwickshire scarce plants are those found in four to 10 sites in the county.

and marginal plants are abundant in the River Tame. A fish habitat survey carried out in support of the assessment identified moderate habitat quality, due to the range of in-channel features. Even though heavily modified, the River Tame at this location supports a range of habitats that appreciably enrich the local area and the river provides a major wildlife corridor. This section of the River Tame is of district/borough value.

7.3.24 Due to access constraints, no habitat survey data is available for the unnamed tributary watercourse of the River Cole south of the B4114 Birmingham Road where the river passes beneath Coleshill Heath Road. This tributary will be crossed by the route of the Proposed Scheme. In the absence of field based assessment, a review of OS mapping and aerial photography has identified that this watercourse is heavily modified and has poor channel form. Due to the limited range of habitats that could be supported within this homogenous watercourse, it is considered likely to have up to local/parish value.

7.3.25 A number of minor watercourses were screened out of requirement for aquatic habitat survey within the Coleshill Junction area, based on scoping criteria (see the SMR (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2)), including two unnamed tributary watercourses of the River Tame just south of the main river channel. However, these are still likely to provide wildlife corridors and habitats for common aquatic species, and are considered to have up to local/parish value.

Water bodies

7.3.26 There are 32 water bodies within the area of land required for the construction of the Proposed Scheme. These include field ponds, lagoons at Coleshill Sewage Treatment Works and ephemeral flooded pools within Coleshill Sewage Works Grassland LWS. Some of these water bodies have been surveyed during Phase 1 habitat surveys and surveys for amphibians, but were screened out from detailed pond habitat surveys. Surveyed field ponds were generally surrounded by species-poor semi-improved grazed grassland. Aquatic vegetation was rare but when it occurred, it was predominantly common reed.

7.3.27 The flooded pools within Coleshill Sewage Works Grassland LWS are part of the designated site, support the habitat of principal importance lowland meadow and, due to the presence of water vole, qualify as a habitat of principal importance. The pools are of county/metropolitan value.

7.3.28 Other water bodies surveyed within the Coleshill Junction area outside of designated sites, and based on habitat alone, are each of local/parish value. As a precautionary assessment, those ponds that have not been surveyed are assumed to have up to district/borough value.

Hedgerows

7.3.29 There is one hedgerow within the land required for the construction of the Proposed Scheme that meets the wildlife and landscape criteria of the Hedgerows Regulations 1997[28], south of Gypsy Lane and adjacent to the M42. This hedgerow qualifies as a habitat of principal importance.

7.3.30 The remaining hedgerows were generally species-poor intact hedgerows. Hedgerows that are ecologically important under the Hedgerows Regulations 1997 criteria are less abundant and have district/borough value. Species-poor hedgerows are common within the arable landscape and have local/parish value. Due to the wildlife corridors created by hedgerows, the hedgerow network within the land required for construction of the Proposed Scheme is considered to be of district/borough value.

Other habitats

7.3.31 Other habitats, such as scrub, are found mostly around field edges, damp ditches and ponds. There are building complexes within the land required for construction of the Proposed Scheme at Coleshill Hall Farm, Coleshill Manor Office Campus, along Attleboro Lane in Water Orton, at Gilson and properties east of Jack O'Watton industrial estate which have the potential to support roosting bats (evaluated separately in Table 11). There is a veteran pedunculate oak at Gilson known as the Dodder's Oak. These features are each of local/parish value.

7.3.32 Phase 1 habitat data from surveys and aerial photography show that the area bordered by the motorway network (M42, M42/M6 link and M6) is predominantly large arable fields with occasional hedgerows, trees and pockets of woodland. The large majority of land surveyed was intensively cultivated and bordered by hedgerows with narrow field margins. Arable land is found across the area and in the surrounding countryside. This habitat has negligible value.

Protected and/or notable species

7.3.33 A summary of the species relevant to the assessment is provided in Table 11.

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

Table 11: Protected and/or notable species

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Water vole	County/ metropolitan	Water vole population present on the ephemeral flooded pools within Coleshill Sewage Works Grassland LWS and possibly on the adjacent River Tame	Evidence of water vole presence has been observed on the flooded pools within Coleshill Sewage Works Grassland LWS. Footprints which may be attributed to water vole were observed on the River Tame, where the river passes adjacent to the pools. It is likely that the River Tame has historically offered dispersal corridors for water voles within the area. A known population of water voles is present on the River Tame at Parkhall upstream of Coleshill Junction in the adjacent area[29] and at Kingsbury Water Park downstream of the area, which is connected to the River Tame. Water vole is a species of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[30], which is uncommon within Warwickshire and there has been a continued decline of this species recorded throughout watercourses in the county.
Notable plants	County/ metropolitan	Assemblage of plants within Coleshill Sewage Works Grassland LWS	A number of Warwickshire notable plants were recorded during surveys to support the assessment within Coleshill Sewage Works Grassland LWS associated with seasonally flooded damp pasture: marsh willowherb, common marsh bedstraw, yellow loosestrife, black poplar, great burnet, and bog stitchwort. The Warwickshire rare species marsh dock was also recorded.
	District/borough	River water crowfoot population	Plant noted during surveys of the River Cole and the River Tame near the crossing point of the route of the Proposed Scheme. This plant is scarce within Warwickshire.
	Up to district/borough	Wild pansy populations	Known only from desk study records at Coleshill Heath north of South Drive, Coleshill Hall Farm, Grimstock Country House Hotel, Gilson and at Gilson in field close to junction of B4117 Gilson Road and Gilson Drive. This plant is on the Near Threatened Red List of plants based on 2001 IUCN guidelines and is a Warwickshire notable species.
Bats	Up to County/ metropolitan	Population of brown long-eared bats roosting within the Coleshill Manor Office Campus	Building roost identified as a potential small maternity or small non-breeding summer roost of brown long-eared bats with a peak emergence count of five individuals. Brown long-eared bats are a species of principal importance.

[29] Details of the water vole population at Parkhall are reported in the Volume 2 report for Birmingham Interchange and Chelmsley Wood (CFA24).
[30] Her Majesty's Stationery Office (2006), *Natural Environment and Rural Communities Act 2006* (Chapter 16).

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	District/borough	Assemblage of bats using foraging and commuting habitats around Coleshill Manor Office Campus	Woodland, scrub, hedgerows and grassland habitats support a concentration of commuting and foraging bats with a diverse assemblage of species dominated by the two common species – common and soprano pipistrelle – and a small number of brown long-eared passes. The assemblage also includes the rarer bats include Leisler's, noctule and *Myotis* sp. A low level of Leisler's bat activity was identified during static surveys.
	District/borough	Assemblage of bats using foraging and commuting habitats along the River Cole	The River Cole with its adjacent corridor of grassland habitats supports a concentration of commuting and foraging bats with a more diverse assemblage than most of the habitats surveyed in the area. The assemblage is dominated by the two common species – common and soprano pipistrelle – with occasional passes of rarer bats[31] including Leisler's, noctule and *Myotis* sp. This concentration of bat activity continues where the river corridor flows east of the M6 and through habitats south of Gilson. A low level of Leisler's bat activity was identified during static surveys. Leisler's bat is rare within Warwickshire. Both the noctule and soprano pipistrelle are species of principal importance. Noctule is widespread and common in Warwickshire but there are no desk study records for this species within 10 km of the land required for construction of the Proposed Scheme within the Coleshill Junction area.
	District/borough	Assemblage of bats using foraging and commuting habitats in areas of woodland within Coleshill Sewage Treatment Works and along the adjacent River Tame	The River Tame and habitats within Coleshill Sewage Treatment Works support a concentration of commuting and foraging bats with a more diverse assemblage than most of the habitats surveyed in the area. The assemblage is dominated by the two common species – common and soprano pipistrelle – with occasional brown long-eared bats. Registrations of rarer bats including noctule and *Myotis* sp. indicate use of the area as foraging habitat. A single pass by a Nathusius pipistrelle indicates passage over the habitats rather than core foraging or commuting.

[31] Numbers of bats between 10,000 and 100,000 individuals based on Wray S, Wells D, Long E and Mitchell-Jones T. (2010) Valuing bats in ecological impact assessment. In Practice. December 2010. P23-25.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	District/borough	Assemblage of bats using roosting, foraging and commuting habitats at and near Water Orton	Hedgerows, water bodies and grassland habitat support low levels of activity by a more diverse assemblage of bat species. The assemblage is dominated by the two common species – common and soprano pipistrelle – with records of rarer bats including noctule, *Myotis* sp. and Leisler's bat. Low level of activity by Leisler's has been recorded during static surveys along a hedgerow that is adjacent to a small water body. One transient summer roost was identified with a peak emergence count of one common pipistrelle in a residential house on Attleboro Lane.
	Local/parish	Assemblage of bats using roosting, foraging and commuting habitats north of Gilson Hall	Scrub, hedgerows and grassland habitats near the village of Gilson support a concentration of commuting and foraging bats dominated by the two common species – common and soprano pipistrelle – and a small number of brown long-eared passes. Occasional records of rarer bats include Leisler's and noctule and only a very small number of calls were recorded. Similarly, a small number of *Myotis* sp. passes are likely to represent irregular commuting or opportunistic foraging rather than core foraging activity. Four buildings at Gilson were found to support individuals of commoner bat species (pipistrelle and brown long eared bat) and roosts are summer (non breeding) day or transitional roosts. Three buildings had peak emergence counts between one and three bats; two roosts were confirmed through the identification of droppings alone, the number and pattern of distribution being consistent with transient use.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Amphibians	County/ metropolitan	Assumed great crested newt metapopulation (AMP)[32]: AMP21 near Woodland Cemetery	AMP21, which is outside of the land required for construction of the Proposed Scheme, has a total of six water bodies, five of which have been surveyed (four complete and one incomplete). One of the water bodies has a confirmed breeding population of great crested newts of medium population size class. These metapopulations also support other amphibians (smooth newt, common frog and/or common toad). Great crested newt and common toad are species of principal importance. Given the records provided from Warwickshire Biological Records Centre it appears that great crested newt is abundant within Warwickshire and, given the results collated, it is likely that great crested newts are widespread within the Coleshill Junction area. However, ponds which support breeding populations of great crested newt meet the criteria for LWS selection in Warwickshire[33].
	County/ metropolitan	AMP22 north of the Coleshill Manor Office Campus centred on Coleshill Park Belt LWS between the M6 and the M42/M6 Toll	AMP22, which is partially within the land required for construction of the Proposed Scheme, has a total of nine water bodies, all of which have been surveyed (five complete and four incomplete). Three of the water bodies have confirmed breeding populations of great crested newts (all small population size classes with a cumulative peak count of ten). Due to incomplete surveys, it is assumed that AMP22 could support a medium population size class of great crested newt. These water bodies also support other amphibians (smooth newt, common frog and/or common toad). One of the water bodies also supports a low population size class of palmate newts; there are few records for this species within Warwickshire or within the local area.
	County/ metropolitan	AMP24 south of Water Orton and north of the M42/M6 Link	AMP24, which is within the land required for construction of the Proposed Scheme, has a total of 17 water bodies, 15 of which have been surveyed (12 completed and three incomplete). Nine of the water bodies have confirmed breeding populations of great crested newts (all small population size class). Cumulatively, this metapopulation has a medium population size class. Ten of the water bodies also support other amphibians (smooth newt, common frog and/or common toad).

[32] A great crested newt metapopulation is a group of associated populations made up from newts which both breed in the ponds and live in the terrestrial habitat around a cluster of ponds. The newts are likely to return to the same pond each year; however, there may be some interchange of newts between the ponds within the metapopulation. Assumed metapopulations (AMP) have currently been identified based on a combination of desk based information and survey results. Details of AMP are given in Volume 5: Appendix EC-002-003.
[33] Guidance for the selection of non-statutory SINCs in Warwickshire (Warwickshire Wildlife Sites Project, 1998).

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Up to county/ metropolitan	Great crested newt metapopulation: AMP33, south west of Water Orton, close to Water Orton Primary School	AMP33 has a total of five water bodies, all of which have received incomplete surveys. Due to the presence of great crested newts, (one small population size class, peak count of 5) and because of incomplete surveys, it is assumed that AMP33 could support a medium population size class of this species. This metapopulation is partially within the land required for construction of the Proposed Scheme.
	Up to county/ metropolitan	Great crested newt metapopulation: AMP34 north-west of Coleshill Manor Office Campus and south-east of M6 J4a	AMP34, which is outside of the land required for construction of the Proposed Scheme, has a total of three water bodies, two of which have been surveyed (one complete and one incomplete). Due to the presence of a small population size class of great crested newts identified in one water body from incomplete surveys, it is assumed that AMP34 could support a medium population size class. Both water bodies also support other amphibian species (smooth newt in both and common frog in one).
	Up to county/ metropolitan	Great crested newt populations in all ponds not subject to full survey; outside of great crested newt metapopulations	Using a precautionary approach, water bodies that have not been surveyed could support breeding populations of great crested newt of medium population size class.
	District/borough	AMP23, north of Gilson	AMP23, which is partially within the land required for construction of the Proposed Scheme, has a total of five water bodies, four of which have received surveys (two complete and two incomplete); the remaining water body was not surveyed due to access restrictions. One of the water bodies has a confirmed breeding population of great crested newts (small population size class, peak count 6). Three of the water bodies surveyed also support other amphibians (smooth newt, common frog and/or common toad).

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Local/parish	Common amphibian populations in 16 individual water bodies which lie outside of great crested newt metapopulations	There are no additional water bodies with great crested newt presence confirmed outside of the six metapopulations identified. The surveys found other amphibians in 16 additional water bodies. Two of these water bodies contain common frog, smooth newt and common toad, five water bodies contain common frog and common toad, three water bodies contain just smooth newt and six water bodies contain just common frog. There were no exceptional populations of amphibians recorded and none of these populations were found to meet the LWS selection criteria for Warwickshire.
Birds	County/ metropolitan	Breeding barn owl pair near Water Orton	A traditional barn owl nest site[34] was identified near Water Orton within the land required for construction of the Proposed Scheme. A pair of barn owl constitutes more than 1% of the estimated county breeding population. Barn owl is a Schedule 1 bird[35].
	County/ metropolitan	Population of breeding lapwing at Coleshill Manor Office Campus, west of Coleshill	Three lapwing breeding territories. The number of lapwing recorded is greater than 1% of the estimated county breeding population. Lapwing is a species of principal importance and is on the Red List of Birds of Conservation Concern (BoCC)[36].
	County/ metropolitan	Population of wintering green sandpiper within Coleshill Sewage Treatment Works	A single green sandpiper is thought to have overwintered at Coleshill Sewage Treatment Works. This constitutes greater than 1% of the county population. Green sandpipers are a Schedule 1 bird.
	District/borough	Population of wintering gadwall within Coleshill Sewage Treatment Works, Coleshill Industrial Estate	Up to 10 gadwall were recorded wintering within the section of River Tame adjacent to Coleshill Sewage Treatment Works. Gadwall is an Amber List BoCC species.
	Local/parish	Breeding bird assemblage within grass field adjacent to River Cole and immediately west of Coleshill	Field surveys recorded 38 bird species within this area of which 18 are notable. Thirteen notable species are through to have bred on site, including species such as reed bunting and yellowhammer, both species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.

[34] A traditional nest site is one that has been regularly used in previous years but not found to be occupied at the time of the surveys to support the assessment.
[35] Specially protected or Schedule 1 birds receive full protection under the Wildlife and Countryside Act 1981 (as amended). In addition to the protection from killing or taking that all birds, their nests and eggs have under the Act, Schedule 1 birds and their young must not be disturbed at the nest.
[36] Gregory RD, Wilkinson NI, Noble DG, Robinson JA, Brown AF, Hughes J, Proctor DA, Gibbons DW and Galbraith CA (2002), *The population status of birds in the United Kingdom, Channel Islands and the Isle of Man*; an analysis of conservation concern 2002-2007. British Birds 95: 410-450.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Local/parish	Breeding bird assemblage within Coleshill Manor Office Campus, west of Coleshill	Field surveys recorded 50 bird species within this area of which 22 are notable. Fourteen notable species are through to have bred on site, including species such as linnet, a species of principal importance, and yellowhammer. Species recorded (with the exception of lapwing whose population at the site is of county/metropolitan value) are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Breeding bird assemblage within arable and grass fields to the south of Water Orton	Field surveys recorded 56 bird species within this area of which 28 are notable. Fifteen notable species are thought to have bred on site, including species such as lapwing and yellow hammer, both species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Breeding bird assemblage within grass fields to the immediate north of Gilson Hall, Gilson (including the Old Saltleians RFC)	Field surveys recorded 36 bird species within this area of which 15 are notable. Nine notable species are through to have bred on site, including species such as house sparrow and starling, a species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Breeding bird assemblage within arable fields at Attleboro Farm, south of Water Orton	Field surveys recorded 35 bird species within this area of which 13 are notable. Ten notable species are thought to have bred on site, including species such as linnet and yellowhammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Breeding bird assemblage within Coleshill Sewage Treatment Works	Field surveys recorded 61 bird species within this area of which 27 are notable. Twelve notable species are thought to have bred on site, including species such as grey wagtail and reed bunting. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Wintering bird assemblage within Coleshill Manor Office Campus, west of Coleshill	Field surveys recorded 38 bird species within this area of which 16 are notable, including species such as lapwing and lesser redpoll, a species of principal importance. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Wintering bird assemblage within grass field adjacent to River Cole and immediately west of Coleshill	Field surveys recorded 21 bird species within this area of which four are notable, including species such as kestrel and redwing. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Local/parish	Wintering bird assemblage within grass fields south of Water Orton	Field surveys recorded 40 bird species within this area of which 19 are notable, including species such as lesser redpoll and yellow hammer. Species recorded are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
	Local/parish	Wintering bird assemblage within Coleshill Sewage Treatment Works	Field surveys recorded 49 bird species within this area of which 20 are notable, including species such as lesser redpoll and reed bunting. Species recorded (with the exception of gadwall and green sandpiper whose populations at the site are of district/borough and county/metropolitan value respectively) are considered to be common and widespread in the habitat types surveyed, and/or no large or important populations were recorded.
Otter	District/borough	Otter population using the River Tame, the River Cole and associated tributaries	Evidence of otter (spraints) was found on the River Cole and River Tame and it is likely that these watercourses offer key dispersal corridors for otters from the more rural Warwickshire and Staffordshire reaches into the West Midlands conurbation. There are desk study records of recent otter evidence on the River Cole within the Coleshill Junction area and high levels of otter activity on the River Tame further north of the area. It is likely that otters will exploit the connecting tributaries and water bodies associated with these main watercourses for commuting, refuge and as a foraging resource. National and county surveys show a trend indicating the continued re-colonisation by otter of all main watercourses in Warwickshire, although otter is still likely to be relatively few in number and transient, but breeding. Otter is a species of principal importance.
Aquatic macro-invertebrates	Local/parish	Assemblage in the River Cole, surveyed at proposed point of realignment and a location downstream of the land required for construction of the Proposed Scheme near Gilson	Biological indices were consistent with a river that exhibits good biological water quality, although results also indicate pollution tolerant taxa within the assemblage, which is indicative of a stressed community. The aquatic macro-invertebrate communities were of moderate conservation value on account of the moderately diverse assemblages recorded, although all species recorded were common.
	Up to local/parish	Assemblages on all other watercourses in the area	In discussion with the Environment Agency, no other watercourses were identified as requiring survey although they may provide suitable habitat for commonly occurring species. Using a precautionary approach, the macro-invertebrate communities within watercourses where no access was available are assumed to have up to the highest value achieved for watercourses sampled in this area.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Fish	Local/parish	Population in the River Cole near Coleshill Hall Farm and at Gilson	Available Environment Agency data and information from surveys to support the assessment both identify the presence of a mixed coarse fish assemblage, dominated by common species (e.g. minnow and gudgeon), which have a high to medium tolerance to environmental disturbance. The presence of larger cyprinid species such as roach, chub, dace and perch indicates that the river is capable of supporting a relatively species-rich mixed coarse fishery.
	Up to local/parish	Populations in all other watercourses	In discussion with the Environment Agency, no other watercourses were identified as requiring survey although they may provide suitable habitat for commonly occurring species. Using a precautionary approach, the fish populations within watercourses where no access was available are assumed to have up to the highest value achieved for watercourses sampled in this area
Badgers	Local/parish	Six badger social territories within the land required for construction of the Proposed Scheme	Four of the six social territories contain setts within the land required for the construction of the Proposed Scheme. Badgers are widespread throughout the UK and Warwickshire. The badger social groups within the study area are not likely to form a critical part of the county or the district population.
Reptiles	Up to local/parish	Populations of common species within suitable habitat within the Coleshill Junction area	No reptile populations were found during surveys and only limited and isolated patches of suitable habitat were identified. However, there are grass snake records within the Coleshill Junction area and, as the area is within the known range of common lizard and slow-worm, it is possible that these common reptile species are present in suitable habitat but in low numbers. Grass snake, slow worm and common lizard are species of principal importance. Given the distribution of adder within Warwickshire, and the lack of records in the area from Warwickshire and Birmingham Biological Records Centres, it is unlikely that adder is present in the Coleshill Junction area.
Hazel dormouse	Negligible	Dormouse populations within suitably woody habitats in the area	No survey evidence in this area. The species is not likely to be present within the Coleshill Junction area and there are no records indicating historic presence.
White-clawed crayfish	Negligible	Populations within watercourses in the area	No white-clawed crayfish were found during surveys of the River Tame or the River Cole and the species is assumed absent. Signal crayfish have been confirmed in the River Cole. Due to the connectivity of nine of the watercourses within the Coleshill Junction area (all unnamed tributaries of the River Cole) it is possible that non indigenous signal crayfish present in the River Cole have colonised these tributaries, making it less likely that native white-clawed crayfish would be present.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Terrestrial invertebrates	Negligible	Meadowcroft Pony Paddocks and Coleshill Sewage Treatment Works	The two sites surveyed in the area were found to have no habitats of particular note for invertebrates and no notable species or assemblages were recorded. No other habitats were identified as having the potential to support important terrestrial invertebrate assemblages within the area.

Future baseline

Construction (2017)

7.3.34 A summary of the known committed developments which are assumed to be mostly built and occupied prior to construction of the Proposed Scheme is provided in Section 2.1 of this report, with further details provided in Volume 5: Appendix CT-004-000. It is not expected that these developments will significantly affect the character and value of ecological resources with the area.

Operation (2026)

7.3.35 There are no known committed developments or changes to management in the Coleshill Junction area that will affect the operational baseline.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme and avoid or reduce impacts to features of ecological value:

- the design of the realigned River Cole will ensure that the channel is sufficiently sized. Consideration will be given in the design to the objectives of the WFD as described in the River Basin Management Plan. This may include the use of soft engineering solutions for bank design, and the inclusion of natural forms such as berms or incorporation of a two-stage channel, riffles and pools and marginal planting, where reasonably practicable;
- eight viaducts: three at the River Cole, two at an unnamed tributary of the River Cole and three at the River Tame, will negate the need for culverting and will retain wildlife connectivity along these water courses for species such as otter and bats;
- the realignment of the unnamed tributary watercourse of the River Cole south of the B4114 Birmingham Road will prevent the need for culverting;
- avoidance of in-channel structures associated with viaducts and bridges will prevent impacts to watercourse habitat, form and function; and
- all culverts will be made suitable to allow passage for mammals such as otter and water vole, taking into account flood events; or, where this is not possible, an alternative dry tunnel will be installed.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-003-000), which includes translocation of protected species where appropriate.

Assessment of impacts and effects

Designated sites

7.4.3 Coleshill Hall Farm LWS is entirely within the land required for construction of the Proposed Scheme and the 1.7ha site will be lost as a result of the construction of the Coleshill east and west viaducts. This would affect the degraded perennial rye grass community, surrounding hedgerows and ditch system. These impacts will result in a permanent adverse effect on site integrity that will be significant at a county/metropolitan level.

7.4.4 Approximately 2.7ha of broadleaved semi-natural woodland will be lost from Coleshill Park Belt LWS (almost 30% of the 9.6ha LWS) as a result of construction of the embankments of the Birmingham spur. The loss will largely be within The Belt and the woodland along Green Lane. The habitat loss would be from the pedunculate oak and ash canopy woodland in The Belt and the hawthorn scrub along Green Lane. The Proposed Scheme would also fragment the retained sections of the LWS into the three separate parts: The Belt (which would be lost and fragmented with the majority of the retained parts east of the Proposed Scheme), The Catmore (the retained parts would be west of the Proposed Scheme) and woodland along Green Lane (the retained parts would be west of the Proposed Scheme but no longer connected to The Catmore). The Catmore would largely remain intact although all three remaining fragments of the LWS would be more vulnerable to edge effects such as wind throw and with reduced connectivity through the landscape. These impacts will result in a permanent adverse effect on site integrity that will be significant at a county/metropolitan level.

7.4.5 Approximately 5.5ha of Coleshill Sewage Works Grassland LWS (almost 20% of the 28ha LWS) will be permanently lost as a result of the Watton Lane and Watton House north embankments and Water Orton viaducts 1 and 3, which carry the main line and north chords over the Birmingham to Nuneaton Line and on to the River Tame and Curdworth viaducts; and temporary establishment and use of the Water Orton viaduct 1 and 3 (north) satellite compound. This would result in partial loss of the seasonally flooded lagoon and an associated area of rush pasture, a habitat of principal importance. Construction may interfere with the seasonal inundation of this area from the drain that runs north-west to south-east through the LWS. There will also be loss of tussocky, unmanaged grassland with scattered small trees and scrub on the eastern edge of the LWS, but the Proposed Scheme should not affect the drier and relatively species-rich MG1 *Arrhenatherum elatius* grassland, in the west of the LWS. The permanent works will be separated from the LWS by an access road bordered by a new hedgerow. These impacts will result in a permanent adverse effect on site integrity and will be significant at a county/metropolitan level.

7.4.6 No impacts are expected on Wheeley Moor Farm Meadows LWS, which forms part of the baseline.

Habitats

7.4.7 There is 10.3ha of woodland within the land required for the construction of the Proposed Scheme within the Coleshill Junction area comprising approximately 10.2ha of broad-leaved semi-natural and plantation woodland, and 0.1ha of coniferous plantation. This loss will be from woodland within Coleshill Park Belt LWS, woodland near Jack O'Watton industrial estate, a plantation woodland belt adjacent to the Old Saltleians RFC and woodland adjacent to Coleshill Sewage Treatment Works.

7.4.8 Woodland has a very low coverage in Warwickshire and within the area, with the main block of woodland, Coleshill Park Belt, being designated as an LWS. The loss of woodland from The Belt, The Catmore and the adjoining woodland along Green Lane will have a permanent adverse effect on the conservation status of woodland habitat that will be significant at a county/metropolitan level. Losses of woodland that would be significant at a local/parish level are reported in Volume 5: Appendix EC-005-003.

7.4.9 Approximately 20.8km of hedgerow within the land required for the construction of the Proposed Scheme within the Coleshill Junction area. This includes 152m of an ecologically important hedgerow near Water Orton. The final length of hedgerow to be lost will depend on the detailed design and they will be retained where practical, but as a precautionary approach for the purposes of the assessment it is assumed that all of the hedgerows would be lost. The majority of hedgerows within the land required for construction of the Proposed Scheme are generally species poor and not well connected. However, there will be loss of the ecologically important hedgerow near Water Orton and on species-rich hedgerows in the area. The loss and severance of hedgerows will cause an adverse effect on the conservation status of hedgerow, which will be significant at district/borough level.

7.4.10 The Proposed Scheme will result in loss of neutral semi-improved grassland, 7.2ha of which is within sites designated for grassland habitats (Coleshill Hall Farm LWS and Coleshill Sewage Works Grassland LWS). None of the grassland surveyed within the land required for construction of the Proposed Scheme, including these LWS, has been identified as the habitat of principal importance, lowland meadows. There will be some rush pasture, a habitat of principal importance, lost from within Coleshill Sewage Works Grassland LWS. The loss of grassland and rush pasture from within Coleshill Sewage Works Grassland will result in a permanent adverse effect on the conservation status of these habitats that will be significant at up to a county/metropolitan level. Losses of grassland that will be significant at a local/parish level are reported in Volume 5: Appendix EC-005-003.

7.4.11 Realignment works on the River Cole will result in the permanent loss of approximately 660m of existing channel, which has already been modified by bank strengthening, bridges and weirs (see Section 2.2 of this report). In the short-term, temporary adverse effects on watercourse form and function are likely to result from the realignment works, which will be significant at a district/borough level. Appropriate channel design will result in the establishment of functional habitats within two to five years. Whilst localised shading impacts are anticipated as a result of the proposed structures, any impact on watercourse habitat and function is considered likely to be offset by the increase in channel length within the realigned section, which will be approximately 730m. No significant long term adverse effects

on watercourse habitat and function will result from the proposed works and the design of the realigned channel could be beneficial.

7.4.12 The width of the three viaducts over the River Tame totals approximately 35m. Combined with the low headroom, the viaducts will cause shading which is expected to result in localised loss of vegetation thus affecting habitat connectivity. The shading may also locally alter aquatic macro-invertebrate and fish assemblages and species distribution. The resulting permanent adverse effect on the conservation status of the River Tame will be significant at the district/borough level.

7.4.13 Taking a precautionary approach to assessment, the loss of 32 ponds within the land required for the construction of the Proposed Scheme could result in a permanent adverse effect on the conservation status of water bodies that, in each case, would be significant at up to the district/borough level.

7.4.14 It is considered unlikely that any other effects on habitat receptors at more than the local/parish level will occur. Effects significant at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Species

7.4.15 South of Water Orton and north of the M42/M6 Link, at assumed great crested newt metapopulation AMP24, 13 of the 17 water bodies and over half the available terrestrial habitat will be lost, affecting grassland, hedgerows and small areas of woodland which could be used for foraging, refuge and/or hibernation. At AMP23, Gilson, approximately a fifth of available habitat will be lost affecting grazed pasture and hedgerows, which could be used as refuge or for foraging. There will also be severance of habitat within AMP23 and AMP24 preventing future dispersal of great crested newts. These impacts would result in a permanent adverse effect on the conservation status of AMP23 and AMP24, which in each case would be significant at the county/metropolitan level.

7.4.16 There will be loss of 11 water bodies outside of assumed great crested newt metapopulations, only three of which have been surveyed for amphibians; and two were found to support smooth newt, common frog and common toad. Should great crested newt be present within any of the water bodies where no survey was possible loss of the water bodies could result in an adverse effect on the conservation status of each of these amphibian populations which in each case would be significant at up to a county/metropolitan level.

7.4.17 At AMP22, north of the Coleshill Manor Office Campus, there will be no loss of water bodies but loss of approximately half the available terrestrial habitat affecting grazed pasture, woodland and hedgerows, which are likely to be used for foraging, refuge and/or hibernating. At AMP33, south west of Water Orton, there will be no loss of water bodies but loss of approximately one third of available terrestrial habitat affecting grazed pasture, a small woodland block and hedgerows, which are likely to be used for foraging, refuge and/or hibernating. These impacts will result in permanent adverse effects on the conservation status of the great crested newt populations within AMP22 and AMP33 that in each case will be significant at the district/borough level.

7.4.18 Evidence of water voles (i.e. feeding stations and latrines) has been found on the flooded pool within Coleshill Sewage Works Grassland LWS and footprints attributed to water vole have been observed on the adjacent River Tame. Works associated with the construction of viaducts crossing the River Tame, as well as associated access routes and the northern satellite compound for Water Orton viaducts 1 and 3 may result in habitat loss from the flooded lagoon. Water voles rely on vegetative cover along commuting corridors and may be reluctant to cross open areas, or may be more vulnerable to predation by crossing open areas. Shading of the River Tame under the viaducts could reduce vegetation cover and create habitat severance within a water vole's territorial range and could also reduce the available foraging resource. Any water voles may also be temporarily displaced from the area during construction due to disturbance from noise and lighting. Due to the potential vulnerability of any remnant populations, these impacts will cause a permanent adverse effect on the conservation status of water vole that will be significant at a county/metropolitan level.

7.4.19 Shading of the River Tame and the River Cole from viaducts, and realignment works on the River Cole, may affect populations of river water crowfoot which is scarce within Warwickshire. Taking a precautionary approach to assessment, this could have a permanent adverse effect on the population of river water crowfoot that would be significant at up to a district/borough level.

7.4.20 Loss of seasonally flooded habitats within the Coleshill Sewage Works Grassland LWS could lead to loss of the associated populations of Warwickshire notable and rare plants: marsh willowherb, common marsh bedstraw, yellow loosestrife, black poplar, great burnet, bog stitchwort and marsh dock. This will have a permanent adverse effect on the conservation status of this assemblage of plants that will be significant at a county/metropolitan level.

7.4.21 Wild pansy populations are known from desk study records at four locations within the land required for construction of the Proposed Scheme. Taking a precautionary approach to assessment, the loss of the wild pansy population at these sites could adversely affect the conservation status of this species, which would be significant at up to a district/borough level.

7.4.22 The construction process will cause temporary loss of habitats used by birds, together with disturbance of adjacent habitats. In areas of open farmland these impacts will cause minimal effects on the bird populations as there is plenty of suitable alternative habitat nearby. Due to the availability of alternative farmland habitat, the impacts on the breeding lapwing population will not be significant. However, some of the woodland dependent species will have less alternative habitat to utilise, such as within Coleshill Park Belt LWS, and the habitat loss will result in an adverse effect that will be significant at local/parish level.

7.4.23 The Proposed Scheme will result in the removal of nesting and foraging habitat from a barn owl breeding territory near Water Orton, leading to loss of this territory. This will result in an adverse effect on the breeding pair of barn owl that will be significant at a county/metropolitan level.

7.4.24 No confirmed otter holts or terrestrial sites for otter were identified within the Coleshill Junction area. Due to the design of the viaducts at the River Cole, an

associated tributary of the River Cole and the River Tame there will be no permanent loss of accessible watercourse for otters. In addition, the bridging of watercourses may offer further cover and territorial marking sites for otters. Construction activities along the realigned section of the River Cole, along the River Tame and associated tributaries may result in noise and visual disturbance to otter, potentially acting as a deterrent to otter commuting and creating temporary severance within an otter's territorial range. Taking a precautionary approach to assessment, these impacts could lead to a temporary adverse effect on the conservation status of the population concerned during construction, which would be significant at up to a district/borough level.

7.4.25 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts are considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in a significant adverse effect on the conservation status of the population concerned will differ dependent on the status of the species concerned.

7.4.26 The impact of disturbance on bat populations will generally be localised and limited to the period of construction. Bats utilising retained habitats may be subject to irregular and localised disturbance from lighting and noise during the construction period where works in autumn, winter and spring may be carried out for short periods after dusk or prior to dawn. These impacts would only temporarily deter bats from using foraging and commuting habitats.

7.4.27 Construction works adjacent to transient building roosts used by commoner bat species (common pipistrelle and brown long eared) within Gilson may result in disturbance of bats using these roosts. However, the adoption of measures within the draft CoCP will provide controls to prevent displacement of bats and the loss of these roosts. Although there will be loss of some foraging and commuting habitat used by the assemblage of bats north of Gilson Hall, this loss would be minor and a commuting route will be maintained beneath the M42 Coleshill North viaduct. These impacts are unlikely to lead to a permanent adverse effect on the conservation status of the assemblage of bats concerned and will not be significant.

7.4.28 A diverse assemblage of bats use foraging and commuting habitats along the River Cole and adjacent habitats including: common and soprano pipistrelle with records of rarer bats including Leisler's, noctule and *Myotis* species. No confirmed roosts or buildings/trees with potential to support roosting bats associated with this assemblage will be lost. The overall character of this area limits the potential for habitats to support high densities of roosting and foraging/commuting bats. Suitable habitats for bat species within the land required for construction of the Proposed Scheme are relatively isolated from habitats in the wider countryside. Barriers to dispersal include trunk roads, the M42, M6 and M42-M6 link and urban areas including Water Orton, Coleshill and Chelmsley Wood. The River Cole forms an important corridor for bats for commuting and foraging bats away from urban areas. Key foraging and commuting habitat will be lost due to realignment works on the River Cole and loss of adjacent grassland and hedgerows. These impacts will lead to a temporary adverse effect on the conservation status on the assemblage of bats concerned that would be significant at the district/borough level.

7.4.29 Habitat within the Coleshill Sewage Treatment Works and along the adjacent River Tame is used by common pipistrelle, soprano pipistrelle, occasional brown long-eared, noctule, Nathusius pipistrelle and *Myotis* species. A low density of trees with moderate potential to be used by roosting bats are located within land required for the construction of the Proposed Scheme although no confirmed tree or building roosts will be lost and loss of roosting opportunities will be limited. Key foraging habitat will be permanently lost within Coleshill Sewage Treatment Works, along the River Tame due to shading and loss within Coleshill Sewage Works Grassland LWS. However, these impacts will be localised and the River Tame will still be available as a commuting and foraging corridor during and following construction. These impacts are unlikely to lead to a permanent adverse effect on the conservation status of the assemblage of bats concerned and will not be significant.

7.4.30 Land at Water Orton supports a diverse assemblage of bats including: common pipistrelle, soprano pipistrelle, noctule, Myotis sp. and Leisler's bat. One confirmed transient non-breeding roost for common pipistrelle will be lost within land required for the construction of the Proposed Scheme due to the demolition of a building along Attleboro Lane. No other building roosts have been identified within Water Orton as there was limited access to buildings. However, it is likely that some buildings would provide roosting habitat for at least the common bat species: common pipistrelle and soprano pipistrelle. A low density of trees with high and moderate potential to be used by roosting bats were identified in hedgerows between Water Orton and the M42-M6 link. These trees are within land required for the construction of the Proposed Scheme and will be lost. The network of hedgerows south of Water Orton forms key commuting and foraging habitats away from the developed and urban areas. The network is likely to provide links to habitats along the River Tame and Parkhall, to the north-east, and to buildings within Water Orton which may support roosting bats. The overall character of this area limits the potential for habitats to support high densities of foraging/commuting bats due to urban development and surrounding motorways. The Proposed Scheme will result in the permanent loss and severance of commuting and foraging habitat. While the losses of habitat will be localised, this loss will increase the fragmentation of commuting and foraging habitats and reduce the foraging resource for bats. These impacts will lead to a temporary adverse effect on the conservation status on the assemblage of bats concerned that would be significant at the district/borough level.

7.4.31 The confirmed brown long-eared bat roost associated with Coleshill Manor Office Campus, which is a potential maternity roost, will not be lost. Adoption of measures within the draft CoCP will provide controls on noise and vibration which will act to limit disturbance and displacement of bats from this roost. These impacts are unlikely to lead to a permanent adverse effect on the conservation status of the population of brown long-eared bats and will not be significant.

7.4.32 The habitats around Coleshill Manor Office Campus are used by a diverse assemblage of bats including: common pipistrelle, soprano pipistrelle, brown long-eared bat, Leisler's, noctule and *Myotis* species. A low density of trees with high and moderate potential to be used by roosting bats are located within woodland and along hedgerows within land required for the construction of Proposed Scheme although no confirmed tree roosts will be lost and loss of roosting opportunities will be limited.

There will be a loss and severance of hedgerows and woodland habitat, including from Coleshill Park Belt LWS. There is limited occurrence of woodland habitats within the area and many of the smaller pockets of woodland would also be lost reducing the woodland foraging resource for bats. The overall character of this area limits the potential for habitats to support high densities of foraging/commuting bats as suitable habitats are relatively isolated from the wider countryside due to the presence of motorways and urban areas. These impacts will lead to a temporary adverse effect on the conservation status of the assemblage of bats concerned that will be significant at the district/borough level.

7.4.33 It is considered unlikely that any other effects on species receptors at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Other mitigation measures

7.4.34 This section describes additional measures designed to reduce or compensate for significant ecological effects.

7.4.35 Compensation for the loss of rush pasture and grassland from within Coleshill Sewage Works Grassland LWS, Coleshill Hall Farm LWS (7.2ha loss from both LWS) and from meadows along the banks of the River Cole will be approximately 17.3 ha of species-rich grassland. This will be created along the realigned banks of the River Cole on either side of the River Cole viaducts, with the majority being between the realigned Manor Drive and Gilson Drive. The target condition for these grasslands will be lowland meadows, a habitat of principal importance. Following establishment of these habitats, which will be expected to occur within 10 years, it is expected that any adverse impacts will be reduced to a level which will not result in any significant effect on the conservation status of the habitats concerned.

7.4.36 Compensation for the loss of woodland habitats within Coleshill Park Belt LWS will include 7.5ha of new woodland created close to the retained section of Coleshill Park Belt LWS to the east and west of the route of the Proposed Scheme, between Gilson Drive and the M42/M6 link. This woodland planting will increase the size of the retained fragments of The Catmore and the woodland along Green Lane and will reconnect these two woodlands. The target condition for the woodland planting will be lowland mixed deciduous woodland, a habitat of principal importance. In addition to the compensatory woodland described previously, the Proposed Scheme in this area will contain approximately 39.1ha of woodland and scrub planting. This planting will include a native diverse mix of woodland and scrub species. The amount of woodland and scrub habitat created will exceed the amount of woodland removed for construction of the Proposed Scheme in this area. Following establishment and maturity of the compensatory woodland habitats (assumed to be 50 years), it is expected that any adverse impacts will be reduced to a level which will not result in any significant effect on the conservation status of woodland habitats.

7.4.37 New hedgerow creation will be undertaken and connected habitat is provided within the landscaping of the Proposed Scheme to compensate for losses of wildlife corridors that are provided by hedgerows. There will be temporary adverse effects whilst the new hedges become established and mature. Following establishment and maturation of planting it is expected that any adverse impacts on hedgerows and the

wildlife corridors they create will be reduced to a level which will not result in any significant effect on the conservation status of the habitat.

7.4.38 Compensatory habitat to address impacts from loss of ponds and associated impacts on great crested newt and common amphibian populations will be provided within the ecological mitigation area to the south of Water Orton in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). This will include the provision of replacement ponds, terrestrial habitat and hibernation habitat sufficient to maintain the favourable conservation status of pond habitats and of the amphibian populations affected.

7.4.39 It is proposed that the loss of the population of notable plants from Coleshill Sewage Works Grassland LWS and from the four sites near Gilson would be mitigated through either the collection of seeds from the plants for dispersal within the ecological compensation areas or other retained areas, or by translocation of plants, in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-000-001/2). Following the implementation of the measures proposed it is expected that any adverse impacts on the populations of notable plants during the construction of the Proposed Scheme will be reduced to a level at which they will not result in any significant effect on the conservation status of the populations concerned.

7.4.40 There will be planting of riparian vegetation on realigned reaches of the River Cole to maintain cover for species such as otter where reasonably practicable. It is likely that there will still be temporary impacts on otter prior to full habitat maturation, although the effects on the conservation status of otter are unlikely to be significant due to the large size of otter territories and the relatively small stretches of watercourse affected.

7.4.41 Beneath the three consecutive viaduct locations crossing the River Tame, artificial cover, which could comprise continuous brash piles tethered to the bank to present the material washing away in flood conditions, will be used to encourage water voles to move along the wildlife corridors and reduce habitat severance effects on water voles. Any part of the seasonally flooded pools and associated drains within Coleshill Sewage Works Grassland LWS affected will be reinstated following construction to create habitats suitable for water vole. Although there may be temporary disturbance of water vole during construction, following construction and the implementation of the measures proposed it is expected that any adverse impacts on water vole will be reduced to a level at which they will not result in any significant effect on the conservation status of the species. However, there will remain a residual significant effect from viaducts shading the River Tame and associated habitats, which will be significant at a district/borough level.

7.4.42 Additional measures to those within the draft CoCP will be implemented to reduce disturbance impacts on roosting, foraging and commuting bats in accordance with the Principles of Ecological Mitigation identified in Volume 5: Appendix CT-001-000/2. Key features that are included in the Proposed Scheme to compensate for the impacts on foraging and commuting habitats for bats and to mitigate for habitat severance will include new planting along cutting slopes and embankments at Gilson, from the

realigned River Cole to the retained sections of woodland near Coleshill Manor Office Campus and south of Water Orton.

7.4.43 The ecological compensation areas along the banks of the realigned River Cole, adjacent to the retained section of Coleshill Park Belt LWS and south of Water Orton, will include habitats that will benefit foraging bats. Whilst the planting areas establish and mature, there will be a temporary impact from the loss of foraging and commuting habitat on bat assemblages associated with the River Cole, Coleshill Manor Office Campus and Water Orton. However, some bats will be able to use the planting areas for foraging and commuting prior to these habitats reaching maturity, as scrub habitat and young woodland can support invertebrates as a food source and be used as a navigable feature by bats. Following the implementation of the measures proposed it is expected that any adverse impacts on bats during the construction of the Proposed Scheme will be reduced to a level at which they will not result in any significant effect on the conservation status of the assemblage of bats using habitats along the River Cole, land at Water Orton and near Coleshill Manor Office Campus.

7.4.44 Mitigation measures to address the potential killing, injury and disturbance of badgers will be provided in accordance with the Principles of Ecological Mitigation identified in Volume 5: Appendix CT-001-000/2. This will include the provision of badger proof fencing and replacement setts where necessary.

7.4.45 There will be a permanent residual adverse effect on two barn owl territories due to loss of nest sites, foraging habitat, disturbance and displacement that will be significant at a county/metropolitan level. To offset the likely loss of barn owls from the vicinity of the Proposed Scheme, opportunities to provide barn owl nesting boxes in areas greater than 1.5km from the route will be explored with local landowners to enhance barn owl populations in existing habitats that will not be affected by the Proposed Scheme. It is considered likely that agreements with landowners can be reached and that with the implementation of these measures, the residual effect on barn owl will be reduced to a level that is not significant.

Summary of likely residual significant effects

7.4.46 The mitigation, compensation and enhancement measures described above reduce the effects to a level that is not significant, except for the shading of the River Tame and barn owl. The effects on barn owls would be offset if barn owl nest boxes could be located on suitable land.

7.5 Effects arising from operation

Avoidance and mitigation measures

7.5.1 The following measures have been included as part of the design of the Proposed Scheme and avoid or reduce impacts on features of ecological value:

- connectivity will be maintained for wildlife, including bats, due to the presence of the viaducts in the Coleshill Junction area. These spaces beneath viaducts will offer animals a way of passing beneath the route of the Proposed Scheme and will reduce the risk of collisions with trains. Planting is designed to encourage species such as bats to use these crossing points;
- the placement of the route within deep cutting east of Gilson will reduce the

risk of bat species crossing over the railway and colliding with moving trains and will reduce the potential for noise and visual disturbance from adjacent transient building roosts within Gilson; and

- cutting slopes along the railway will not include planting of woody species, which will therefore not encourage bats to use the slopes for foraging and commuting, thus further reducing the risk of collision with moving trains.

Assessment of impacts and effects

7.5.2 The noise made by passing trains has the potential to disturb birds within habitats close to the Proposed Scheme. Birds habituate to loud noises that they hear regularly and frequently, and hence it is considered that this will not generally cause significant effects. There is some evidence to suggest that breeding bird densities can be reduced where there is persistent noise from busy roads due to birds being unable to hear each-others songs. However, this is not expected to occur with the Proposed Scheme as the trains will pass quickly. The effect of train noise on breeding birds is therefore considered not to be significant.

7.5.3 The operation of the Proposed Scheme has the potential to result in a variety of impacts on bat populations including those as a result of collision with passing trains, turbulence and noise. The point at which such impacts are considered to result in a significant adverse effect on the conservation status of the population concerned will differ between species. As a consequence the following assessment of operational impacts takes into account the differing character and nature of the bat populations and/or assemblages concerned in determining the likely effects of the Proposed Scheme on each of these receptors.

7.5.4 Noise, vibration and lighting from passing trains have the potential to disturb bat species foraging and commuting within habitats close to the Proposed Scheme. Understanding of the impact of noise on bats caused by passing trains is limited. There is some evidence to suggest that gleaning bats, such as brown long-eared, will have reduced foraging success within areas where there is persistent noise from busy roads. However, noise generated from passing trains will be regular but temporary and as such will differ from that resulting from a busy road.

7.5.5 Due to the large areas over which bats forage it is likely that any loss of, or displacement from, suitable foraging habitat in the vicinity of the Proposed Scheme would in itself amount to only a small proportion of the wider available resource. However, the impact of any such disturbance or displacement could be greatly increased if bats are hampered in moving between breeding sites, hibernation sites and other roosts which they commonly utilise.

7.5.6 Where the route of the Proposed Scheme bisects, or is located in close proximity to existing features known to be utilised regularly by foraging or commuting bats, there is an increased risk that bats could be killed or injured as a result of collisions with passing trains or associated turbulence. The significance of any such effect will be dependent on both the flight habitat of the species or species concerned and the vertical alignment of the Proposed Scheme (i.e. is the railway in cutting, on embankment, on a viaduct, or at grade) at the point the impact occurs.

7.5.7 The following species, which could be at particular risk of collision with trains, have been identified within the area through surveys and desk study: Leisler's, noctule, pipistrelle, and brown long-eared. The mitigation measures that are included within the Proposed Scheme to reduce the impacts of habitat severance during construction will act to reduce the risk of collisions of bats with trains.

7.5.8 Three viaducts within this area will cross habitats used by foraging and commuting bats. Bats species may traverse across the route of the Proposed Scheme along the River Tame and River Cole as species commute along these watercourses. Most bat species will pass underneath bridge structures over water, provided they have a clearance height of 2m, with the exception of noctule, which prefer a minimum clearance of 6m[37]. The installation of viaducts with clearance above the River Tame and the River Cole of between approximately 6m and 11m will encourage bat species to cross beneath the route of the Proposed Scheme and reduce the risk of some bats flying up and over the structures and into the path of moving trains. Although there is a risk of individual bats being killed or injured by collision with trains, the impacts are unlikely to result in significant effects on the conservation status of the species concerned.

7.5.9 It is considered unlikely that any other effects at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-003.

Other mitigation measures

7.5.10 Additional elements designed to reduce or compensate for significant ecological effects are not required in this area.

Summary of likely residual significant effects

7.5.11 Taking into account mitigation, compensation and enhancement proposed, no residual significant ecological effects during operation are predicted.

[37] Highways Agency (2008), *Design Manual for Roads and Bridges (DMRB)*, Interim advice Note 116/08. Nature conservation in relation to bats. 2008 (Table 8.1).

8 Land quality

8.1 Introduction

8.1.1 This section presents the baseline conditions that exist along the Proposed Scheme in relation to land quality and reports the likely impacts and any significant effects resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, mining or mineral resources point of view, including: geological sites of special scientific interest (SSSI), local geological sites (LGS), areas of current underground or opencast mining and areas of designated mineral resources. Mitigation measures are presented and any residual effects are summarised.

8.1.2 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (for example contaminated soils may need to be removed or the construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment. In addition, a review has been undertaken to establish whether the operation of the Proposed Scheme will lead to contamination of its surrounding environment and what needs to be done to prevent such contamination.

8.1.3 The main environmental features of this area include: the River Cole, various Local Wildlife Sites (LWS) and widespread areas of sand and gravel and building stone, which represent identified mineral resources.

8.1.4 The main land quality issues in this area include the presence of the following within the land required for the construction and operation of the Proposed Scheme:

- Coleshill Gas Works historical landfill;
- Coleshill Sewage Treatment Works and associated former sludge beds; and
- one sand and gravel Mineral Safeguarding Area (MSA) covering much of the study area and two building stone MSA, which are more localised within the study area around Coleshill Hall Farm.

8.1.5 Details of baseline information and the land quality assessment methodology are outlined in the following appendices (presented in Volume 5):

- Appendix CT-001-000/1: the SMR and Appendix CT-001-000/2 the SMR Addendum; and
- Appendix LQ-001-019: Land quality appendix.

8.1.6 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 13 Water resources and flood risk assessment. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3, Section 14.

8.1.7 Engagement has been undertaken with North Warwickshire Borough Council (NWBC), Solihull Metropolitan Borough Council (SMBC) and the Environment Agency (EA) regarding contaminated land and with Warwickshire County Council (WCC) regarding mineral resources.

8.2 Scope, assumptions and limitations

8.2.1 The assessment scope, key assumptions and limitations for the land quality assessment are set out in Volume 1 and in the SMR and its addendum presented in Volume 5 (Appendices CT-001-000/1 andCT-001-000/2).This section follows the standard assessment methodology.

8.2.2 Baseline data were reviewed for the area of land required to construct the Proposed Scheme, together with a buffer extending out for a minimum of 250m, but in the case of groundwater data up to 1km. This is defined as the study area.

8.2.3 Areas of utility diversion works in existing highways have been excluded because, with respect to land quality issues, utility works within the highway are a low risk construction activity, as most of the excavation works will be within the highway construction layers, and reinstatement will be undertaken with highway construction materials.

8.2.4 Familiarisation visits to the study area were made in October 2012 where the location of the Proposed Scheme was viewed from points of public access only. In addition, visits to key sites have been undertaken to validate the data collected. Key sites are those which are considered to have the greatest potential for contamination and are considered to be at risk of being affected by the Proposed Scheme. Not all sites identified as a priority for inspection have been visited because of land access constraints. Site visits were undertaken to confirm documentary knowledge regarding the sites and the lack of complete site walkovers is considered unlikely to have substantially impacted the land quality assessment. Site visit notes are presented in Volume 5: Appendix LQ-001-019 Section 4.

8.3 Environmental baseline

Existing baseline

8.3.1 Unless stated otherwise, all features described in this section are presented on Maps LQ-054 to LQ-055 and LQ-066 (Volume 5, Map Book 19).

Geology

8.3.2 This section describes the underlying ground conditions within the study area. It first describes any made ground present, followed by near surface superficial deposits and lastly describes the deeper bedrock geology. The geological mapping is illustrated on Map WR-02-19 (Volume 5, Map Book 19).

8.3.3 The presence of made ground is not indicated on British Geological Survey (BGS) mapping, but there is likely to be made ground associated with the existing highways and railway lines that will be crossed by the Proposed Scheme and various small areas of infilling, including the infilled pits, infilled ponds and infilled domestic water wells scattered throughout the study area.

8.3.4 There are five (historical) landfills listed in the study area, which are assumed to consist of infilled ground.

8.3.5 Superficial Deposits intermittently underlie the areas traversed by the north chord and Birmingham spur lines, as well as the main line. The Proposed Scheme will pass through the following:

- granular material in the form of Glaciofluvial Deposits, which is generally present in areas of higher elevation with River Terrace Deposits occupying the river valley formed by the meandering course of the River Cole;
- Glaciolacustrine deposits, comprising predominantly cohesive material, which are present predominantly in areas of higher elevation;
- Alluvium, comprising clay, silt, sand and gravel, which is present on the floodplain of the River Cole; and
- Head Deposits, comprising clay, silt, sand and gravel resulting from downslope movement, which are present around Green Lane and at the western end of the Birmingham spur.

8.3.6 Bedrock of the Mercia Mudstone Group underlies the whole of the Proposed Scheme in the study area. The Mercia Mudstone Group is described as red and green-grey, mudstones and subordinate siltstones with widespread thin beds of gypsum/anhydrite. Intermittent layers of sandstone are also present within the Mercia Mudstone, including the Arden Sandstone that outcrops towards the south of the study area.

Groundwater

8.3.7 Bedrock of the Mercia Mudstone Group, which underlies the Proposed Scheme, is classified as a Secondary B aquifer. The Arden Sandstone is classified as a Secondary A aquifer.

8.3.8 Glaciofluvial Deposits, River Terrace Deposits and Alluvium are classified as Secondary A aquifers, Head Deposits are classified as a Secondary (undifferentiated) aquifer and Glaciolacustrine Deposits are classified as unproductive strata.

8.3.9 No groundwater source protection zones are present within the study area.

8.3.10 There are no licensed groundwater abstractions and seven unlicensed groundwater abstractions within the study area.

8.3.11 Further detail on the groundwater beneath the Proposed Scheme can be found in Section 13 Water resources and flood risk assessment.

Surface waters

8.3.12 The Proposed Scheme crosses the meandering course of the River Cole around Manor Drive and South Drive to the west of Coleshill. The River Tame marks the northern end of the Proposed Scheme in the study area.

8.3.13 Ponds and minor surface watercourses are located within the study area, some of which are crossed by the Proposed Scheme.

8.3.14 There are no licensed surface water abstractions within 1km of the Proposed Scheme.

8.3.15 Further information on surface waters is provided in Section 13 Water resources and flood risk assessment.

Current and historical land use

8.3.16 All potentially contaminated sites (identified from both current and historical land uses) are shown on maps LQ-01-054b to LQ-01-055 and LQ-01-066 (Volume 5: Map Book 19).

8.3.17 Potentially contaminative current land uses include Coleshill Sewage Treatment Works (Map LQ-01-055, A4), the Birmingham to Nuneaton Line (Map LQ-01-055, A6), Capitol Joinery timber yard on the B4114 Birmingham Road (Map LQ-01-054, B5) and a vehicle depot off the A446 Lichfield Road, east of Gilson (Map LQ-01-054, E5).

8.3.18 Historically the principal potentially contaminative land use was the Coleshill Gas Works and associated landfill (Map LQ-01-055, B4) located on the line of the Proposed Scheme in the north of the study area. Coleshill Gas Works was operational between the 1950's and 1980's and is also listed as an historical landfill that accepted industrial waste. Coleshill Gas Works is now predominantly developed as Coleshill Industrial Estate, although an area that has not been developed since the cessation of the gas works use will be crossed by the Proposed Scheme. Information from NWBC indicates that remediation works were undertaken at Coleshill Gas Works/landfill in the 1990s prior to the development of the industrial estate. However, no validation reports have been seen and a realistic and worst case scenario has been assumed that a full range of contaminants still remain in the undeveloped section of Coleshill Gas Works.

8.3.19 Other past potentially contaminative land uses include four other historical landfills, a former sewage works at Gilson (Map LQ-01-055, E6), which will be crossed by the Proposed Scheme; and a former cement works and coal block factory at the current Jack O'Watton industrial estate (Map LQ-01-066, G1)to the north-east of Water Orton, fronting A446 Lichfield Road.

8.3.20 There are also a number of infilled ponds within the study area, which may have been manually infilled with a variety of waste materials.

Other regulatory data

8.3.21 Regulatory data reviewed include pollution incidents, radioactive and hazardous substances consents and environmental permits (previously landfill, Integrated Pollution Control (IPC) and Integrated Pollution Prevention and Control (IPPC) licences). A number of these have been recorded in the study area, the most notable is a pollution incident, classified as a minor incident, which occurred in 1997 to the east of the area of land required to construct the Proposed Scheme in Coleshill Industrial Estate. It involved the accidental release of 2,500 litres of diesel to groundwater. Classification of the pollution incident as minor suggests that there is unlikely to be substantial residual contamination. Given the time elapsed since the incident and the location of the incident outside of the land required to construct the Proposed Scheme, it has not been included in any further assessment.

Mining/mineral resources

8.3.22 The Minerals Local Plan for Warwickshire[38] aims to safeguard parcels of land where there are mineral resources of economic or conservation value (Policies MPS1 and MPS5). The Warwickshire Minerals Development Framework (MDF) Core Strategy is currently in development.

8.3.23 There are no active mining or mineral sites or Preferred Areas (PA)[39] within the study area.

8.3.24 A sand and gravel MSA covers the majority of the study area and two building stone MSA will be crossed by the Proposed Scheme, one between the M6/M42 junction and Coleshill Hall Farm and the other immediately to the east of Coleshill Hall Farm. The latter building stone MSA also extends over a large area of Coleshill to the east of the Proposed Scheme. The two building stone MSA relate to the Arden Sandstone Formation which outcrops in these areas.

Geo-conservation resources

8.3.25 There are no geo-conservation resources identified within the study area.

Receptors

8.3.26 The sensitive receptors that have been identified within this study area are summarised in Table 12.

Table 12 Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents	High
		Workers	Moderate
	Controlled waters	Secondary A aquifers	High
		Secondary B aquifer	Moderate
		Secondary (undifferentiated) aquifer and unproductive strata	Low
		Rivers	High
		Other surface watercourses and water bodies	Moderate
	Built environment	Buildings and property	Low to high
		Underground structures and services	Low
	Mineral resources	Sand and gravel MSA	Moderate
		Building stone MSAs	Moderate
	Ecological	Local Wildlife Sites	Low

[38] Warwickshire County Council (1995), *Minerals Local Plan for Warwickshire*.
[39] Areas where mineral deposits are known to exist and where the county council considers there will be least planning objection to mineral extraction taking place.

Issue	Receptor type	Receptor description	Receptor sensitivity
Impacts on mining/mineral sites (severance and sterilisation of mineral sites)	Mining/mineral sites	Sand and gravel MSA	Moderate
		Building stone MSA	Moderate

Future baseline

8.3.27 There are currently no identified committed development sites within the study area which are likely to change the land quality baseline either prior to or during construction or operation of the Proposed Scheme. The sites described in Section 2.1 that are assumed to be built by 2017 are either too far away from the Proposed Scheme to alter land quality, or the developments will not alter the land use sufficiently to change the land quality baseline.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 The construction assessment takes into account the mitigation measures contained within the draft CoCP (Volume 5: Appendix CT-003-000/1). The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme. Its requirements in relation to work in contaminated areas will ensure the effective management and control of the work. Such requirements include the following (Volume 5: Appendix CT-003-000/1):

- methods to control noise, waste, dust, odour gases and vapours (draft CoCP Sections 5, 7, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (draft CoCP Section 5);
- the management of human exposure for both construction workers and people living and working nearby (draft CoCP Section 11);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (draft CoCP Sections 7 and 15);
- management of any unexpected contamination found during construction (draft CoCP Section 11);
- a post remediation permit to work system (draft CoCP Section 11);
- storage requirements for hazardous substances such as oil (draft CoCP Section 16); and
- a requirement for contractors to pay due consideration to the impacts of extreme weather events and related conditions which may affect land quality during construction (draft CoCP Section 5).

8.4.2 The draft CoCP requires that a programme of further investigations, which may include both desk based and site based work, will take place in order to confirm the full extent of areas of contamination and a risk assessment undertaken to determine what, if any, site specific remediation measures will be required to allow the Proposed

Scheme to be constructed safely and to prevent harmful future migration of contaminants (draft CoCP, Section 11). The investigation and assessment of potentially contaminated sites will be undertaken in accordance with:

- Environment Agency CLR11 'Model Procedures for the Management of Land Contamination' (2004)[40]; and
- British Standard BS10175 'Investigation of Potentially Contaminated Sites' (2011)[41].

8.4.3 Where significant contamination is encountered, a remedial options appraisal will be undertaken to define the most appropriate remediation techniques. This appraisal will be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with Sustainable Remediation Forum UK's publication A Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010)[42]. The preferred option will then be developed into a remediation strategy, in consultation with regulatory authorities prior to implementation.

8.4.4 Contaminated soils excavated from the site, wherever feasible, will be treated as necessary to remove or render any contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation methods, soil washing and bio-remediation to remove oil contaminants. Contaminated soil disposed of off-site will be taken to a soil treatment facility, another construction site (for treatment, as necessary, and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

8.4.5 The majority of the Proposed Scheme through the study area will be constructed on embankment with viaducts crossing surface watercourses, roads and the Birmingham to Nuneaton Line. Parts of the Proposed Scheme will be constructed in cutting at Water Orton and Gilson.

8.4.6 Construction works will include earthworks, utility diversions, deep foundations, temporary dewatering and other activities. In addition, road infrastructure works will also be required for the Proposed Scheme in the Coleshill Junction area.

8.4.7 Construction compounds for the Coleshill Junction area will be located at various points along the Proposed Scheme (Section 2.3). The compounds will include maintenance facilities for plant and machinery and fuel storage in bunded tanks.

Land contamination

8.4.8 In line with the assessment methodology, as set out in the SMR and SMR addendum, an initial screening process was undertaken (identified in the methodology as Stages A and B) to identify areas of current or historical contaminative use within the study

[40] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination.*
[41] British Standard BS10175 (2011), *Investigation of Potentially Contaminated Sites.*
[42] Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. In total, 56 areas were considered during this screening process; 24 of these areas were taken forward to more detailed risk assessments (Stages C and D), in which the potential risks were assessed more fully. The majority of the areas undergoing the more detailed risk assessments were infilled domestic water wells, infilled ponds and infilled pits. All areas assessed are shown on Maps LQ-01-054b to LQ-01-055 and LQ-01-066 (Volume 5, Map Book 19) and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

8.4.9 Conceptual site models (CSM) have been produced for the 24 areas taken to Stage C and D assessments. The detailed CSM are provided in Volume 5 (Appendix LQ 001-019, Section 3) and the results of the baseline risk assessments are summarised in this section. Potentially contaminated areas have been grouped and considered together, where appropriate. The following factors have determined the need for Stage C and D assessments:

- whether the area is within or beyond the area of land required for the construction of the Proposed Scheme or associated offline works; e.g. road realignments;
- the vertical alignment, i.e. whether the Proposed Scheme is in cut or on embankment;
- the presence of underlying Principal or Secondary A aquifers or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

8.4.10 A summary of the baseline CSM are provided in Table 13. The impacts and baseline risks quoted are before any mitigation is applied.

8.4.11 The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, it is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists.

Table 13: Summary of baseline CSM* sites which may pose a contaminative risk for the Proposed Scheme

** Each area is assigned a unique identification number (see Volume 5, Appendix LQ-001-019).
*** The moderate or high risks identified reflect the uncertainty in existing baseline information. Whilst there are unlikely to be properties or receptors that experience the reported high or moderate existing baseline risk in the absence of site investigation a precautionary, worst case risk is reported in the table.

Area ref**	Area name (map)	Main potential impacts	Main baseline risk***
19-05	Woodlands Cemetery historical landfill (LQ-01-055, H8)	Potential impact to human health on-site, groundwater and property receptors.	Low
19-07	Former sewage works at Gilson (LQ-01-055, E6)	Potential impact to groundwater receptor.	Low
19-08	Infilled pond (LQ-01-055, D5)	Potential impact to property receptor.	Low

Area ref**	Area name (map)	Main potential impacts	Main baseline risk***
19-10 and 19-13	Grimstock Hill historical landfill and Trajan Hill historical landfill (LQ-01-055, D4 and C4)	Potential impact to human health on-site and off-site and property receptors.	Moderate/low
19-12	Former garage (LQ-01-055,C4)	Potential impact to human health on-site and off-site, groundwater an property receptors.	Low
19-15	Infilled pond (LQ-01-055, D6)	Potential impact to human health off-site, and property receptors.	Low
19-16	Infilled pond (LQ-01-055, A5)	Potential impact to human health on-site and off-site, groundwater and property receptors.	Low
19-17	Coleshill Gas Works historical landfill (LQ-01-055, B4)	Potential impact to human health on-site and property receptors.	Moderate/low
19-18	Vehicle depot (LQ-01-054, E5)	Potential impact to human health on-site and off-site, and groundwater receptors.	Low
19-20	Timber yard, formerly a saw mill (LQ-01-054, B5)	Potential impact to human health on-site and off-site, groundwater and controlled water receptors.	Low
19-24	Birmingham to Nuneaton Line (LQ-01-055, A6)	Potential impact to human health off-site and groundwater receptors.	Low
19-25	Coleshill Sewage Treatment Works (LQ-01-055, A4)	Potential impact to human health on-site and off-site and groundwater receptors.	Low
19-26	Coleshill Water Reclamation Works historical landfill (LQ-01-055, A3)	Potential impact to human health on-site and property receptors.	Moderate/low
19-27	Former Coleshill Hall Hospital with former tank (LQ-01-066, H8)	Potential impact to human health on-site and groundwater receptors.	Low
19-35	Electricity substation (LQ-01-066, H7)	Potential impact to human health on-site and off-site, groundwater and property receptors.	Low
19-38	Infilled pond (LQ-01-066, B5)	Potential impact to human health off-site, groundwater and property receptors.	Low
19-40	Infilled pond (LQ-01-066, E5)	Potential impact to human health off-site, groundwater and property receptors.	Low
19-43	Infilled pond (LQ-01-066, E4)	Potential impact to human health off-site, groundwater and property receptors.	Low
19-45	Infilled pond (LQ-01-066, F4)	Potential impact to groundwater and property receptors.	Low
19-46	Infilled pond (LQ-01-055, B6)	Potential impact to groundwater and property receptors.	Low
19-49	Former works including coal and cement block factories now Jack O'Watton Business park (LQ-01-066, G1)	Potential impact to human health on-site and off-site and groundwater receptors.	Low
19-52	Infilled pit (LQ-01-056, H7)	Potential impact to groundwater and property receptors.	Low

Area ref**	Area name (map)	Main potential impacts	Main baseline risk***
19-56	Infilled pond (LQ-01-055, A5)	Potential impact to groundwater and property receptors.	Low

*CSM have been prepared as part of the detailed land contamination methodology (refer to Volume 5) for baseline, construction and post-construction.

Temporary effects

8.4.12 An assessment of the effects of contamination has been undertaken by comparing the CSMs developed for potential contaminated areas at baseline, construction and post construction stages. The baseline and construction CSMs have been compared to assess effects at the construction stage.

8.4.13 Table 14 presents the summary of the construction effects obtained from a comparison of the baseline and construction impacts. The construction risk assessment has taken into account the requirements of the draft CoCP to which construction will adhere. The details of these comparisons are presented in Volume 5 (Appendix LQ 001-019).

8.4.14 The baseline and construction CSM have been compared to determine the change in level of risk to receptors during the construction stage, and thus to define the level of effect at the construction stage. Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is assessed to remain as high. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.

Table 14: Summary of temporary (construction) effects

Area ref.	Area name (map)	Main baseline risk	Main construction risk*	Temporary effect and significance
19-05	Woodlands Cemetery historical landfill (LQ-01-055, H8)	Low	Low	Negligible (not significant)
19-07	Former sewage works at Gilson (LQ-01-055, E6)	Low	Moderate/low	Negligible to minor adverse (not significant)
19-08	Infilled pond (LQ-01-055, D5)	Low	Low	Negligible (not significant)
19-10 and 19-13	Grimstock Hill historical landfill and Trajan Hill historical landfill (LQ-01-055, D4 and C4)	Moderate/low	Moderate/low	Negligible (not significant)
19-12	Former garage (LQ-01-055,C4)	Low	Low	Negligible (not significant)
19-15	Infilled pond (LQ-01-055, D6)	Low	Low	Negligible (not significant)
19-16	Infilled pond (LQ-01-055, A5)	Low	Low	Negligible (not significant)
19-17	Coleshill Gas Works historical landfill (LQ-01-055, B4)	Moderate/Low (human health on-site and property receptors)	Moderate/Low (human health on-site and property receptors and groundwater)	Negligible to minor adverse (not significant)

Area ref.	Area name (map)	Main baseline risk	Main construction risk*	Temporary effect and significance
19-18	Vehicle depot (LQ-01-054, E54)	Low	Low	Negligible (not significant)
19-20	Timber yard, formerly a saw mill (LQ-01-054, B5)	Low	Moderate/Low	Negligible to minor adverse (not significant)
19-24	Birmingham to Nuneaton Line (LQ-01-055, A6)	Low	Low	Negligible (not significant)
19-25	Coleshill Sewage Treatment Works (LQ-01-055, A4)	Low	Moderate/low	Minor adverse (not significant)
19-26	Coleshill Water Reclamation Works historical landfill (LQ-01-055, A3)	Moderate/low	Moderate/low	Negligible (not significant)
19-27	Former Coleshill Hall Hospital with former tank (LQ-01-066, H8)	Low	Low	Negligible (not significant)
19-35	Electricity substation (LQ-01-066, H7)	Low	Low	Negligible (not significant)
19-38	Infilled pond (LQ-01-066, B5)	Low	Low	Negligible (not significant)
19-40	Infilled pond (LQ-01-066, E5)	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
19-43	Infilled pond (LQ-01-066, E4)	Low	Low	Negligible (not significant)
19-45	Infilled pond (LQ-01-066, F4)	Low	Low	Negligible (not significant)
19-46	Infilled pond (LQ-01-055, B6)	Low	Moderate/low (groundwater)	Minor adverse (not significant)
19-49	Former works including coal and cement block factories now Jack O'Watton Business park (LQ-01-066, G1)	Low	Low	Negligible (not significant)
19-52	Infilled pit (LQ-01-056, H7)	Low	Low	Negligible (not significant)
19-56	Infilled pond (LQ-01-055, A5)	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)

* The low/moderate main construction risk identified in the above table does not necessarily imply an unacceptable risk. Application of the processes and measures within the CoCP will ensure that site risks during the construction stage are controlled.

8.4.15 Table 14 indicates that based upon the assessment, no significant effects have been identified during the construction phase in relation to potential land contamination. However, temporary risks to groundwater have been identified from the following potential sources of contamination:

- the former sewage works adjacent to Gilson Drive, which will be crossed by the Proposed Scheme;

- Coleshill Gas Works historical landfill, which will be crossed by the Proposed Scheme;
- the Capitol Joinery timber yard and former saw mill fronting the B4114 Birmingham Road, which will be demolished as the site will be crossed by the Proposed Scheme;
- Coleshill Sewage Treatment Works and associated former sludge beds, which are partially within the area of land required for the construction and operation of the Proposed Scheme; and
- infilled ponds (ref nos. 19-40, 19-46 and 19-56).

8.4.16 These risks relate to the temporary mobilisation of contaminants during construction potentially allowing an increase in migration of contaminants to groundwater. The risks are assessed as temporary minor adverse effects.

8.4.17 Construction compounds located in this study area will include staff welfare facilities, maintenance facilities for plant and machinery and fuel storage in bunded tanks. Construction compounds will store and use potentially contaminative materials such as fuels, oils and solvents and the measures outlined in the draft CoCP will manage risks from the storage of such materials.

8.4.18 The main and satellite construction compounds may also be used for temporary storage of potentially contaminated soils. The mitigation measures outlined in the draft CoCP will manage potential risks from the storage of such materials. The location of these construction compounds is given in Section 2.3.

8.4.19 It is considered unlikely that additional remediation works will be required over and above the mitigation measures contained as standard within the draft CoCP.

8.4.20 There are anticipated to be no significant cumulative temporary effects from construction.

Permanent effects

8.4.21 Baseline and post-construction CSM have been compared to assess the permanent (post-construction) effects. The post-construction CSM assumes that all the required remediation has been carried out and validated.

8.4.22 Table 15 includes the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these are significant. The details of these comparisons are presented in Volume 5 (Appendix LQ 001-019).

Table 15: Summary of permanent (post-construction) effects

Area ref.	Area name (map)	Main baseline risk	Main post-construction risk	Post-construction effect and significance
19-05	Woodlands Cemetery historical landfill (LQ-01-055, H8)	Low	Low	Negligible (not significant)
19-07	Former sewage works at Gilson (LQ-01-055, E6)	Low	Very low to Low	Negligible to minor beneficial(not significant)

Area ref.	Area name (map)	Main baseline risk	Main post-construction risk	Post-construction effect and significance
19-08	Infilled pond (LQ-01-055, D5)	Low	Low	Negligible (not significant)
19-10 and 19-13	Grimstock Hill historical landfill and Trajan Hill historical landfill (LQ-01-055, D4 and C4)	Low	Low	Negligible (not significant)
19-12	Former garage (LQ-01-055,C4)	Low	Low	Negligible (not significant)
19-15	Infilled pond (LQ-01-055, D6)	Low	Low	Negligible (not significant)
19-16	Infilled pond (LQ-01-055, A5)	Low	Low	Negligible (not significant)
19-17	Coleshill Gas Works historical landfill (LQ-01-055, B4)	Moderate/low	Moderate/low	Negligible (not significant)
19-18	Vehicle depot (LQ-01-054, E5)	Low	Low	Negligible (not significant)
19-20	Timber yard, formerly a saw mill (LQ-01-054, B5)	Low	Very low	Negligible to minor beneficial (not significant)
19-24	Birmingham to Nuneaton Line (LQ-01-055, A6)	Low	Low	Negligible (not significant)
19-25	Coleshill Sewage Treatment Works (LQ-01-055, A4)	Low	Low	Negligible (not significant)
19-26	Coleshill Water Reclamation Works historical landfill (LQ-01-055, A3)	Moderate/low	Moderate/low	Negligible (not significant)
19-27	Former Coleshill Hall Hospital with former tank (LQ-01-066, H8)	Low	Low	Negligible (not significant)
19-35	Electricity substation (LQ-01-066, H7)	Low	Low	Negligible (not significant)
19-38	Infilled pond (LQ-01-066, B5)	Low	Low	Negligible (not significant)
19-40	Infilled pond (LQ-01-066, E5)	Low	Very low	Negligible to minor beneficial (not significant)
19-43	Infilled pond (LQ-01-066, E4)	Low	Low	Negligible (not significant)
19-45	Infilled pond (LQ-01-066, F4)	Low	Low	Negligible (not significant)
19-46	Infilled pond (LQ-01-055, B6)	Low	Very low	Negligible to minor beneficial (not significant)
19-49	Former works including coal and cement block factories now Jack O'Watton Business park (LQ-01-066, G1)	Low	Low	Negligible (not significant)
19-52	Infilled pit (LQ-01-056, H7)	Low	Low	Negligible (not significant)

Area ref.	Area name (map)	Main baseline risk	Main post-construction risk	Post-construction effect and significance
19-56	Infilled pond (LQ-01-055, A5)	Low	Very Low	Negligible to minor beneficial (not significant)

8.4.23 The magnitude of the permanent effects and their significance have been determined by calculating the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.

8.4.24 Table 15 shows that the Proposed Scheme results in either a reduction or no change in the level of risk already existing at each site for both on site and off site receptors.

8.4.25 Table 15 indicates that, based on the assessment, no significant effects have been identified in relation to potential land contamination. However, following remediation, there will be overall negligible to minor beneficial impacts. Depending on the type of remediation undertaken, the beneficial effect could include an improvement in groundwater quality, the breaking of a ground gas migration pathway or the reduction in the volume of contaminants present in the soil.

8.4.26 As an example, a minor beneficial effect has been identified where the timber yard, which lies on the route of the Proposed Scheme, will be demolished during construction. Contaminated material encountered will be removed or remediated, which will prevent/minimise further leaching to groundwater. The result is a minor beneficial effect in this location.

8.4.27 There are anticipated to be no significant cumulative permanent effects.

Mining/mineral resources

8.4.28 Construction of the Proposed Scheme has the potential to impact existing mineral resources. This could occur by sterilisation of the resource, direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[43] that may occur during the construction phase of the Proposed Scheme, possibly continuing through to the operation.

Temporary effects

8.4.29 A small area of the sand and gravel MSA within the study area will be used as a main construction compound then returned to the landowner and temporary sterilisation will occur here. However the majority of the area of this MSA within the study area and the areas of the two building stone MSA within the study area will be retained by HS2 and are subject to permanent effects, which are described in the following section.

[43] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site.

Permanent effects

8.4.30 There will be a negligible effect on the sand and gravel MSA and the building stone MSA located to the east of Coleshill Farm. The effects on these resources are assessed as not significant because there will only be partial losses of the large local resources. The building stone MSA between the M6/M42 junction and Coleshill Farm will be crossed by the Proposed Scheme and there will be a partial loss of this smaller resource. The effect on this MSA is assessed as minor adverse.

8.4.31 Table 16 presents a summary of the assessment of effects on the mining and mineral resources identified.

Table 16: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance
Area generally extending eastwards from the Birmingham conurbation	Mineral safeguarding area	Mineral Safeguarding Area for sand and gravel extraction. The Proposed Scheme passes through the western edge of the MSA	Moderate	Minor	Negligible (not significant)
Area between the M6/M42 junction and Coleshill Farm	Mineral safeguarding area	Mineral Safeguarding Area for building stone extraction.	Moderate	Moderate	Minor adverse (not significant)
Area to the east of Coleshill Farm	Mineral safeguarding area	Mineral Safeguarding Area for building stone extraction.	Moderate	Minor	Negligible (not significant)

8.4.32 There are anticipated to be no significant permanent effects from operation on the mineral resources. The cumulative effects on mineral resource across the whole of the Proposed Scheme are discussed in the assessment of route wide effects presented in Volume 3.

Geo-conservation resources

8.4.33 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

8.4.34 At this stage, no additional mitigation measures are considered necessary to mitigate risks from land contamination at the construction phase beyond those set out in the draft CoCP and instigated as part of required remediation strategies. In addition to the excavation and treatment of contaminated soils, it may also be necessary to install ground (landfill) gas and leachate control systems at Coleshill Gas Works historical landfill, on a temporary or permanent basis, to ensure that ground (landfill) gas and leachate migration pathways are controlled and do not adversely affect the Proposed Scheme or the wider environment as a consequence of the Proposed Scheme.

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

Summary of likely residual significant effects

8.4.36 No likely residual significant adverse effects are anticipated with the application of the mitigation measures described.

8.5 Effects arising from operation

8.5.1 Users of the Proposed Scheme (i.e. rail passengers), whilst within trains, will at all routine times within a controlled environment, and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

8.5.2 Maintenance and operation of the Proposed Scheme will be in accordance with environmental legislation and good practice whereby appropriate spillage and pollution response procedures will be established.

Assessment of impacts and effects

8.5.3 Gilson Road auto-transformer station will be situated to the east of the main line, to the south of the existing B4117 Gilson Road, part of which will be retained for access. An auto-transformer station can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, the proposed auto-transformer station, in common with other modern substations, will use secondary containment appropriate to the level of risk.

8.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

8.5.5 It is unlikely that there will be any cumulative effects on land quality of in-combination effects on receptors because of the environmental controls that will be placed on operational procedures.

Other mitigation measures

8.5.6 No other mitigation measures will be required beyond what has already been outlined relating to land quality in the Coleshill Junction study area.

8.5.7 There may be ongoing monitoring requirements following remediation works carried out during construction. Such monitoring, including monitoring of groundwater quality or ground gas, could extend into the operational phase of the Proposed Scheme.

Summary of likely residual significant effects

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

9 Landscape and visual assessment

9.1 Introduction

9.1.1 This section reports the assessment of the likely significant landscape and visual effects. It starts by summarising the baseline conditions found within and around the route of the Proposed Scheme and goes on to describe the significant effects that will arise during construction and operation on landscape character areas (LCAs) and visual receptors.

9.1.2 In this section, the operational assessment section refers not just to the running of the trains but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

9.1.3 Principal landscape and visual issues in the area include:

- temporary landscape and visual effects arising during construction from the presence of construction plant, construction compounds, removal of existing vegetation, severance of agricultural land and the construction of the Proposed Scheme; and
- permanent landscape and visual effects arising during operation from the presence of new engineered landforms cutting across the existing landscape, new viaducts, noise fence barriers, highway infrastructure, overhead line equipment and regular passing of high speed trains. In the main, such effects will reduce over time as planting establishes as part of the Proposed Scheme matures.

9.1.4 A separate but related assessment of effects on the setting of heritage assets is included in Section 6 – Cultural Heritage. Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented Volume 5: Appendix LV-001-019, which comprises the following:

- Part 1 – Engagement with technical stakeholders;
- Part 2 – Environmental baseline report;
- Part 3 – Assessment matrices; and
- Part 4 – Schedule of non-significant effects.

9.1.5 The extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages has been discussed with Warwickshire County Council (WCC), North Warwickshire Borough Council (NWBC) and Solihull Metropolitan Borough Council (SMBC). Summer field surveys, including photographic studies of LCAs and visual assessment of viewpoints, were undertaken from May to October 2012 and from May to July 2013. Winter surveys were undertaken from November 2012 to March 2013.

9.2 Scope, assumptions and limitations

9.2.1 The assessment scope, key assumptions and limitations for the landscape and visual assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-0001-000/1)

and the SMR Addendum (Volume 5: Appendix CT-0001-000/2). This report follows the standard assessment methodology.

9.2.2 The study area has been informed by the construction and operational phase zones of theoretical visibility (ZTV), which are shown in Volume 5, Map Book – Landscape and visual assessment, Maps LV-07-082 to LV-07-084a, LV-07-098; LV-08-082 to LV-08-084a and LV-08-098. The ZTV has been produced in line with the methodology described in the SMR Addendum (Volume 5: Appendix CT-001-000/2), and is an indication of the theoretical visibility of the Proposed Scheme. In some locations, such as along the M6 Toll and road networks within the area, the lack of data on vegetation cover may mean the actual visibility is substantially less than shown in the ZTV. Tall construction plant (e.g. cranes and piling rigs) are excluded from the ZTV for the construction phase and overhead line equipment is excluded from the ZTV for the operational phase, but these are described and taken into account in the assessment of effects on landscape character areas and visual receptors.

9.2.3 LCAs and visual receptors within approximately 2km of the Proposed Scheme have been assessed.

Limitations

9.2.4 During the baseline survey there were some areas which were inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement has been used to approximate the likely views from these locations.

9.3 Environmental baseline

Existing baseline

Landscape baseline

9.3.1 The meandering River Cole and River Tame have formed a broad and generally undulating, low lying valley that was formerly parkland and farmland. There are currently a variety of land uses across the area, with agriculture and industry and settlements at Coleshill, Water Orton and Smiths Wood, east Birmingham. These settlements exhibit a range of building styles, which overall include conservation areas, modern high rise buildings and residential estates.

9.3.2 The valley is crossed by numerous major transport corridors, including the M42/M6 Toll, the M6 and the railways referred to as the Birmingham to Nuneaton and Birmingham and Derby Lines. The area is also crossed by many National Grid overhead power lines. Vegetation patterns include hedgerows and narrow groups of mature trees along the river banks and transport corridors, with a greater density of small woodland blocks around the Coleshill Manor Office Campus. A limited network of PRoW crosses the CFA, mainly linking settlements with connections over and under the transport corridors.

9.3.3 The LCA within the area have been identified through reference to Natural England's National Character Areas (NCA)[44], Warwickshire Landscape Guidelines[45], The North Warwickshire Landscape Character Assessment[46] (NWLCA), and the Solihull Countryside Strategy: First Review 2010-2020[47]. The Warwickshire, Coventry and Solihull Sub-Regional Green Infrastructure Strategy[48] has also been referred to.

9.3.4 Descriptions of all LCAs are provided in Volume 5: Appendix LV-001-019 (Part 2). For the purposes of this assessment the study area has been sub-divided into nine discrete LCA, three of which are most likely to be affected. A summary of these LCAs is provided below. The LCAs are shown in Volume 5: Map Book – Landscape and visual assessment, Maps LV-02-082 to LV-02-04-084 and LV-02-04-098.

M42 Corridor LCA

9.3.5 The majority of this LCA is located within the Birmingham Interchange and Chelmsley Wood area (CFA24). Within the Coleshill Junction area, the LCA is located to the south of the study area. The LCA is defined by the M6 and M42, adjacent roadside vegetation and a generally flat landform of open fields. The fields are small to medium scale and divided by hedgerows. These fields and the roadside vegetation are generally in good condition. Due to the presence of vehicles and motorway lighting, the tranquillity is low. There are several PRoW and therefore the LCA is valued at a local level. The LCA has a low sensitivity to change.

Cole Valley LCA

9.3.6 The LCA has been derived from the NWLCA. The landform of the LCA is defined by a broad valley with gently undulating terrain. The former historic parkland landscape has been fragmented by development, such as the Lakeside Industrial Park on Marsh Lane, the major transport routes of the M6, M6 Toll and M42, infrastructure such as National Grid overhead power lines and rail lines. The north of the LCA retains a rural character, comprising predominantly arable fields bounded by sparse but trimmed hedgerows and less development, including Coleshill Manor Office Campus, a number of residences and Coleshill Manor Farm. The narrow River Cole meanders across the LCA with mature trees along sections of its banks. The Belt, The Catmore, the Duck Decoy and Woodlands Cemetery are small belts or blocks of mainly deciduous woodland in the parkland landscape around the Coleshill Manor Office Campus. These woodlands and the hedgerows are relatively well maintained and in a fair condition.

9.3.7 The tranquillity of the LCA is considered to be low due to the busy, major transport routes and the substantial levels of light spill from these and the surrounding settlements, including Chelmsley Wood, Smith's Wood and Coleshill. Several PRoW cross between these settlements and circulate around the Coleshill Manor Office

[44] Natural England, *NCA Profile: 97 Arden (NE337),* http://www.naturalengland.org.uk/publications/nca/default.aspx, accessed: 2012.
[45] Warwickshire County Council and The Countryside Commission (1993), *The Warwickshire Landscape Guidelines,* Warwickshire County Council, Warwick.
[46] North Warwickshire Borough Council (August 2010), *Landscape Character Assessment Final Report*, http://www.northwarks.gov.uk/downloads/file/3746/final_report_august_2010, accessed 2012.
[47] Solihull Metropolitan Borough Council, *Solihull's Countryside Strategy*: First Review 2010-2020, http://www.solihull.gov.uk/Attachments/countsidestrategyfirstrev1.pdf, accessed: 2012.
[48] Warwickshire County Council (2013), *The Warwickshire, Coventry & Solihull Sub-Regional Green Infrastructure Strategy* (Consultation Draft February 2013).

Campus and woodlands. The LCA is within designated green belt and, when considered with the PRoW network, is likely to be valued at a regional level. However, as a result of the extensive fragmentation of the landscape, the fair condition and its low tranquillity, this area has a medium sensitivity to change.

River Tame Floodplain LCA

9.3.8 The majority of this LCA is located within the Castle Bromwich and Bromford area (CFA25). Within the Coleshill Junction area, the LCA is located in the north-west of the study area and defined by a narrow tract of generally flat landform between the M6, Castle Vale and Minworth. As a result of these surrounding land usages the LCA is largely inaccessible. The LCA is crossed by the narrow meandering River Tame with bordering wetlands and narrow extents of woodlands. Of these, Parkhill and Parkhall Woods are ancient woodland. These elements are in fair condition. The LCA is crossed by the Birmingham and Derby and Birmingham to Nuneaton Lines and National Grid overhead power lines, therefore the tranquillity is low. The LCA is designated green belt and therefore of regional value. Overall the LCA has a high sensitivity to change.

Visual baseline

9.3.9 Descriptions of the identified representative viewpoints are provided in Volume 5: Appendix LV-001-019 Part 2. A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are shown in Volume 2: CFA19 Map Book, Maps LV-03-082 to LV-03-084a, LV-03-098 and LV-04-082 to LV-04-084a and LV-04-098. The viewpoints are numbered to identify their locations. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport and 6: Employment.

9.3.10 No protected views have been identified within the study area.

9.3.11 Residential receptors have a high sensitivity to change and are located on the edges of Chelmsley Wood, Coleshill, Gilson, Water Orton and high rise buildings in Smith's Wood, in addition to isolated groups of properties throughout the study area. In general, views from these receptors include a mixture of transport, rural elements and other infrastructure including National Grid overhead power lines. The combination of gently undulating landform with hedgerows or belts of vegetation along transport corridors, limits the extent of views.

9.3.12 Recreational receptors, also with a high sensitivity to change, use the PRoW throughout the study area. The viewpoints identified along the PRoW network are typically located in residential or agricultural locations, often crossing or close to transport routes.

9.3.13 Viewpoints representative of the views of people travelling along scenic roads (roads not managed by the Highways Agency), include the B4117 Gilson Road, the A446 Lichfield Road, the B4114 Birmingham Road and the B4118 Birmingham Road/Water Orton Road. These have a medium sensitivity to change with existing views characterised by fields, hedgerows or mature roadside vegetation.

Future baseline

9.3.14 A summary of the committed developments which are assumed to be built and occupied prior to either the construction or operation of the Proposed Scheme is provided below, along with the consequential effect on the character of LCAs and nature of views. Developments which would introduce new visual receptors which may be significantly affected are also described. These developments are shown in Volume 5: Map Book – Cross topic, Maps CT-13-054, 055 and 066.

Construction (2017)

9.3.15 There are no committed developments identified for the area that would introduce new visual receptors or changes to the sensitivity of the identified LCAs.

Operation (year 1 – 2026)

9.3.16 There are no committed developments identified for the area that would be constructed in the same timeframe as the Proposed Scheme.

9.4 Temporary effects arising during construction

9.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible in many locations and will have the potential to give rise to significant temporary effects which cannot be mitigated practicably. Such effects are temporary and vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main civil engineering works will take place, including establishment of compounds, main earthworks and structure works. The effects associated with the peak construction phase in this CFA will generally be considered to be long term given the construction programme (see Section 2.3). Overall, civil engineering works in this CFA will be undertaken between the start of 2017 and the end of 2022. The M6 motorway main compound will be in place for approximately five years. Satellite compounds will be in place for between approximately one and a half years and five years. The civil engineering works at most individual sites along the route in this area will occur for a period of between approximately two years and six years. Effects during other phases of works are likely to be lesser due to less construction equipment being required at the time and a reduced intensity of construction activity.

9.4.2 The construction works that have been taken into account in determining the effects on landscape and visual receptors include:

- general earthworks, vegetation removal, modification of landform, construction of balancing ponds, relocation of National Grid overhead power lines and the presence of construction plant and compounds;
- construction of the Coleshill no. 1 embankment and the M6 motorway viaducts (south and north) and M6 motorway box structure;
- construction of the Coleshill no. 2 embankment; construction of the Coleshill west viaduct and construction of the viaducts carrying the Birmingham spur;

- construction of the B4114 Birmingham Road underbridge and Coleshill no. 3 embankment;
- construction of the River Cole east and west viaducts; Birmingham spur (including Green Lane embankment); realignment of the River Cole, including removal of vegetation, and realignment of Manor Drive;
- construction of the Birmingham spur diveunder, M42 Coleshill box structure and M42 Coleshill viaducts (south and north);
- construction of the Gilson embankment; Gilson Road retaining wall; realignment of the B4117 Gilson Road and construction of the Gilson Road auto-transformer station;
- construction of Gilson cutting, hedgerow removal from the fields east of Gilson and construction of Footpath M62 overbridge;
- construction of the Lichfield Road embankment, Chattle Hill box structure and Watton House south embankment;
- construction of the Water Orton no. 4 viaduct, Watton Lane embankment, Watton House north embankment, River Tame west and east viaducts and Water Orton no. 1 and no. 3 viaducts;
- removal of vegetation within The Belt (woodland belt) and adjacent to Manor Drive;
- construction of the M42-M6 motorway link viaducts (east and west);
- construction of the Attleboro Farm embankment and Attleboro flyover; realignment of Attleboro Lane and the construction of the Attleboro Lane overbridge;
- construction of the Attleboro Lane pumping station;
- construction of Water Orton cutting and south retaining wall, Attleboro retaining wall and Marsh Lane embankment; and
- the demolition of Coleshill Hall Farm, construction of Green Lane Footpath M77 underpass, the demolition of Coleshill Manor Office Campus phase 2 building and the demolition of properties on Attleboro Lane.

Avoidance and mitigation measures

9.4.3 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include (see Volume 5: Appendix CT-003-000/1):

- maximising the retention and protection of existing trees and vegetation where possible (draft CoCP Section 12);
- use of well-maintained hoardings and fencing (draft CoCP Section 5);
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses (draft CoCP Section 5);

- replacement of any trees intended to be retained which may be accidentally felled or die as a consequence of construction works (draft CoCP Section 12);
- appropriate maintenance of planting and seeding works and implementation of management measures, to continue through the construction period as landscape works are completed (draft CoCP Section 12); and
- a requirement for contractors to pay due consideration to the impacts of extreme weather events and related conditions which may affect landscape and visual resources during construction (draft CoCP, Section 5).

9.4.4 These measures have been taken account of in the assessment of the construction effects below.

Assessment of temporary impacts and effects

9.4.5 The most apparent changes to landscape character and viewpoints during construction will relate to the temporary presence of construction plant and the removal of existing landscape elements, such as trees, hedgerows and agricultural land. Changes will be most notable to the south of Water Orton with the emerging construction of the cuttings and embankments; and adjacent to the River Cole and Coleshill Manor Office Campus with viaducts and embankments. The height of the construction plant and viaducts and the proximity of construction activities to the sensitive viewpoints identified, coupled with generally low lying landform will result in significant visual effects during construction. The retention of intervening hedgerows, trees and roadside vegetation will partially screen low level construction activity.

Landscape assessment

9.4.6 The following section describes the likely significant effects on LCAs during construction. All LCAs within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5: Appendix LV-001-019 Part 4.

M42 Corridor LCA

9.4.7 The construction activity within this LCA is mainly within the Birmingham Interchange and Chelmsley Wood area (CFA24). Within the Coleshill Junction area, the activity will be located on the M6 and the adjoining fields. Construction activity will include the formation of large scale embankments, removal of hedgerows and the construction of the Coleshill no. 1 embankment and the M6 motorway viaducts (south and north) and M6 motorway box structure. There will be the presence of construction compounds and the presence of construction traffic. Within the Birmingham Interchange and Chelmsley Wood area (CFA24), the construction activity will include large scale earthworks, the removal of trees and hedgerows and the construction of the Birmingham Interchange station.

9.4.8 Overall the scale and extent of the construction activity will reduce the tranquillity locally and, with the scale and extent of activity; will result in a high magnitude of change. The high magnitude of change, assessed alongside the low sensitivity of the receptor, will result in a moderate adverse effect.

Cole Valley LCA

9.4.9 The construction activity will be located across the central and northern section of the LCA, from Green Lane to the River Tame and east of Water Orton. Construction activities will include the formation of large scale embankments, construction of numerous viaducts and the realignment of the River Cole. Additionally, the removal of hedgerows and vegetation along the River Cole and The Belt woodland will lead to the severance of fields and increased openness. A number of historic and listed buildings at and near Coleshill Hall Farm and the modern phase 2 building at Coleshill Manor Office Campus will be demolished. The presence of construction traffic on existing roads and haul routes crossing fields will introduce additional built form, lighting and general activity within the agricultural landscape. The construction phase will also relocate National Grid overhead power lines.

9.4.10 The scale and extent of construction activity will reduce the tranquillity locally. The partial loss and alteration to the agricultural character of the area and the removal of vegetation will result in a medium magnitude of change. The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

River Tame Floodplain LCA

9.4.11 The construction activity within this LCA is entirely located within the Castle Bromwich and Bromford area (CFA25). This will include the removal of ancient woodland from Park Hall and Parkhill Woods and the diversion of the River Tame. Additionally there will be the construction of embankments, presence of construction compounds and localised reduction in tranquillity, resulting in a high magnitude of change. The high magnitude of change, assessed alongside the high sensitivity of the character area, will result in a major adverse effect.

Visual assessment

9.4.12 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken during winter, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, will be in leaf. Where residential, hotel or healthcare receptors experience significant effects at night time arising from additional lighting; these are also presented in this section. Representative viewpoints within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5: Appendix LV-001-019 Part 4.

9.4.13 The number identifies the viewpoint locations which are shown in Volume 5: Map Book – Landscape and visual assessment, Maps LV-07-082 to LV-07-04-084a and LV-03-07-098. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport, 5: Hotel and Healthcare and 6: Employment.

9.4.14 Where a viewpoint may represent multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

Viewpoint 306.2.002: View west from residences on the B4117 Coventry Road, and High Lodge Coleshill

9.4.15 Construction plant will be visible in the foreground of the view crossing the A446 Stonebridge Road/Lichfield Road, albeit in the context of existing traffic on this road. The construction of Coleshill Heath Road underbridge and M6 motorway north and south viaducts will be visible in the middle ground. This will include views of upper sections of cranes, the formation of the upper sections of the approach embankments and the relocation of National Grid overhead power lines. The views will be partially filtered by vegetation in the foreground and middle ground and alongside existing elements within the view, such as lighting columns, motorway gantries and retained National Grid overhead power lines. Therefore the magnitude of change is considered to be medium.

9.4.16 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.17 At night, the continuous lighting of the Coleshill Heath Road underbridge satellite compound, the temporary workers accommodation site 5 and the M6 Motorway north viaduct (south) satellite compounds are considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 307.2.007: View east from residences in Newby Grove, Bacon's End

9.4.18 The cranes constructing Coleshill east and west viaducts and the B4114 Birmingham Road underbridge will be visible in the middle ground above the vegetated embankments in the foreground. View will also include the demolition of Coleshill Hall Farm, the formation of the upper sections of the approach embankments to these viaducts and the relocation of National Grid overhead power lines. This activity is considered to represent a substantial change viewed obliquely from the receptor and partially filtered by vegetation in the foreground. Therefore the magnitude of change is considered to be medium.

9.4.19 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 309.2.006: View east from residences in Birkbeck House, Kingshurst

9.4.20 The construction of the Coleshill east and west viaducts and River Cole east and west viaducts will be visible in the middle ground of the view. The M42 Coleshill south and north viaducts and M42 Coleshill box structure will be visible in the background of the view. This will include views of cranes, the formation of approach embankments, relocation of National Grid overhead power lines and construction plant crossing the fields via the haul roads. Due to the elevated location of the receptor (high-rise flats), these elements will be highly visible, but are considered within the character of views of existing infrastructure. Therefore the magnitude of change is considered to be medium.

9.4.21 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.22 At night, the continuous lighting of the construction compounds within the background of the view are considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 310.2.001: View north-west from New Cottages

9.4.23 Construction plant on the B4114 Birmingham Road, the formation of the approach embankments to Coleshill east viaduct, temporary material stockpiles and the demolition of Coleshill Hall Farm will be visible in the foreground of the view. The formation of embankments crossing fields will also be visible in the middle ground. These activities will represent substantial changes within proximity to the receptor and the direct frame of view. Therefore the magnitude of change is considered to be high.

9.4.24 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.25 At night, the continuous lighting of the Coleshill west viaduct satellite compound is considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 310.4.007: View north-west from the B4114 Birmingham Road

9.4.26 Construction plant on the B4114 Birmingham Road, Coleshill west viaduct satellite compound and the construction of a balancing pond and access road will be visible in the foreground of the view. The realignment of the River Cole and the vegetation removal associated with this, the cranes and construction of the River Cole east and west viaducts and the formation of the approach embankments to the Birmingham spur dive under will be visible in the middle ground of the view. The demolition of the Coleshill Manor Office Campus phase 1 building and the subsequent embankment formation will be visible in the background of the view. Overall this activity is considered to represent an extensive alteration to the existing views of fields, the River Cole and Coleshill Manor Office Campus. Therefore the magnitude of change is considered to be high.

9.4.27 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 310.2.010: View south-west from residences on Lawnsdale Close, Coleshill

9.4.28 Construction plant on the A446 Stonebridge Road will be visible in the foreground of the view and partially filtered by foreground roadside vegetation. These views will be in the context of existing traffic on this road. The upper sections of cranes constructing the River Cole east and west viaducts, M42 Coleshill north and south viaducts and the M42 Coleshill box structure will be visible in the middle ground. This activity will be highly visible, but is largely characteristic of the views of existing vertical elements, like the National Grid overhead power lines and will be partially filtered by vegetation in the foreground. Therefore the magnitude of change is considered to be medium.

9.4.29 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 311.2.001: View south from Coleshill Hall Cottages

9.4.30 The construction plant on Gilson Drive and the construction hoarding adjacent to it will be visible in the foreground of the view. Construction plant will be highly visible as this is not a through road. The hoarding will foreshorten existing views; however, the upper sections of cranes constructing the M42 Coleshill box structure and the River Cole east and west viaducts will be visible above it. The upper sections of the cabins within the M42 Coleshill box structure satellite compound will also be visible. Overall this activity will result in substantial changes in close proximity and within the direct frame of view. Therefore the magnitude of change is considered to be high.

9.4.31 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.32 At night, the continuous lighting of the M42 Coleshill Box Structure satellite compound will be visible in the middle ground. This will increase the lighting within the view, but will be in the context of the existing lighting from the M42. Therefore, the magnitude of change to this receptor at night is considered to be medium, resulting in a moderate adverse effect.

Viewpoint 311.3.003 View south-east from PRoW (Footpath) M54

9.4.33 The construction of the M42-M6 motorway link east and west viaducts and their approach embankments crossing the fields and the motorways will be visible in the middle ground. Also in the view, within the fields will be the M42-M6 motorway link viaduct (central) satellite compound and construction plant on the haul roads. The removal of vegetation from The Belt woodland and the formation of the Green Lane embankment will be visible in the background of the view. This activity will be partially filtered by vegetation in the foreground and middle ground. Therefore the magnitude of change is considered to be medium.

9.4.34 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 311.3.004: View north-east from PRoW (Footpath) M55

9.4.35 The construction of Attleboro Lane realignment and the construction fencing up to approximately 2.4m within the direct frame of view within the foreground. The M42-M6 motorway link viaduct (west) satellite compound and the formation of the approach embankments to the M42-M6 motorway link east and west viaducts will be visible in the middle ground of the view, crossing the fields. This is considered to represent a substantial change in close proximity to the receptor compared with existing views of fields. Therefore the magnitude of change is high.

9.4.36 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 311.2.005: View north-east from Attleboro Farm

9.4.37 The temporary construction fencing up to approximately 2.4m high and vehicles on Attleboro Lane accessing the M42-M6 motorway link viaduct (west) satellite compound will be visible within the direct frame of view in the foreground. The Attleboro flyover satellite compound, temporary earthworks stockpiles and the embankment formation to the Attleboro flyover will be visible in the middle ground of

the view, crossing fields. This activity is considered to represent a major alteration to existing views of agricultural fields. Therefore the magnitude of change is high.

9.4.38 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.39 At night, continuous lighting of the Attleboro flyover satellite compound will be visible in the foreground of the view. This will introduce lighting within a small extent of the view. Therefore the magnitude of change is considered to medium, giving rise to a moderate adverse effect.

Viewpoint 311.2.006: View east from residences in Gilson, including Gilson Hall

9.4.40 The excavation of the Gilson cutting (up to a depth of approximately 9m), construction of Footpath M62 overbridge and the construction plant on the haul roads will be visible in the foreground of the view. The realignment of existing National Grid overhead power lines will also be visible in the foreground of the view. As a result of these open views of construction activities in close proximity, the magnitude of change is considered to be high.

9.4.41 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 311.3.007: View south-east from PRoW (Footpath) M54

9.4.42 The construction of the M42 Coleshill north viaduct, the M42 Coleshill box structure, and the M42 Coleshill south viaduct will be visible in the foreground of the view due to the elevated location of the receptor. These activities will be highly visible but set within the context of existing views of motorway gantries and National Grid overhead power lines. Therefore the magnitude of change will be medium.

9.4.43 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 311.6.008: View south-east from Coleshill Manor Office Campus

9.4.44 The demolition of the modern phase 2 building within the Coleshill Manor Office Campus and the Green Lane embankment formation will be within the direct frame of view, at close range within the foreground. The M42 Coleshill box structure satellite compound, the vegetation removal from along the River Cole and cranes constructing the River Cole east and west viaducts will be visible in the middle ground. This activity is considered to be a major alteration to key characteristics of built form, open fields and vegetation. Therefore the magnitude of change is considered to be high.

9.4.45 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 312.3.002: View north-west from PRoW (Footpath) M56

9.4.46 The temporary construction fencing up to approximately 2.4m high surrounding the M42 Coleshill north viaduct satellite compound and the upper sections of elements within this construction compound will be visible in the foreground. These views will also include the construction hoarding and construction plant crossing the haul

routes. The cranes construction of the M42 Coleshill box structure and the M42 Coleshill north viaduct will be visible in the middle ground of the view above the existing field boundary vegetation. As this activity will be highly visible and within the direct frame of view, the magnitude of change is high.

9.4.47 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 312.2.005: Views west from residences and Grimstock Country House Hotel off the B4117 Gilson Road

9.4.48 The temporary construction fencing, realignment of the B4117 Gilson Road and hedgerow removal will be within the direct frame of view within the foreground. The construction of the Gilson Road auto-transformer station, the embankments to the M42 Coleshill north viaduct and the cranes constructing Footpath M62 overbridge will be visible in the middle ground of the view. Due to the activity within the direct frame of view the magnitude of change is high.

9.4.49 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.50 At night, the continuous lighting of the M42 Coleshill north viaduct satellite compound is considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 313.2.002: View south-west from residences along Attleboro Lane

9.4.51 The construction hoarding, the construction of a balancing pond and the new alignment of Attleboro Lane will be visible in the foreground of the view. The demolition of properties along Attleboro Lane, the formation of embankments, construction of Attleboro Lane overbridge and Attleboro flyover, including cranes will be visible in the middle ground of the view. As this activity will be within the direct frame of view the magnitude of change is high.

9.4.52 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoints 313.2.003: View south from residences along Vicarage Lane and Water Orton Primary School

9.4.53 The removal of hedgerows and vegetation from the boundaries of the playing fields and the works required to change arable fields to sports pitches will be visible in the foreground. This will include construction of new ditch drainage within the direct frame of view within the adjacent fields. The temporary earthworks stockpiles and construction plant crossing the haul roads will be visible in the middle ground. Also within the middle ground and across the entire frame of view will be the formation of the Marsh Lane embankment to approximately 10m above existing ground level. This will be visible above the temporary construction hoarding/noise fence barrier. Therefore the magnitude of change is high.

9.4.54 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoints 313.2.006: View south from residences along Coleshill Road and 313.2.007: View south from residences along the B4117 Watton Lane

9.4.55 Construction plant, temporary construction hoarding and the Water Orton viaduct 1 and 3 (south) satellite compound will be visible in the foreground, in the direct frame of view from properties on the B4117 Watton Lane within the adjacent fields. The embankment formation, approximately 19m above existing ground level and the cranes constructing Water Orton viaducts nos. 1 and 3 and realigned National Grid overhead power line will be visible across a wide extent of the frame of view, within the middle ground of the view; therefore the magnitude of change is high.

9.4.56 The view of the Proposed Scheme from location 313.2.006 during construction is illustrated on the photomontage shown in Figure LV-01-202 (Volume 2, CFA19 Map Book).

9.4.57 The high magnitude of change assessed alongside the high sensitivity of these receptors will result in major adverse effects.

9.4.58 At night, for receptor 313.2.007, continuous lighting of the construction compound will be visible in the foreground of the view. This will be viewed alongside street lighting on the B4117 Watton Lane. Therefore the magnitude of change is considered to be medium, giving rise to a moderate adverse effect.

Viewpoint 313.4.010: View north from the B4117 Gilson Road

9.4.59 The construction of Water Orton viaducts nos. 1 and 3 and the realigned National Grid overhead power line will visible at close range in the foreground. The construction activity will be approximately 19m directly above the B4117 Gilson Road, within the direct frame of view due to the open character of the B4117 Gilson Road. Therefore the magnitude of change is considered to be high.

9.4.60 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect.

Viewpoint 314.2.001: View west from residences at Chattle Hill and Gorsey Way

9.4.61 The temporary construction hoarding and the operations to realign the National Grid overhead power line will be visible in the foreground along the A446 Lichfield Road. The upper sections of Chattle Hill box structure satellite compound and the embankment formation for Chattle Hill box structure will be visible in the middle ground of the view. Views will be partially filtered by existing roadside vegetation in the foreground and therefore the magnitude of change is considered to be medium.

9.4.62 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.63 At night the continuous lighting of the Chattle Hill Box Structure satellite compound will be visible in the foreground. This is considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 314.6.002: View west from Coleshill Industrial Estate

9.4.64 The construction of Chattle Hill box structure will be visible in the foreground, within the direct frame of view, including the formation of the approach embankments and Chattle Hill box structure satellite compound. This is considered to represent a substantial change within the direct frame of view. Therefore the magnitude of change is high.

9.4.65 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 315.4.003: View east from Curdworth Bridge, the A446 Lichfield Road

9.4.66 The construction of the River Tame east and west viaducts, demolition of existing buildings within and adjacent to the sewage works and relocation of National Grid overhead power lines will be visible in the middle ground. Due to the general open character of views across the river this activity will be highly visible. Therefore the magnitude of change is high.

9.4.67 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect.

Viewpoint 371.2.001: View south from residences on the B4118 Birmingham Road/Water Orton Road

9.4.68 The construction plant on the B4118 Birmingham Road/Water Orton Road will be visible in the foreground. This is considered to reflect the character of existing traffic. The temporary construction hoarding and the construction plant on the haul roads will be visible in the middle ground of the view. Also within the middle ground of the view, but viewed obliquely will be the B4118 Water Orton Road overbridge satellite compound and the construction of the Water Orton Road overbridge. This activity is considered to represent a substantial change compared to views of fields, which will be partially filtered by existing vegetation. Therefore the magnitude of change is considered to be medium.

9.4.69 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

9.4.70 At night, the continuous lighting of theB4118 Water Orton road overbridge satellite compound will be visible in the middle ground. This is considered to be non significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Cumulative effects

9.4.71 Section 2.1 and Volume 5: Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the construction of the Proposed Scheme. The consequential cumulative effect of these developments on LCAs and viewpoints is described below. The developments are shown on Volume 5: Map Books – Cross topic, Maps CT-13-054, 055 and 066.

9.4.72 There are no committed developments which are assumed to be under construction at the same time as the Proposed Scheme, and therefore, there are no consequential cumulative effects on LCAs and viewpoints.

Other mitigation measures

9.4.73 Consideration of where planting can be established early in the construction programme will be given during the detailed design stage. This may include consideration of early planting in ecological mitigation sites which would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be practicably mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. Therefore, no other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

9.4.74 These effects will be temporary and reversible in nature lasting only for the duration of the construction works. Any residual effects will generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed from surrounding residential receptors, and by users of PRoW and main roads within the study area.

9.5 Permanent effects arising during operation

9.5.1 The specific elements of the Proposed Scheme which may give rise to permanent significant effect on landscape and visual receptors include:

- high speed trains, overhead line equipment, boundary fencing and repositioned National Grid overhead power lines;
- the Coleshill Heath Road underbridge, Coleshill no. 1 embankment and adjacent planting, the M6 Motorway box structure, the M6 motorway south viaduct and the M6 motorway north viaduct;
- Coleshill no. 2 embankment and planting, the Coleshill west viaduct, the Coleshill East viaduct, the Footpath M77 realignment and underpass and areas for ecological mitigation;
- the B4114 Birmingham Road underbridge, Coleshill nos. 3 and 5 embankments, ecological mitigation/compensation area and flood compensation area;
- the River Cole diversion, the River Cole east viaduct and west viaducts, Coleshill no.4 embankment;
- the Birmingham spur diveunder and M42 Coleshill north viaduct and the M42 Coleshill box structure;
- the B4117 Gilson Road realignment, Gilson embankment, Gilson Road auto-transformer station, realignment of Footpath M62 and the Footpath M62 overbridge, Gilson cutting;
- the A446 Lichfield Road embankment, Chattle Hill box structure, Watton House south embankment, Watton Lane embankment, Watton House north

embankment, the River Tame west viaduct and the River Tame east viaduct;

- Water Orton viaducts 1 and 3, Marsh Lane embankment and the north chord embankments, balancing ponds and areas of ecological mitigation;
- the M42-M6 motorway link viaducts, Attleboro Farm embankment, Attleboro flyover, the realignment of Attleboro Lane, Attleboro Lane pumping station and the Attleboro Lane overbridge;
- the B4118 Water Orton Road embankment, Water Orton cutting north retaining wall, Water Orton cutting south retaining wall and the B4418 Water Orton Road overbridge; and
- realignment and reconfiguration of overhead electricity transmission lines, including new electricity pylons.

Avoidance and mitigation measures

9.5.2 The operational assessment of impacts and effects is based on year 1 (2026), year 15 (2041) and year 60 (2086) of the Proposed Scheme. A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that have been incorporated into the design of the Proposed Scheme include:

- the adoption of a green infrastructure approach to the design of the landscape environment within the Proposed Scheme to ensure the creation of a well-connected landscape that helps to alleviate flooding, and benefit biodiversity and recreation;
- embankment and cuttings, both for the railway and highway alignments, have been shaped so as to integrate the Proposed Scheme into the character of the surrounding landscape;
- where it was considered that a noise fence barrier will create a visual impact on neighbouring residences, where reasonably practicable, a landscape bund has been provided;
- planting, including native broad-leaved woodland, shrub and hedgerows, to screen the new railway and associated roads from neighbouring residences and users of adjacent PRoW, and to aid integration of the Proposed Scheme into the landscape; and
- selection of species will reflect tree and shrub species native to the area and take into account possible climate change impacts associated with the quality and availability of water and the potential increase in pests and diseases.

9.5.3 Specific design measures to aid in integrating the Proposed Scheme within the landscape include:

- ecological mitigation/compensation areas in two main locations – adjacent to the realigned River Cole; and south of Water Orton;
- establishment of woodland edge management zones where the Proposed Scheme encroaches upon existing woodland, at The Catmore and Water

Orton, to enable retention of existing vegetation where possible and a more integrated transition between the Proposed Scheme and retained vegetation; and

- substantial areas of new planting and many areas of potential advance planting, adjacent to the B4117 Watton Lane and the M42/M6 Toll.

9.5.4 These measures have been taken account of in the assessment of the operational effects below.

Assessment of impacts and effects

9.5.5 The likely significant effects on the landscape character and viewpoints in operation will arise from new engineered embankments across the existing landscape; the introduction of new viaducts with associated infrastructure; the introduction of noise fence barriers that will create a man-made linear feature; permanent severance of land; the introduction of highway infrastructure into the rural environment, including road bridges; the introduction of overhead line equipment; and the introduction of regular high speed trains. At a number of locations, views of the Proposed Scheme will be almost entirely obscured by existing and retained roadside vegetation. Furthermore, in most cases, effects will reduce over time as planting established as part of the Proposed Scheme matures.

Landscape assessment

9.5.6 This section describes the significant effects on LCAs during year 1, year 15 and year 60 of operation. Non-significant effects on LCAs are presented in Volume 5: Appendix LV-001-019 Part 4.

9.5.7 The assessment of effects in year 15 assume proposed planting has grown by approximately 450mm a year (i.e. trees will be 7-7.5m high). The assessment of effects in year 60 assumes all planting has reached its fully mature height.

M42 Corridor LCA

9.5.8 The elements of the Proposed Scheme affecting this LCA will be located mainly within the Birmingham Interchange and Chelmsley Wood area (CFA24). Within the Coleshill Junction area, the Proposed Scheme will cross the M6 and the adjacent fields. The track and track bed will be elevated on embankments and box structures crossing the existing motorways. Landscape impacts of the Proposed Scheme include:

- the introduction of a new transport corridor with new crossings of the M6 and fields, that will form prominent elements but be largely characteristic of the existing infrastructure setting;
- the introduction of large scale embankments across the existing landform of flat terrain; and
- the introduction of overhead line equipment and National Grid power line realignment, that will form prominent elements but are largely characteristic of the existing infrastructure setting.

9.5.9 Landscape impacts within the Birmingham Interchange and Chelmsley Wood area (CFA24) will include the Birmingham Interchange station, new car-parks and highways

modifications which will reduce the tranquillity locally. Overall the magnitude of change is considered to be high in year 1 of operation.

9.5.10 The high magnitude of change assessed alongside the low sensitivity of the character area will result in a moderate adverse effect in year 1 of operation.

9.5.11 By year 15 and beyond to year 60, the presence of the Birmingham Interchange station, embankments and high speed trains will retain the high magnitude of change and the effect will remain unchanged.

Cole Valley LCA

9.5.12 The Proposed Scheme will be located across the central and northern sections of this LCA, from Green Lane to the River Tame and east of Water Orton. The track and track bed will mainly be elevated on embankments or viaducts with extensive earthworks creating false cuttings. In certain locations, where the Proposed Scheme will cross existing motorways, the approach embankments will rise to approximately 14m above existing ground levels. Landscape impacts of the Proposed Scheme will include:

- the introduction of a new transport corridor with new viaducts crossing the River Cole and the River Tame, the motorways and secondary roads across the LCA, that will form prominent elements but be largely characteristic of the existing infrastructure setting;
- the introduction of large scale embankments across the existing landform of gently undulating terrain;
- the introduction of noise fence barriers, overhead line equipment and National Grid power line realignment, that will form prominent elements but are largely characteristic of the existing infrastructure setting;
- the realignment of the River Cole with adjacent new woodland and shrub planting, which will be a substantial alteration;
- the introduction of balancing ponds and access tracks, which will be largely inconspicuous elements within the mainly agricultural setting;
- the introduction of the new built form of Gilson Road auto-transformer station;
- realignments of Manor Drive, Attleboro Lane and the B4117 Gilson Road; and
- realignments of several PRoW including PRoW M77, M54, M43 and M60, which are a minor alteration to the existing PRoW network.

9.5.13 Given the context of existing major infrastructure, the operation of the Proposed Scheme through this LCA will not noticeably alter tranquillity.

9.5.14 Therefore, due to the Proposed Scheme introducing prominent elements that are either largely characteristic of the existing infrastructure setting or will result in a partial loss to the landscape character, the magnitude of change is considered to be medium in year 1 of operation.

9.5.15 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.16 By years 15 and 60 of operation, planting will have established and matured, reducing the appearance of the massing and scale of the viaducts, aiding integration of the embankments and further reflecting the existing landscape character. This will reduce the effects to be non-significant. These are reported in Volume 5: Appendix LV-001-019 Part 4.

River Tame Floodplain LCA

9.5.17 The Proposed Scheme in operation will be located entirely within the Castle Bromwich and Bromford area (CFA25). The introduction of high speed trains mainly on embankment, reduction in tranquillity and changes to the character of the area will result in a medium magnitude of change.

9.5.18 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation.

9.5.19 By years 15 and 60 the magnitude of change will remain medium and the effect will remain unchanged.

Visual assessment

9.5.20 This section describes the significant effects on visual receptors during year 1, year 15 and year 60 of operation. Non-significant effects on visual receptors are presented in Volume 5: Appendix LV-001-019, Part 4.

9.5.21 For each viewpoint the following assessments have been undertaken:

- effects during winter of year 1 of operation;
- effects during summer of year 1 of operation;
- effects during summer of year 15 of operation; and
- effects during summer of year 60 of operation.

9.5.22 Where significant effects have been identified, an assessment of effects at night time arising from additional lighting has also been undertaken.

9.5.23 The number identifies the viewpoint locations which are shown in Volume 5: Map Book – Landscape and visual assessment, Maps LV-08-082 to LV-08-084a and LV-08-098. In each case, the middle number (xxx.X.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport and 6: Employment.

9.5.24 Where a viewpoint may represent multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

9.5.25 The view of the Proposed Scheme from viewpoint 306.2.002 (illustrated in the photomontage shown in Figure LV-01-123 Volume 2: CFA19 Map Book) would not be significantly affected due to the small extent of the trains within the field of view and in the context of the existing road infrastructure. The view of the Proposed Scheme from viewpoint 310.3.005 (illustrated in the photomontage shown in Figure LV-01-124 Volume 2: CFA19 Map Book) would not be significantly affected due to the intervening vegetation and small extent of the Proposed Scheme within the field of view.

Viewpoints 307.3.003: View east from PRoW (Green Lane) M77 and 308.3.005: View west from PRoW (Green Lane) M77

9.5.26 There will be open views of the Coleshill nos. 2 and 5 embankments (approximately 15m plus false cutting above existing ground level), passing trains, and noise fence barriers on the Coleshill east and Coleshill west viaducts in the middle ground. These views of the Proposed Scheme will be within the direct frame of view which will result in a substantial change to the existing views of agricultural fields. Therefore the magnitude of change is considered to be high.

9.5.27 The high magnitudes of change assessed alongside the high sensitivity of the receptors will result in major adverse effects in the winter of year 1 operation.

9.5.28 In summer, the views will remain open due to the elevation of the Proposed Scheme in the view and the lack of intervening screening. Therefore the magnitude of change is considered to remain high, meaning the overall effects will be unchanged from the winter view.

9.5.29 By year 15, the planting on Coleshill nos. 2 and 5 embankments will have established, reducing the appearance of the mass of the earthworks and partially filtering views of the noise fence barriers, trains and overhead line equipment on Coleshill east and west viaducts. Therefore the magnitude of change is considered to be medium.

9.5.30 The medium magnitude of change assessed alongside the high sensitivity of the receptors is considered to result in moderate adverse effects in the summer of year 15.

9.5.31 By year 60, the planting on Coleshill nos. 2 and 5 embankments will have matured and will have further reduced the appearance of the mass earthworks. The partial filtered views of the Coleshill east and west viaducts will remain. Therefore the magnitude of change is considered to remain as medium, meaning the overall effects will be unchanged.

Viewpoint 309.3.005: View east from PRoW (Footpath) M58

9.5.32 Views of the Green Lane embankment, new planting and the overhead line equipment on the River Cole west viaduct in the middle ground will be partially filtered by the vegetation on Green Lane. Therefore the magnitude of change is medium.

9.5.33 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.34 In summer, the visible extent of the Proposed Scheme will reduce due to screening from intervening vegetation. However, the magnitude of change is considered to remain as medium, meaning the overall effects will be unchanged.

9.5.35 By year 15, the new planting will largely filter views of the Proposed Scheme. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 309.2.006: View east from residences in Birkbeck House, Kingshurst

9.5.36 The trains, overhead line equipment, Coleshill east and west viaducts and River Cole east and west viaducts will be visible in the middle ground of the view. The M42 Coleshill south and north viaducts and M42 Coleshill box structure will be visible in the background of the view, due to the elevated location of the receptor. The Proposed Scheme will cause a noticeable deterioration in the view, due to the loss of vegetation, the change of landform and the introduction of new infrastructure, although these elements will be seen in the context and character of existing infrastructure. Therefore the magnitude of change is medium.

9.5.37 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.38 In summer, the view will remain as per winter due to the elevated location of the receptor. Therefore the magnitude of change is considered to remain medium, meaning the overall effects will be unchanged.

9.5.39 By year 15 and beyond to year 60, the new planting will have established and largely filter views of the Proposed Scheme. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix: LV-001-019 Part 4.

Viewpoint 310.2.001: View north-west from New Cottages

9.5.40 The proposed planting, the approach embankments of Coleshill east viaduct and Coleshill no. 5 embankment will be visible within close proximity in the foreground of the view. Therefore the magnitude of change is considered to be high.

9.5.41 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 operation.

9.5.42 In summer of year 1, the open nature of the views across the B4114 Birmingham Road means that the summer views will be comparable to the winter views. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.43 By years 15 and 60, new planting will have established and matured in the foreground, however this is considered to remain a substantial change due to the elevation of the embankments. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged in years 15 and 60 of operation.

Viewpoint 310.4.007: View north-west from the B4114 Birmingham Road

9.5.44 The Coleshill pumping station, Coleshill nos.4 and 5 embankments, the Coleshill west viaduct, M42 Coleshill box structure and new planting will be visible in the middle ground, looking across fields and the M42/M6 Toll. These Proposed Scheme will be viewed in the context of the motorway and National Grid overhead power lines. Therefore the magnitude of change is considered to be medium.

9.5.45 The medium magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.46 In summer of year 1, the open views across the motorway are considered to reflect the views as per winter. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.47 In years 15 and 60 of operation, the open views will remain. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

Viewpoint 311.2.001: View south from Coleshill Hall Cottages

9.5.48 The new planting and embankments of the Birmingham spur will be visible in the direct frame of view, within the foreground. The upper sections of the M42 Coleshill box structure and the M42 Coleshill south viaduct, with noise fence barriers and overhead line equipment will be visible in the middle ground beyond. This will introduce new built form within the view and will limit existing background views. Therefore the magnitude of change is considered to be high.

9.5.49 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 operation.

9.5.50 In summer of year 1, the open views of the upper sections of the Proposed Scheme will reflect views as per winter. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.51 By years 15 and 60, new planting will have established and matured. This will reduce the appearance of the mass of the Birmingham spur and largely filter views of the M42 Coleshill box structure and the Coleshill west viaduct. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 311.3.003 : View south-east from PRoW (Footpath) M54

9.5.52 The M42/M6 motorway link viaducts (east and west) and the Green Lane embankment will be visible in the middle ground, crossing fields and the motorways. This will include views of the overhead line equipment and the upper sections of noise fence barriers crossing between the embankment and onto the viaducts. The Proposed Scheme will be highly visible but viewed in the context of the existing motorways and the National Grid overhead power lines. Therefore the magnitude of change is considered to be medium.

9.5.53 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.54 In summer, the height of the viaducts and embankments mean that they will remain visible above vegetation. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.55 In years 15 and 60, new planting will have established and matured on the embankments. This will reduce the effect to being non-significant. This is reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoints 311.3.004: View north-east from PRoW (Footpath) M55 and 311.2.005: View north-east from Attleboro Farm

9.5.56 The realigned Attleboro Lane and adjacent planting will be visible in the direct frame of view within the foreground. The Attleboro Farm embankment, the Attleboro flyover and Marsh Lane embankments of the north chord will be visible in the middle ground, across the majority of the frame of view. Additionally the scale of the embankment will limit views of the background. Therefore the magnitude of change is considered to be high.

9.5.57 The high magnitude of change, assessed with the high sensitivity of the receptor, will result in a major adverse effect in the winter of year 1 of operation.

9.5.58 Due to the scale and height of the Marsh Lane embankment within the middle ground of the view, rising above the intervening vegetation, the summer view is considered to remain as per winter. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.59 In years 15 and 60, new planting will have established and matured on the embankments, which will reduce the appearance of their mass and aid in their integration with existing vegetation. However their scale and the impact of foreshortening of existing views of Water Orton will remain. Therefore the magnitude of change is medium.

9.5.60 The medium magnitude of change, assessed alongside the high sensitivity of the receptor, will result in moderate adverse effects in the summers of years 15 and 60.

Viewpoint 311.2.006: View east from residences in Gilson, including Gilson Hall

9.5.61 The new planting in the fields between the viewpoint and the top of the cutting and the upper sections of overhead line equipment and the Footpath M62 overbridge will be partially visible the foreground of the view due to screening by existing vegetation. The realigned National Grid overhead power lines will be visible in the middle ground of the view and representative of existing views of these elements. Therefore, due to the changes in the foreground of the view, the magnitude of change is considered to be medium.

9.5.62 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 operation.

9.5.63 In summer of year 1, the open character and proximity of the Proposed Scheme are considered to retain views as per winter. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.64 By years 15 and 60 the planting will have established and matured. This will reduce the effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019, Part 4.

Viewpoint 311.3.007: View south-east from PRoW (Footpath) M54

9.5.65 The M42 Coleshill box structure and the adjacent M42 Coleshill north viaduct and Birmingham spur diveunder will be visible in the middle ground, crossing the M42/M6 Toll. The views will include upper sections of trains and overhead line equipment and

will be visible due to the open character of the motorway and elevated location of the viewpoint. However in the context of views of a motorway, the Proposed Scheme is considered to reflect this existing character. Therefore the magnitude of change is medium.

9.5.66 The view of the Proposed Scheme from this location during operation is illustrated on the photomontage shown in Figure LV-01-125 (Volume 2: CFA19 Map Book).

9.5.67 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.68 In summer of year 1, views will remain as per winter due the elevated position of the receptor. Therefore the magnitude of change is considered to remain the same, meaning the overall effect will be unchanged.

9.5.69 In years 15 and 60, the elevated position of the receptor will retain views as per year 1. Therefore the magnitude of change is considered to remain the same, meaning the overall effect will be unchanged.

9.5.70 The view of the Proposed Scheme from this location during year 15 of operation is illustrated on the photomontage shown in Figure LV-01-248 (Volume 2: CFA19 Map Book).

Viewpoint 311.6.008: View south-east from Coleshill Manor

9.5.71 The Green Lane embankment and associated new planting will be highly visible in close proximity in the foreground and middle ground. In addition to the change in the landform, the embankment will limit background views and therefore the magnitude of change is high.

9.5.72 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 operation.

9.5.73 In summer of year 1, the proximity and height of the Green Lane embankment is considered to retain the views as per winter. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.74 In years 15 and 60, open views of the Proposed Scheme will remain and therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged in years 15 and 60 of operation.

Viewpoints 312.3.002: View west from PRoW (Footpath) M56

9.5.75 The new planting on the slopes of the Green Lane embankment, carrying the north chord, as well as the upper sections of trains and overhead line equipment on the M42 Coleshill north viaduct will be visible in the foreground and middle ground, of the view crossing the fields. These elements will be highly visible but largely characteristic of existing views of motorway gantries and signage. Therefore the magnitude of change is considered to be medium.

9.5.76 The medium magnitude of change assessed alongside the high sensitivity of the receptors will result in moderate adverse effects in the winter of year 1 of operation.

9.5.77 In summer of year 1, the elevated position of the receptor will retain views as per winter. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.78 In years 15 and 60, new planting will have established and matured, however not sufficiently to screen elevated views of the Proposed Scheme. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged in years 15 and 60 of operation.

Viewpoint 312.2.003: View south-west from residences along the B4117 Gilson Road

9.5.79 The upper sections of passing trains and overhead line equipment crossing the M42 Coleshill north viaduct will be visible in the middle ground of the view above the intervening vegetation. In the context of the existing views of National Grid overhead power line and motorway signage these elements will be largely characteristic. Therefore, it is considered that the magnitude of change will be medium.

9.5.80 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.81 In summer of year 1 and beyond, to years 15 and 60, intervening vegetation will largely filter views of the Proposed Scheme. This will reduce effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part4.

Viewpoint 312.2.005: Views west from residences and Grimstock Country House Hotel along the B4117 Gilson Road

9.5.82 The realignment of the B4117 Gilson Road and the areas of new planting will be visible in the foreground of the view. This is considered to reflect the character of existing views of the road. The Gilson Road auto-transformer station and access route (the old section of the B4117 Gilson Road), realigned National Grid overhead power lines and the M42 Coleshill north viaduct will be visible in the middle ground of the view. In the context of existing views of National Grid overhead power lines, this is considered to reflect views of existing infrastructure. Therefore the magnitude of change is medium.

9.5.83 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in winter of year 1 of operation.

9.5.84 In summer of year 1, the view is considered to remain as per winter due to the proximity of the Proposed Scheme to the receptor. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.85 By year 15 and beyond to year 60, the proposed planting will have established. This will reduce the effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 313.2.002: View south-west from residences along Attleboro Lane

9.5.86 The balancing pond, new planting, the realigned Attleboro Lane and the Attleboro Lane pumping station and access road will be visible in the foreground of the view. The embankments of the Attleboro Lane overbridge, Attleboro flyover and earthworks of Marsh Lane embankment will be visible in the middle ground of the

view. Vegetation along Attleboro Lane will partially filter views and therefore the magnitude of change is medium.

9.5.87 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.88 In summer of year 1, views of the elevated sections of the Proposed Scheme will remain as per winter. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.89 By year 15, the planting will have established, however not sufficiently to filter views of the elevated sections of the Proposed Scheme. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged in summer of year 15 of operation.

9.5.90 By year 60 the planting will have established. This will reduce the effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-01, Part 4.

Viewpoint 313.2.003: Views south from residences along Vicarage Lane and Water Orton Primary School

9.5.91 The sport pitches will be visible in the foreground and will retain open views, albeit a minor change from agricultural fields. The northern face of the north chord embankments will be visible across a wide extent of the field of view, in the middle ground. The scale of this embankment will contrast with the generally flat landscape although partially filtered by vegetation in the foreground bordering the school and the residences. Therefore the magnitude of change is medium.

9.5.92 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.93 In summer of year 1 the height of the embankment will retain views as per winter. Therefore the magnitude of change is considered to remain high, meaning the overall effect will be unchanged.

9.5.94 In years 15 and 60, new planting will have established and matured. This will reduce effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoints 313.2.006: View south from residences along Coleshill Road and 313.2.007: View south from residences along the B4117 Watton Lane

9.5.95 The new ecological areas including new tree planting will be visible in the foreground of the view within the fields, although partially filtered by the retained roadside hedges. The Marsh Lane embankment and Water Orton no.3 viaduct and the trains will be visible across a wide extent of the field of view in the middle ground. Views of the embankment will be of a greater scale and mass than the motorway embankments and signage and will be a major alteration compared to the existing vegetated ridge line. Therefore, the magnitude of change is considered to be high.

9.5.96 The view of the Proposed Scheme from viewpoint 313.2.006 during operation is illustrated on the photomontage shown in Figure LV-01-126 (Volume 2: CFA19 Map Book).

9.5.97 The high magnitude of change assessed alongside the high sensitivity of these receptors will result in major adverse effects in the winter of year 1 operation.

9.5.98 In summer of year 1 the view is considered to remain as per winter due to the scale of the embankment. Therefore the magnitude of change is considered to remain high, meaning the overall effects will be unchanged.

9.5.99 By year 15 and beyond to year 60, the new planting the new planting will have established within the fields and on the embankments to reduce their scale and integrate the earthworks within the landscape. The new trees within the foreground will largely screen the Marsh Lane embankment and reduce the effects to non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part 4.

9.5.100 The view the Proposed Scheme from viewpoint 313.2.006 during year 15 of operation is illustrated on the photomontage shown in Figure LV-01-249 (Volume 2: CFA19 Map Book).

Viewpoint 313.4.010: View north from the B4117 Gilson Road

9.5.101 Due to the open character of the B4117 Gilson Road, the Water Orton viaducts 1 and 3, crossing over the M42/M6 Toll and the B4117 Gilson Road, overhead line equipment, trains and noise fence barriers will be highly visible in the foreground of the view. Therefore, the magnitude of change is considered to be high.

9.5.102 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.103 In summer of year 1, the proximity of the receptor will retain views as per winter. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.104 In years 15 and 60, due to the elevated position of the Proposed Scheme the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged in years 15 and 60 of operation.

Viewpoint 314.2.001: View west from residences at Chattle Hill and Gorsey Way

9.5.105 Views of passing trains and overhead line equipment on the Lichfield Road embankment, including the Chattle Hill box structure and the Watton Hill south embankment will be visible in the middle ground of the view. This will include for the upper sections of National Grid overhead power lines. While these elements will be located above existing roadside vegetation, they will be partially filtered by vegetation in the foreground. The views will be in the context of the lighting columns, traffic and road infrastructure along the A446 Lichfield Road. Therefore the magnitude of change is medium.

9.5.106 The view of the Proposed Scheme from this location during operation is illustrated on the photomontage shown in Figure LV-01-127 (Volume 2: CFA19 Map Book).

9.5.107 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.108 In summer the foreground vegetation will further screen views, however views of the Chattle Hill box structure and embankments will remain. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.109 By year 15 the planting will have established and matured, largely filtering views of the Proposed Scheme and reducing the scale of the embankments, in conjunction with foreground vegetation. This will reduce the effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 314.6.002: View west from Coleshill Industrial Estate

9.5.110 The passing trains and overhead line equipment on the main line Chattle Hill box structure and Watton House south embankment will be highly visible in the foreground. The Proposed Scheme will be viewed in the context of existing views of infrastructure along the A446 Lichfield Road. Therefore, the magnitude of change will be medium.

9.5.111 The medium magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect in winter of year 1 of operation.

9.5.112 In summer the view is considered to remain as per winter due to the lack of intervening elements. Therefore the magnitude of change is considered to remain the same, meaning the overall effect will be unchanged.

9.5.113 By year 15 the open and direct views of the Chattle Hill box structure and Watton House south embankment and the magnitude of change and level of effect will remain unchanged.

9.5.114 By year 60 the planting on the Watton House south embankment will have established and reduce the effects to being non-significant. These effects are reported in Volume 5: Appendix LV-001-019 Part 4.

Viewpoint 315.4.003: View east from Curdworth Bridge, on the A446 Lichfield Road

9.5.115 The passing trains, noise fence barriers and overhead line equipment will be visible on the River Tame east and west viaducts and Water Orton viaducts 1 and 3 in the middle ground. These elements of the Proposed Scheme will be visible across the field of view, albeit in the context of existing views of the Birmingham and Derby Line and National Grid overhead power lines. Therefore, the magnitude of change is considered to be medium.

9.5.116 The view of the Proposed Scheme from this location during operation is illustrated on the photomontage shown in Figure LV-01-128 (Volume 2, CFA19 Map Book).

9.5.117 The medium magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.118 In summer the view is considered to remain as per winter due to the lack of intervening elements and open views along the River Tame. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

9.5.119 By years 15 and 60 the planting will establish, however views will remain of the Proposed Scheme. Therefore the magnitude of change is considered to remain medium, meaning the overall effect will be unchanged.

Cumulative effects

9.5.120 Section 2.1 and Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. The consequential cumulative effect of these committed developments on LCA and viewpoints is described below. The developments are shown in Volume 5: Map Book – Cross-Topic Maps, Maps CT-13-054, 055 and 066.

9.5.121 There are no known developments which are assumed to be under construction at the same time as the Proposed Scheme, and therefore there are no consequential cumulative effects on the LCA and viewpoints.

Other mitigation measures

9.5.122 The permanent effects of the Proposed Scheme on landscape and visual receptors have been substantially reduced through incorporation of the measures described previously. Effects in year 1 of operation may be further reduced by establishing planting early in the construction programme and/or the planting of large stock in specific locations, both of which will be considered during the detailed design stage. The implementation of such measures would result in planting becoming visually effective in screening the railway earlier in the operational stage.

Summary of likely residual significant effects

9.5.123 In most cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. Therefore, on the basis that the proposed other mitigation measures are delivered, the following residual effects will remain at year 15 of operation:

- adverse effects on the M42 Corridor LCA and the River Tame Floodplain LCA due to the continued presence of high speed trains and changes to the character of the area;
- adverse effects on views from residences at New Cottages (310.2.001), Attleboro Farm (311.2.005) and Attleboro Lane (313.2.006) arising from proximity of the Proposed Scheme and visibility of the embankments and general views of trains and rail infrastructure along the line of the route;
- adverse effects on views for recreational users of the PRoW M77 (307.3.003 and 308.3.005), PRoW M55 (311.3.004), PRoW M54 (311.3.007) and PRoW M56 (312.3.002) due to open views trains and rail infrastructure along the line of the route;
- adverse effects on transport users on the B4114 Birmingham Road (310.4.007), the B4117 Gilson Road (313.4.010) and the A446 Lichfield Road (315.4.003) due to the Proposed Scheme crossing these roads within the direct frame of the view; and

- adverse effects on employment users at Coleshill Manor Office Campus (311.6.008) and Coleshill Industrial Estate (314.6.002) due to proximity of the Proposed Scheme. Effects on viewpoint 314.6.002 will reduce to non-significant by year 60 of operation with further maturing of proposed planting.

10 Socio-economics

10.1 Introduction

10.1.1 The section reports likely significant economic and employment effects during the construction and operation of the Proposed Scheme.

10.1.2 The need for a socio-economic assessment results from the potential for the Proposed Scheme to affect:

- existing businesses and community organisations and thus the amount of local employment;
- local economies, including employment; and
- planned growth and development.

10.1.3 The beneficial and adverse socio-economic effects of the Proposed Scheme are reported at two different levels: route-wide; and CFA. Effects on levels of employment are reported at a route-wide level in Volume 3. Localised effects on businesses and observations on potential local economic effects are reported within each CFA report.

Construction

10.1.4 The proposed construction works will have the following relevance in terms of socio-economics in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme; and
- potential employment opportunities arising from construction in the local area (including in adjacent CFA).

Operation

10.1.5 The proposed operation of the route will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

10.2 Scope, assumptions and limitations

10.2.1 The assessment scope, key assumptions and limitations for the socio-economics assessment are set out in Section 8 of Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

10.2.2 There have been no variations to the socio-economic assessment methodology arising from engagement with stakeholders and community organisations.

10.3 Environmental baseline

Existing baseline

Study area description

10.3.1 Section 2 of this report provides a general overview of the Coleshill Junction area which includes data of specific relevance to socio-economics notably demographic and employment data. The following provides a brief overview in terms of employment, economic structure, labour market, and business premises availability within the area[49].

10.3.2 The Coleshill Junction area lies largely within the area covered by North Warwickshire Borough Council (NWBC); parts of Solihull are included within the area west of the M6 and the Proposed Scheme. Due to the geographic distribution of affected resources, NWBC area has been used as a basis for developing the environmental baseline.

10.3.3 Where possible, baseline data has been gathered on demographic character areas (DCA)[50] to provide a profile of local communities. Volume 5: Appendix SE-002-104 shows the location of the DCA. The area contains the DCA of Water Orton, Coleshill and Smith's Wood. The Water Orton DCA lies mostly between the M6 and A446 Lichfield Road and includes the village of Water Orton and the area to its south until the B4114 Birmingham Road. The Coleshill DCA consists primarily of the market town of Coleshill. The Smith's Wood DCA consists of Smith's Wood ward.

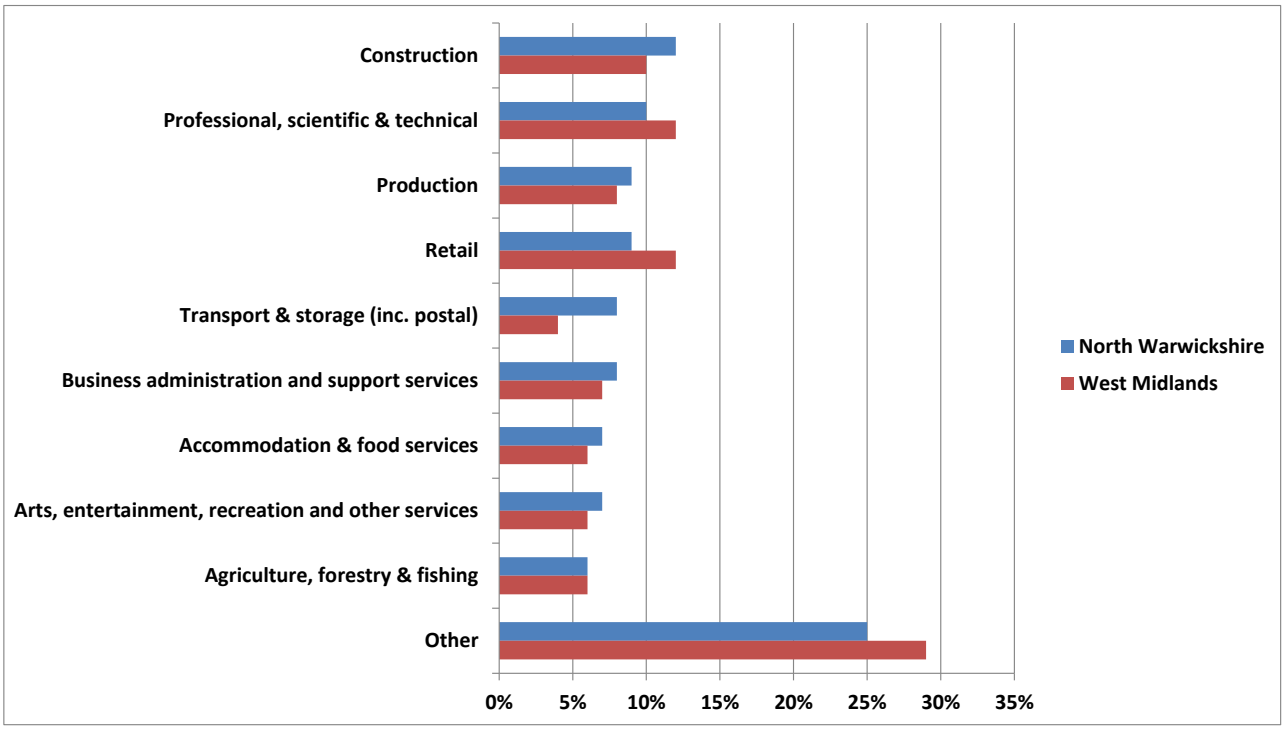
Business and labour market

10.3.4 In terms of business activities NWBC has the same proportion (at 6%) of agriculture, forestry and fishing businesses as the West Midlands although both are greater than England (4%) as a whole. NWBC has a higher proportion of construction sector (12%) businesses compared to the West Midlands (10%) and England (11%). The professional, scientific and technical sector has a lower proportion of businesses (10%) than the West Midlands region (12%) and England (14%)[51]. This is shown in Figure 6[52].

10.3.5 Approximately 39,000 people worked in NWBC area while 6,500 worked in Coleshill DCA, 2,100 in Water Orton DCA and 1,400 in Smith's Wood DCA[53].

[49] Further information on the socio-economics baseline, with regard to business and labour market profile, within the area is contained in the Volume 5: Appendix SE-001-000.
[50] DCA have been determined through an understanding of local context and aim to be aligned as closely as possible to groups of lower super output areas (LSOAs).
[51] Office for National Statistics (ONS) (2012), *UK Business: Activity, Size and Location 2011*, ONS, London. Please note 2011 data has been used to provide an appropriate comparison with 2011 Census data.
[52] The figure presents the proportion of businesses within each business sector in the borough but not the proportion of employment by sector.
[53] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.

Figure 6: Business sector composition in NWBC and West Midlands[54,55]

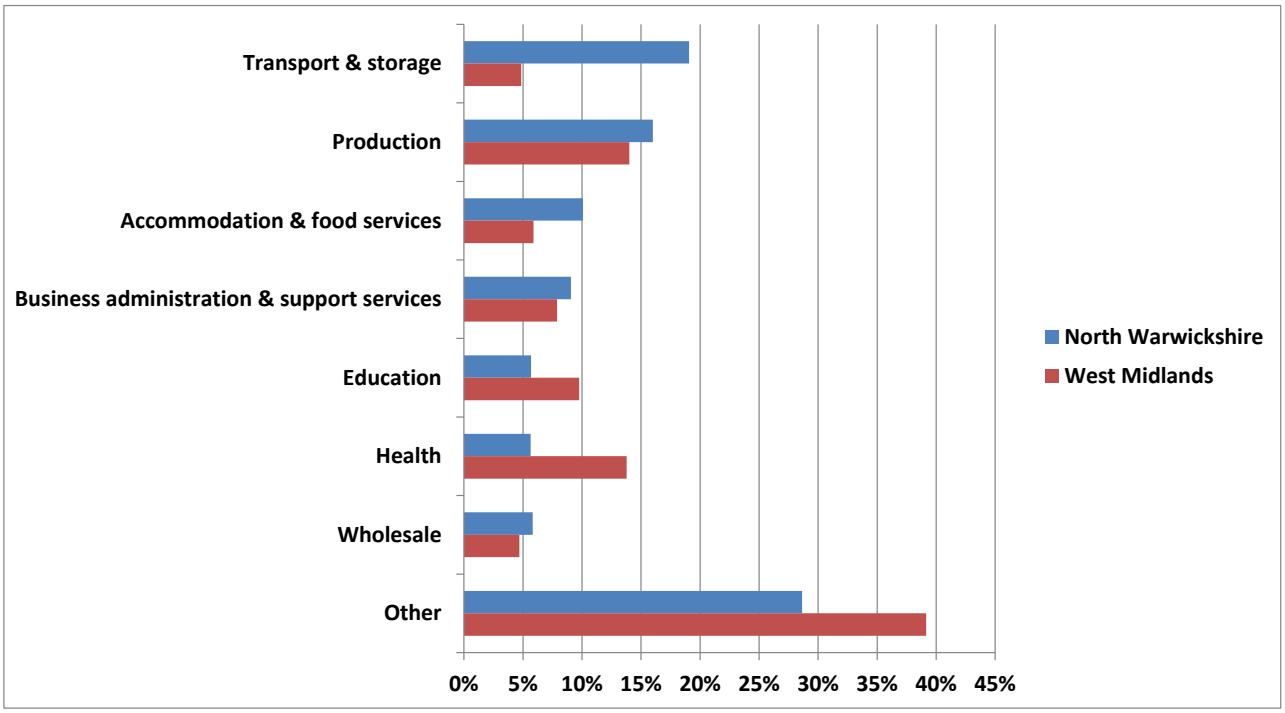


10.3.6 According to the ONS Business Register and Employment Survey 2011, the sector with the highest proportion of employment in NWBC is transport and storage (19%) which is higher than the West Midlands and England averages (both 5%). Production[56] also makes up 16% of employment in the borough, higher than for the West Midlands (14%) and England (10%). A further key sector for employment is accommodation and food services which at 10% is a higher proportion of the workforce than for the West Midlands (6%) and England (7%)[57]. This is shown in Figure 7. The sector makeup varies between DCA. Production is the sector with the highest proportion of employment in Coleshill DCA (23%) and Water Orton DCA (35%) while in Smith's Wood DCA the greatest concentration of employment is in education (48%).

10.3.7 According to the 2011 Census[58], the employment rate[59] within the NWBC in 2011 was 68% (31,000 people) which is higher than that recorded for both the West Midlands (62%) and England (65%). The employment rate for Coleshill DCA was 69% compared to 74% in Water Orton DCA and 56% in Smith's Wood DCA. The unemployment rate in NWBC was 6% which was lower than the rate for the West Midlands (9%) and the average for England (7%). In Water Orton DCA the unemployment rate was 4% compared to 6% in Coleshill DCA and 15% in Smith's Wood DCA.

[54] 'Other' includes motor trades; wholesale; finance and insurance; property; public administration and defence; education.
[55] ONS (2012), *UK Business: Activity, Size and Location 2011*, ONS, London.
[56] Production, as per ONS definition, is comprised of the mining, quarrying and utilities, and manufacturing sectors.
[57] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.
[58] ONS (2012), *Census 2011*, ONS, London.
[59] The proportion of working age (16-74 years) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment' and includes full-time students who are employed.

Figure 7: Proportion of employment by industry in NWBC and West Midlands[60, 61]



10.3.8 According to the 2011 Census, 20% of NWBC residents aged 16 and over were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 23% in West Midlands and 27% in England, while 28% of residents had no qualifications which was higher than that recorded both for the West Midlands (27%) and England (23%).Qualification levels varied across DCA; in Smith's Wood DCA 9% of residents aged 16 and over were qualified to NVQ4 and above compared to 23% in Coleshill DCA and 24% in Water Orton DCA. In Smith's Wood 38% of residents aged 16 and over had no qualifications compared to 25% in Coleshill DCA and 21% in Water Orton.

10.3.9 Coleshill DCA and Water Orton DCA have high concentrations of employment in the production sector while Smith's Wood DCA is heavily focussed on the education sector. Smith's Wood DCA is also characterised by high unemployment and low skills levels.

Property

10.3.10 Average vacancy rate for industrial and warehousing property in NWBC in July 2013 has been assessed as 3% based on marketed space against known stock while the average vacancy rate of offices was 26%[62]. Overall, this suggests a reasonable availability of alternative accommodation.

[60] 'Other' includes arts, entertainment, recreation and other services; construction and financial and insurance sectors.
[61] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.
[62] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office Agency (VOA).

Future baseline

Construction (2017)

10.3.11 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. Implementation of all outstanding development consents and land allocations would result in approximately 100 additional jobs[63] by 2017. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast.

Operation (2026)

10.3.12 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2026. There are no consents or allocations in this local area which are expected to accommodate additional material employment between 2017 and 2026.

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 In order to avoid or minimise the environmental impacts during construction, the Proposed Scheme design includes provisions to maintain access to businesses during the construction phase.

10.4.2 The draft CoCP includes a range of provisions that will help mitigate socio-economic effects associated with construction within this local area, including:

- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (draft CoCP Section 5);
- reducing nuisance through sensitive layout of construction sites(draft CoCP Section 5);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (draft CoCP Section 13);
- contractors will be required to monitor and manage flood risk and other extreme weather events which may affect socioeconomic resources during construction (draft CoCP, Sections 5 and 16); and
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (draft CoCP Section 14).

[63] Potential employment has been estimated through employment floor space and the Homes and Communities Agency (HCA) *Employment Densities Guide 2nd Edition* (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas.

Assessment of impacts and effects

Temporary effects

Change in business amenity value

10.4.3 No non-agricultural businesses[64] have been identified within this area which are expected to experience significant amenity effects as a result of the Proposed Scheme.

Isolation

10.4.4 No non-agricultural businesses have been identified within this area which are expected to experience significant isolation effects as a result of the Proposed Scheme.

Construction employment

10.4.5 There are plans to locate one temporary main construction compound in the area off Coleshill Heath Road and 18 civil engineering satellite compounds and three railway installation satellite compounds to support construction activity. The use of these sites could result in the creation of up to 2,000 person years of construction employment opportunities[65], or approximately 200 full time equivalent jobs, which depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The overall direct construction employment creation is described as part of the route wide assessment (see Volume 3).

10.4.6 Direct construction employment created by the Proposed Scheme could also lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of this indirect construction employment creation has been assessed as part of the route wide assessment (see Volume 3).

Cumulative effects

10.4.7 No committed projects have been identified that are considered to interact with the Proposed Scheme.

10.4.8 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

Permanent effects

Businesses

10.4.9 Businesses directly affected, i.e. those that lie within the land which will be used for the construction of the Proposed Scheme, are reported in groups where possible to form defined resources, based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a

[64] Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.
[65] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days.

building may have more than one occupier or that similar businesses/resources are clustered together.

10.4.10 In all, three business accommodation units within the Coleshill Junction area would be directly impacted upon by the Proposed Scheme; these business units are located on the B4114 Birmingham Road, A446 Lichfield Road and Manor Drive. From an employment perspective, no significant direct effects on non-agricultural employment have been identified within the area.

10.4.11 It is estimated that land required for the Proposed Scheme would result in the displacement or possible loss of approximately 260 jobs[66] within this area. Taking into account the availability of alternative premises and the total employed within the Borough (approximately 39,000), the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area.

Cumulative effects

10.4.12 No committed projects have been identified that are considered to interact with the Proposed Scheme.

10.4.13 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

Other mitigation measures

10.4.14 The above assessment has concluded that there are no significant adverse effects arising during construction in relation to businesses directly affected by the Proposed Scheme.

10.4.15 Businesses displaced by the Proposed Scheme will be fully compensated within the provisions of the National Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to new premises and will therefore provide additional support over and above statutory requirements to facilitate this process.

10.4.16 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd is committed to working with its suppliers to build a skilled workforce that fuels further economic growth across the UK.

Summary of likely residual significant effects

10.4.17 There are no significant effects arising during construction.

[66] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) *Employment Densities Guide 2nd Edition* (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

10.5 Effects arising during operation

Avoidance and mitigation measures

10.5.1 No mitigation measures are proposed during operation within this area.

Assessment of impacts and effects

Resources with direct effects

10.5.2 There are no resources considered likely to experience significant direct effects during the operational phase of the Proposed Scheme within this area.

Change in business amenity

10.5.3 No non-agricultural businesses have been identified within this area which are expected to experience significant amenity effects as a result of the Proposed Scheme.

Operational employment

10.5.4 Operational employment will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. These are considered unlikely to be accessed by residents of this area.

10.5.5 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

10.5.6 The impact of operational employment creation has been assessed as part of the route-wide assessment (see Volume 3).

Other mitigation measures

10.5.7 The assessment has concluded that operational effects within the area will be either negligible or beneficial and therefore mitigation is not required.

Summary of likely residual significant effects

10.5.8 There are no significant effects identified in the assessment that will arise during operation.

11 Sound, noise and vibration

11.1 Introduction

11.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme for the Coleshill Junction area on:

- people, primarily where they live ('residential receptors') in terms of a) individual dwellings and b) on a wider community basis, including any shared community open areas[67]; and
- community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas[68]'.

11.1.2 The assessment of likely significant effects from noise and vibration on agricultural, community, ecological or heritage receptors and the assessment of tranquillity are presented in Sections 3, 5, 6, 7 and 9 of this report respectively.

11.1.3 In this assessment 'sound' is used to describe the acoustic conditions which people experience as a part of their everyday lives. The assessment considers how those conditions may change through time and how sound levels and the acoustic character of community areas is likely to be modified through the introduction of the Proposed Scheme. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

11.1.4 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect e.g. resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

11.1.5 This section sets out the means to avoid or reduce the adverse effects that may occur.

11.1.6 The approaches to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1 and scope and methodology are defined in the following documents:

- Scope and Methodology Report (SMR) (Appendix CT-001-000/1); and
- SMR addendum (Appendix CT-001-000/2).

11.1.7 More detailed information and mapping regarding the sound, noise and vibration assessment for Coleshill Junction is available in the relevant appendices in Volume 5:

[67] 'Shared community open areas' are those that the emerging National Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park to local green space) that is nearby.

[68] Quiet areas are defined in the Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity (further information is provided in Section 9).

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000);
- sound, noise and vibration baseline (Appendix SV-002-019);
- sound, noise and vibration construction assessment (Appendix SV-003-019);
- sound, noise and vibration operation assessment (Appendix SV-004-019); and
- Map Series SV-01, SV-02, SV-03 and SV-05 (Volume 5, Sound, noise and vibration Map book).

11.2 Environmental baseline

Existing baseline

11.2.1 The study area is predominantly urban and suburban in character, separated by small strips of green belt that flank the major transport routes. The M42 and the M6 run north-south through the area with a major west-east interchange to the south of Water Orton and west of Gilson.

11.2.2 The closest part of Coleshill, the main town in the study area, is approximately 500m to the east of the Proposed Scheme. Due to the presence of these major roads, the sound environment for this area is generally dominated by the sounds of continuous road traffic. Due to these dominant sources, night-time sound levels generally remain high. Local neighbourhood sound sources and agricultural sources are also audible in the less urban parts of this area.

11.2.3 In the residential area of Water Orton, the sound environment is dominated by continuous distant road traffic on the M42, M6 and A452, during both day and night. Local traffic on B4117 Watton Lane and B4118 Birmingham Road also contributes to the environment, as well as the passage of trains on the Birmingham to Nuneaton Line north of Water Orton. Close to these roads, typical daytime sound levels range from 55-60dB[69], reducing to 50-55dB[70] at night-time. In the agricultural areas surrounding Water Orton, and away from the major road links, the soundscape is characterised by distant road traffic punctuated with natural sounds, local road traffic and aeroplanes. Baseline sound levels during the daytime in these areas are generally 55 to 60dB, dropping to 50 to 55dB overnight.

11.2.4 In the residential area of Coleshill, the sound environment is dominated by the sound of distant road traffic on the M42 and traffic using the A446, which runs along the eastern edge of the town. In addition, there are sounds from local community activities. Sound levels in these areas are generally 60 to 65dB during the daytime and 55 to 60dB at night. In residential areas south of Coleshill Industrial Estate, which are located further away from the M42, typical sound levels are around 55dB during the day and 50dB at night.

[69] Quoted dB values at residential areas refer to the free-field 16-hour daytime (07:00 to 23:00) equivalent continuous sound pressure level, $L_{pAeq,16hr}$.
[70] Night-time sound levels refer to the free-field 8-hour night-time (23:00 to 07:00) equivalent continuous sound pressure level, $L_{pAeq,8hr}$.

11.2.5 In the agricultural areas between the M6 and M42 the soundscape is dominated by road traffic, with typical sound levels during the daytime of 65-70dB reducing to 60-65dB at night.

11.2.6 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in Volume 5: Appendix SV-002-019.

11.2.7 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration[71]. Vibration at all receptors from the Proposed Scheme has therefore been assessed using specific thresholds, below which receptors will not be affected by vibration. Further information is provided in Volume 1, Section 8.

Future baseline

11.2.8 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads[72], tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Construction (2017)

11.2.9 The assessment of noise from construction activities assumes a baseline year of 2017 which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline (2012/13) and the future baseline year of 2017. The assessment of noise from construction traffic assumes a baseline year of 2021, representative of the middle of the construction period when the construction traffic flows are expected to be at their peak. Further information can be found in the Traffic and Transport assessment.

Operation (2026)

11.2.10 The assessment is based upon the predicted change in sound levels that result from the Proposed Scheme. The assessment initially considered a worst case (that would overestimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2012/13. Where significant effects were identified on this basis, the effects have been assessed using a baseline year of 2026 to coincide with the proposed start of passenger services. The future baseline is for the sound environment that would exist in 2026 without the Proposed Scheme.

11.3 Effects arising during construction

Local assumptions and limitations

11.3.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report.

[71] Further information is available in the Volume 5: Appendix SV-001-000, the SMR and its Addendum.
[72] Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph.

11.3.2 Although it is anticipated that there may be some night-time working during road and rail possession periods, it is expected that the noise effects would be limited in duration and would hence not be considered significant.

11.3.3 The assessment takes account of people's perception of noise throughout the day. More stringent criteria are applied during evening and night-time periods, when people are more sensitive to noise, compared to the busier and more active daytime period.

Avoidance and mitigation measures

11.3.4 The assessment assumes the implementation of the principles and management processes set out in the draft CoCP which are:

- Best Practicable Means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA) 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; and then
  - screening: for example local screening of equipment or perimeter hoarding;
- where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered in accordance with the draft CoCP Noise Insulation and Temporary Re-housing Policy;
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of 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 will be made available to the local authorities; and
- contractors will be required to comply with the terms of the draft CoCP and appropriate action will be taken by the Nominated Undertaker as required to ensure compliance.

11.3.5 In addition to this mitigation, taller noise screening as described in Section 13 of the draft CoCP[73] has been assumed along edge of the construction site boundary adjacent to the community at; Gilson Road, at the north eastern edge of Gilson, adjacent Gilson Drive, either side of the A446 Lichfield Road, at Water Orton Primary School, and Attleboro Lane.

11.4 Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

11.4.1 The avoidance and mitigation measures will reduce noise inside all dwellings such that it does not reach a level where it would significantly affect[74, 75] residents.

Residential receptors: direct effects – communities

11.4.2 The avoidance and mitigation measures in this area will avoid airborne construction noise adverse effects[7375] on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this section.

11.4.3 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

11.4.4 In locations with lower existing sound levels[75], construction noise effects are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life. These effects are considered to be significant when assessed on a community basis taking account of the local context[76].

11.4.5 The direct adverse construction noise effects[74] on the areas of the residential communities identified in Table 17 are considered to be significant.

Table 17: Direct adverse effects on residential communities and shared open areas that are considered to be significant on a community basis

Significant effect number (see Volume 5 Appendix SV-003-019)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact and details
CSV19-C01	Construction airborne noise	Daytime	Approximately 5 dwellings on Attleboro Lane, Water Orton	Attleboro Lane overbridge with typical and highest monthly noise levels of 63dB[77] and 70dB[77]	12 months commencing 2018

[73] As described in the draft CoCP, provided as necessary by solid temporary hoarding, temporary earth stockpiles, screening close to the activities or other means to provide equivalent noise reduction.
[74] Information is provided in the emerging National Planning Practice Guidance – Noise http://planningguidance.planningportal.gov.uk, e.g. the table summarising the noise exposure hierarchy.
[75] Further information is provided in Volume 5: Appendix SV-001-000.
[76] Further information is provided in SV-001-000 and SV-003-019.

Significant effect number (see Volume 5 Appendix SV-003-019)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact and details
CSV19-C02	Combined construction airborne noise and groundborne vibration	Daytime	Approximately 15 dwellings on Gilson Road and Meadowbank Drive, Gilson	Gilson Cutting and Gilson embankment with typical and highest monthly noise levels of 64dB[77] and 75dB[77] and typical and highest monthly vibration levels of 0.22m/s[1.75]	10 months commencing in 2018 and 7 months commencing 2020

Residential receptors: indirect effects

11.4.6 Construction traffic is likely to cause adverse noise effects on residential receptors at Gilson Drive; approximately 10 dwellings located immediately adjacent to the road (CSV19-C03) are forecast to experience an increase in outdoor noise levels of around 7dB during the peak months (further information on traffic flows is provided in Section 12: Traffic and Transport).

11.4.7 These adverse effects[74] would be a change in the acoustic character of the area such that there is a perceived change in the quality of life and are considered significant when assessed on a community basis taking account of the local context[76].

Non-residential receptors: direct effects

11.4.8 Significant construction noise or vibration effects have been identified on the commercial properties located on the western edge of the Coleshill Industrial Estate (CSV19-N01). A significant noise effect has been identified on a reasonable worst case basis during the daytime at Highway Point, a large industrial premises belonging to International Automotive Components (IAC), which incorporates both manufacturing facilities and office space. The office space is located on the south eastern facade of the building, furthest from the construction works. A significant effect has also been identified, on a reasonable worst-case basis, on Bromwich Court. This is an office block complex providing predominantly open plan office accommodation in a three storey brick built building with a pitched tiled roof. A significant daytime effect is predicted on the offices in both commercial premises over a period of 1 year and 4 months commencing in 2020, reaching a maximum of 82dB[77], due to a range of construction activities including ground and structural engineering works associated with Chattle Hill viaduct, the Water Orton viaduct no. 4 and the Watton House embankment which extends almost to the boundary of the IAC industrial premises.

Non-residential receptors: indirect effects

11.4.9 Significant noise effects on non-residential receptors arising from construction traffic are unlikely to occur in this area.

[77] Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

Cumulative effects from the Proposed Scheme and other committed development.

11.4.10 This assessment has considered the potential cumulative construction noise effects of the proposed scheme and other committed developments[78]. In this area, there is no committed development that would be built at the same time as the Proposed Scheme and accordingly, construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

Summary of likely residual significant effects

11.4.11 The avoidance and mitigation measures reduce noise inside all dwellings from the construction activities such that it is does not reach a level where it would significantly affect[74] residents.

11.4.12 Despite the measures, the temporary adverse effect[74] of outdoor construction noise on the acoustic character around the residential communities of Gilson and the western edge of Water Orton is considered to be significant. The acoustic character of the shared open areas to the south west of Water Orton would also be temporary adversely affected.

11.4.13 On a reasonable worst case basis, noise from specific construction activities has been identified as resulting in residual significant temporary effects on commercial properties on the western edge of the Coleshill Industrial Estate (Bromwich Court and Highway Point)

11.4.14 Construction traffic on Gilson Drive is likely to cause significant but temporary noise effects on adjacent residential receptors.

11.4.15 The HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects during construction. In doing so the Promoter will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

11.5 Effects arising during operation

Local assumptions and limitations

Local assumptions – service pattern

11.5.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based on the highest likely train flows, including the Phase Two services. Trains are expected to be 400m long during peak hours and a mix of 200m and 400m long trains at other times.

11.5.2 The expected passenger service frequency for both Phase One, and Phase One with Phase Two services are described in Volume 1[79]. As a reasonable worst case, this assessment is based upon the service pattern for Monday to Saturday including Phase

[78] Refer to Volume 5: Appendix CT-004-000.
[79] The change in noise and vibration effects between the different timetables is assessed in Volume 1.

Two services. Passenger services will start at or after 05:00 from the terminal stations and in this area will progressively increase to the number of trains per hour in each direction on the main lines set out in Table 18. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by 24:00. Train speeds are shown in Table 18.

Table 18: Train flows and speeds

Description of line	Time period for peak daytime flows	Number of trains per hour in each direction with Phase Two services (Phase One only trains per hour in each direction is set out in brackets)	Speed
Main line between London and the north	07:00-21:00	16 (8)	330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services
London/Birmingham link [Birmingham spur]	07:00-21:00	3 (3)	230kph
Birmingham/north link [north chord]	07:00-21:00	6 (0)	170kph

Avoidance and mitigation measures

11.5.3 The development of the Proposed Scheme has, as far as reasonably practicable, kept the alignment away from main communities and low in the ground. These avoidance measures have protected many communities from likely significant noise or vibration effects.

Airborne noise

11.5.4 HS2 trains will be quieter than the relevant current European Union specifications. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia. The track will be specified to reduce noise, as will the maintenance regime. Overall these measures would reduce noise emissions by approximately 3dB at 360kph compared to a current European high speed train operating on the new track. Further information is provided in Volume 5: Appendix SV-001-000.

11.5.5 To avoid or reduce significant airborne noise effects, the Proposed Scheme incorporates noise barriers in the form of landscape earthworks, noise fence barriers and/or 'low-level' barriers on viaducts. Noise barrier locations are shown on Volume 2: Map Book – Sound, noise and vibration Map series SV-05.

11.5.6 Generally, the assessment has been based on noise barriers having a noise reduction performance equivalent to a noise fence barrier with a top level 3m above the top of the rail, which is acoustically absorbent on the railway side, and which is located 5m to the side of the outer rail. In practice, barriers may differ from this description, but will provide the same acoustic performance. For example, where noise barriers are in the form of landscape earthworks they will need to be higher above rail level to achieve

similar noise attenuation to a 3m barrier because the crest of the earthwork will be further than 5m from the outer rail.

11.5.7 The Proposed Scheme incorporates 'low-level' noise barriers into the design of viaducts. Where needed to avoid or reduce significant airborne noise effects, these barriers are designed to provide noise reduction that is equivalent to a 2m high absorptive noise barrier located on the parapet of the viaduct. Locating these 'low-level' barriers close to the rail also reduces visual impact and limits the mass of the viaduct itself.

11.5.8 Noise effects are reduced in other locations along the line, for example Landscape Character Areas, by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise barriers are not required). The location of these barriers is shown on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05.

11.5.9 Significant noise effects from the operational static sources such as line-side equipment will be avoided through their design and the specification of noise emission requirements (for further information please see Volume 5: Appendix SV-001-000).

11.5.10 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[80]. The assessment reported in this section provides an estimate of the buildings that are likely to qualify under these Regulations. Qualification for noise insulation under these Regulations will be identified and noise insulation offered at the time that the Proposed Scheme becomes operational.

11.5.11 Where required, as well as improvements in noise insulation to windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.

11.5.12 Following Government's emerging National Planning Practice Guidance, where the noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the WHO Night Noise Guidelines for Europe[81], residents are considered to be significantly affected by the resulting noise inside their dwelling. The effect on people at night due to the maximum sound level as each train passes has also been assessed[82]. The Interim Target is a lower level of noise exposure than the Regulations trigger threshold for night noise. In these particular circumstances, where night-time noise levels for the use of new or additional railways authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB[83], or the maximum noise level (dependent on the number of train passes) as a train

[80] Her Majesty's Stationery Office (1996), *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations*, London.
[81] World Health Organization (2010), *Night-time Noise Guidelines for Europe*.
[82] During the night (2300-0700) a significant effect is also identified where the Proposed Scheme results in a maximum sound level at the façade of a building at or above: 85dB L_{pAFmax} (where the number of train pass-bys exceeding this value is less than or equal to 20); or 80dB L_{pAFmax} (where the number of train pass-bys exceeding this value is greater than 20).
[83] Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

passes exceeds the criterion[83], noise insulation will be offered for these additional buildings

Ground-borne noise and vibration

11.5.13 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects –individual dwellings

Surface sections of route; airborne noise and ground-borne vibration

11.5.14 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified three residential buildings (1-3 New Cottages, Birmingham Road), close to the Proposed Scheme, where noise would exceed the daytime trigger threshold set in the Regulations. It is therefore estimated that these buildings are likely to qualify for noise insulation under the Regulations. These dwellings are indicated on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05.

11.5.15 The mitigation measures including noise insulation will reduce noise inside all dwellings such that it will not reach a level where it would significantly affect residents other than as described.

Residential receptors: direct effects –communities

11.5.16 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2, CFA19 Map Book) shows the long term 40dB[84] night-time sound level contour from the operation of trains on the Proposed Scheme and also due to sound from realigned or modified roads or existing railways. The extent of the 40dB night-time sound level contour is generally the same as, or slightly larger than, the 50dB daytime contour[85]. It is generally unlikely that there will be any adverse noise effects outside these contours.

11.5.17 The mitigation measures in this area will avoid airborne noise adverse effects[74] on the majority of receptors, and at the following communities:

- Chelmsley Wood;
- Water Orton; and
- The vast majority of Coleshill.

11.5.18 Above 40dB during the night and 50dB during the day the effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the scheme are presented on Map Series SV-05 (Volume 2, CFA19 Map Book).

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[84] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$.

[85] With the train flows described in the assumptions section of this CFA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

11.5.19 The effects identified, from the change in noise levels, are likely to be considered by the local community as an effect on the acoustic character of the area such that there is a perceived change in the quality of life. These effects are considered to be significant when assessed on a community basis taking account of local context.

11.5.20 The direct adverse effects[74] on the areas of the residential communities identified in Table 19 are considered to be significant.

Table 19: Direct adverse effects on residential communities and shared open areas that are considered significant on a community basis

Significant effect number (see Map series SV-05)	Source of significant effect	Time of day	Location and details
OSV19-C01	Airborne noise increase and vibration from new train services	Daytime and night-time	Approximately 10 dwellings in the vicinity of Meadowbank Drive and B4117 Gilson Road, closest to the Proposed Scheme. Forecast increases in sound from the railway are likely to cause a minor airborne noise adverse effect. A minor and minor ground-borne vibration adverse effect is also forecast at the very closest buildings. There are no shared open spaces identified as being adversely affected in this community area.

Residential receptors: indirect effects

11.5.21 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Non-residential receptors: direct effects

11.5.22 The assessment of operational noise and vibration indicates that significant effects are likely on the non-residential receptors identified in Table 20.

11.5.23 The assessment of effects on non-residential receptors has been undertaken on a reasonable worst case basis taking account of public available information about each receptor. Further information can be found in Volume 5: Appendix SV-004-019.

Table 20: Likely significant noise or vibration effects on non-residential receptors arising from operation of the Proposed Scheme

Significant effect number (see Map series SV-05)	Type of significant effect and source	Time of day	Location and details
OSV19-N01	Noise disturbance of office activities[86] inside buildings due to the operation of train services.	Daytime	Office developments at Bromwich Court and Highway Point

Non-residential receptors: indirect effects

11.5.24 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Summary of likely residual significant effects

11.5.25 The mitigation measures reduce noise inside all dwellings such that it does not reach a level where it would significantly affect[74] residents.

[86] Potential of activity disturbance, especially for activities that require good conditions for verbal communication.

11.5.26 The avoidance and mitigation measures in this area will avoid noise and vibration adverse effects[74] on the majority of receptors and communities, including shared open areas.

11.5.27 Taking account of the avoidance and mitigation measures and local context, the residual permanent noise effects[74] on the acoustic character of the community at the eastern edge of Gilson combined with and ground-borne vibration adverse effects at the very closest buildings to the Proposed Scheme are considered significant. No shared open spaces have been identified as being adversely effected in this community area.

11.5.28 On a reasonable worst case basis, a significant noise effect has been identified on the offices at Bromwich Court and Highway Point that are located close to the route.

11.5.29 The Promoter will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so the Promoter will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

12 Traffic and transport

12.1 Introduction

12.1.1 This traffic and transport section describes the likely impacts on all forms of transport and the consequential effects on transport users arising from the construction and operation of the Proposed Scheme through the Coleshill Junction area.

12.1.2 With regard to traffic and transport, the main issues are increased traffic as a result of implementation of the Proposed Scheme, road realignments and consequential temporary road closures, and temporary and permanent realignments of public rights of way (PRoW).

12.1.3 The effects on traffic and transport have been assessed quantitatively, based on baseline traffic conditions and future projection scenarios.

12.1.4 A detailed report on traffic and transport and surveys undertaken within the area is contained in the Volume 5 Appendix TR-001-000, Transport Assessment.

12.1.5 Figure 2 shows the location of the key transport infrastructure in this area.

12.1.6 Engagement has been undertaken with the key transport authorities including Warwickshire County Council (WCC), and the Highways Agency (HA).

12.2 Scope, assumptions and limitations

12.2.1 The assessment scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.

12.2.2 The study area includes roads potentially affected by the scheme including sections of the M42, M6, M6 Toll, Coleshill Heath Road, the B4114 Birmingham Road, Manor Drive, Gilson Drive, the B4117 Gilson Road, B4117 Watton Road, the 452, Attleboro Lane and the A446 Lichfield Road.

12.2.3 A number of transport modelling tools have been used to inform the assessment including the Department for Transport's traffic forecasting tool, Trip End Model Presentation Program (TEMPRO), for future forecast road traffic growth in the area. The assessment covers the morning (08:00-09:00) and evening (17:00-18:00) peak periods for an average weekday.

12.3 Environmental baseline

Existing baseline

12.3.1 Existing conditions in the WCC area have been determined through site visits, specially commissioned transport surveys, and liaison with Warwickshire transport authorities and stakeholders to source transport models, information on public transport and PRoW and accident data.

12.3.2 Traffic surveys of all roads crossing the route or potentially affected were undertaken in June, July and November 2012, with additional surveys undertaken in May and June

2013, comprising junction turning counts and queue surveys, as well as automatic traffic counts. These surveys were supplemented by traffic and transport data obtained from other sources, including the Highways Agency and survey information held by the local authorities. The highway peak hours in the study area were 08:00-09:00 and 17:00-18:00.

12.3.3 PRoW surveys were undertaken in August and September 2012 to establish the nature of the PRoW and their usage by pedestrians, cyclists and horse riders (non-motorised users). The surveys included all PRoW and roads that will cross the route of the Proposed Scheme, and any additional PRoW and roads that will be affected by the Proposed Scheme. The Proposed Scheme will cross eight PRoW within the Coleshill Junction area (one twice) and will affect three others. Six of the surveyed PRoW were observed to be used by less than 10 people a day. The routes with the greatest observed usage were M43 (south of Water Orton) with 28 users and M77 (east of Chelmsley Wood) with 20 users per day. The Proposed Scheme crosses five roads with footways.

12.3.4 Three motorways pass through the area. The M6 follows a broadly south-east/north-west route within this area and curves around Chelmsley Wood and Smith's Wood before heading west towards Birmingham; it is accessed via the A446 Stonebridge Road at Junction 4 and the A452 at junction 5. The M42 crosses the M6 by Chelmsley Wood and then travels broadly parallel to the M6 through the area past Coleshill; it is accessed via the A45 at Junction 6 to the south and the A446 and A4097 at Junction 9.to the north. The M6 Toll diverges north from the M6 at Junction 3a and forms an extended junction with the M42 through this area, diverging just south of M42 junction 9. There are connections between the M6 and M42 at junction 4 (M42 junction 7/7a) and 4a (M42 junction 8).

12.3.5 The main local roads that will be affected by the Proposed Scheme, from south to north, are Coleshill Heath Road, which connects Chelmsley Wood in the south-west with Coleshill in the north-east; the B4114 Birmingham Road, which links the neighbourhood of Kingshurst in the west with Coleshill in the east; Gilson Drive, which connects Coleshill Hall Cottages and Coleshill Manor Office Campus in the south-west with the village of Gilson in the north-east; the B4117 Gilson Road, which provides a link between the A446 Lichfield road in the south-east and the B4117 Watton Lane; Attleboro Lane, which connects Water Orton to a footpath under theM6 and A452 from Kingshurst in Solihull; and the A446 Lichfield Road, which runs through the CFA from south to north on the western side of Coleshill and provides access to the M6 and M42. All of these roads will require some degree of physical change within the Proposed Scheme.

12.3.6 Other main routes in the area include: the A452, which is close to or alongside the M6 through the area and serves the large urban area of Chelmsley Wood, Smith's Wood, Kingshurst and Castle Bromwich; and the B4117 Watton Lane, which continues west from the B4117 Gilson Road into Water Orton, where it meets the B4118 Water Orton Road that connects westwards into Castle Bromwich.

12.3.7 The Proposed Scheme will cross roads in 10 locations in the Coleshill Junction area.

12.3.8 Safety and accident data for the road network subject to assessment has been obtained from WCC for the three year period of mid-2009 to mid-2012. This has been assessed and no significant accident clusters were identified within the area.

12.3.9 There are seven public bus services that pass through the Coleshill Junction area. These services provide a maximum combined service frequency of 16 buses per hour per direction between Monday and Friday. The following bus services serve communities within the area :

- bus route 90 – Birmingham, Water Orton, Coleshill and Chelmsley Wood;
- bus route 97 – Chelmsley Wood, Birmingham, Birmingham Airport and Coleshill;
- bus route 777 – Birmingham International Station, Coleshill and Hams Hall;
- bus route 891 – Birmingham, Coleshill and Solihull;
- bus route 115 – Tamworth to Coleshill;
- bus route 223 – Coleshill, Gilson and Water Orton to Lea Marston and Solihull; and
- bus route 757 – Coleshill and Water Orton to Sutton Coldfield.

12.3.10 The Proposed Scheme will cross the existing Birmingham to Nuneaton Line between Water Orton and Coleshill Parkway. The rail services on this line, currently operated by CrossCountry, run with an average off peak frequency of two trains per hour and a total of 35 trains per day each way. There are no navigable waterways affected by the Proposed Scheme in this area and consequently these are not considered further in this assessment.

Future baseline

12.3.11 The future baseline traffic volumes have been calculated by applying growth factors based on TEMPRO for the years of assessment 2021, 2026 and extrapolation to 2041, and taking account of any major locally consented schemes. No other changes to the traffic and transport baseline are anticipated in this area.

Construction (2017 to 2025)

12.3.12 Individual construction activities have been assessed against 2021 baseline traffic flows, irrespective of when they occur during the construction period. Future baseline traffic volumes in the peak hours are forecast to grow by around 11% by 2021 compared to 2012.

Operation (2026)

12.3.13 Future baseline traffic volumes in the peak hours are forecast to grow by around 20% by 2026 compared to 2012.

Operation (2041)

12.3.14 Future baseline traffic volumes in the peak hours are forecast to grow by around 46% by 2041 compared to 2012.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The following measures (as detailed in Section 2) have been included as part of the engineering design of the Proposed Scheme in the Coleshill Junction area and will avoid or reduce effects on transport users:

- construction materials, excavated materials and equipment will be transported along a haul road within the land required for construction, where reasonably practicable, to reduce lorry movements on the public highway;
- the majority of roads crossing the Proposed Scheme will be kept open during construction, resulting in reduced diversions of traffic onto alternative routes;
- construction of the new alignment of Manor Drive and its connection to the B4114 Birmingham Road before closure of the existing Manor Drive;
- the Proposed Scheme includes permanent realignment or diversion of eight PRoW and temporary routes will be provided as necessary to reduce loss of amenity;
- road closures will be limited to overnight and/or weekends;
- hard shoulders will be utilised to compensate for lane closures on motorways;
- traffic management or narrow lane working will be used to reduce the need for highway closure;
- HGV routeing along the strategic road network and using designated routes for access as shown on Map TR-03-104 (Volume 5, Map Book Traffic and Transport);
- materials will be transported by rail to reduce the potential numbers of HGV trips that would otherwise be made on the highway network;
- provision of on-site accommodation and welfare facilities to reduce daily travel by site workers; and
- the rail possessions will be managed so these take place for limited durations and in such a way that they will have no significant effect on travellers.

12.4.2 The draft Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-003-000) includes measures that seek to reduce the impacts and effects of deliveries of construction materials and equipment, including reducing construction lorry trips during peak background traffic periods. The draft CoCP includes HGV management and control measures.

12.4.3 Where reasonably practicable, the number of private car trips to and from each site (both workforce and visitors) will be reduced by encouraging alternative modes of transport or vehicle sharing. This will be supported by an over-arching framework

travel plan[87] that will require travel plans to be used along with a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme. As part of this, a construction workforce travel plan will be put into operation with the aim of reducing workforce commuting by private car, especially sole occupancy car travel. Where reasonably practicable, particularly in the urban context, this will encourage the use of sustainable modes of transport.

12.4.4 The measures in the CoCP will include clear controls on vehicle types, hours of site operation, and routes for heavy goods vehicles, to reduce the impact of road based construction traffic. In order to achieve this, generic and site-specific traffic management measures will be implemented during the construction of the Proposed Scheme on or adjacent to the public roads, footpaths and other PRoW affected by the Proposed Scheme as necessary.

12.4.5 Specific measures will include:

- core site operating hours will be 08:00-18:00 on weekdays and 08:00-13:00 on Saturdays and site staff and workers will therefore generally arrive before the morning peak hour and depart after the evening peak hour (although the assessment has assumed that some of work journeys to the construction sites take place within the morning and evening peak hours to reflect a reasonable worst case scenario) (draft CoCP, Section 5); and
- excavated material will be reused wherever reasonably practicable along the alignment of the Proposed Scheme which will reduce the effects of construction vehicles on the public highway (draft CoCP, Section 15).

12.4.6 The need for rail possessions will be managed so that these take place for limited durations overnight and at weekends, such that there will be no significant effects on rail travellers. Rail replacement services will be provided as necessary during rail possessions.

Assessment of impacts and effects

Temporary effects

12.4.7 The following section considers the impacts on traffic and transport and the consequential effects resulting from construction of the Proposed Scheme.

12.4.8 The temporary traffic and transport impacts within this area will be:

- construction vehicle movements to and from the main compound and satellite compounds and construction traffic passing through this area arising from neighbouring areas;
- road realignments and associated overnight or weekend diversions;

[87] Construction and operational travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

- restricted access arrangements and a coordinated traffic management scheme and/or narrow lane working ; and
- PRoW realignments and diversions.

12.4.9 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, movement of excavated materials and site worker trips.

12.4.10 Details of construction compounds are provided in Section 2. The duration of when there will be busy transport activity at each site is shown in Table 21. Some compounds only have traffic movements to other locations within the construction area. This represents the periods when the construction traffic flows will be greater than 50% of the peak flows. Also shown is the estimated number of daily vehicle trips during the peak month of activity, the lower end of the range shows the average number of trips in the busy period and the upper end shows the peak flows. The assessment scenario has assumed the peak month for the combination of activities, i.e. not necessarily the peak activity at each individual site.

Table 21: Typical vehicle trip generation for construction site compounds in this area

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (Months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Main	M6 Motorway Main Compound	Coleshill Heath Road	July 2018	5	27	255-290	125-185
Satellite	M6 Motorway South Viaduct Compound	Track/haul route via M6 Motorway Main Compound	-	-	-	Few external movements	
Satellite	M6 Motorway North Viaduct Compound (South)	Track/haul route via M6 Motorway Main Compound	-	-	-	Few external movements	
Satellite	M6 Motorway North Viaduct Compound (North)	Track/haul route via M6 Motorway Main Compound	-	-	-	Few external movements	
Satellite	Coleshill Viaduct West Compound	Track/haul route via M6 Motorway Main Compound	-	-	-	Few external movements	
Satellite	Birmingham Spur Diveunder Compound	Track/haul route via M6 Motorway Main Compound	-	-	-	Few external movements	
Satellite	M42 Coleshill Box Structure Compound	Gilson Drive	July 2018	5	20	115-125	85-115

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (Months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Satellite	Re-aligned Manor Drive Compound	Track/haul route via M42 Coleshill Box Structure Compound	-	-	-	Few external movements	
Satellite	M42 Coleshill North Viaduct Compound	Gilson Drive	July 2018	2.5	19	60-75	60-90
Satellite	M42-M6 Motorway Link Viaducts (East)	Track/haul route via M42 Coleshill North Viaduct Compound	-	-	-	Few external movements	
Satellite	M42-M6 Motorway Link Viaducts Compound (Central)	M6	June 2018	2	23	50	30-45
Satellite	M42-M6 Motorway Link Viaducts (West) Compound	Track/haul route via M42-M6 Motorway Link Viaduct Compound (Central)	-	-	-	Few external movements	
Satellite	Attleboro Flyover Compound	Coleshill Road	July 2018	3.5	14	110-130	90-120
Satellite	Water Orton Viaducts 1 and 3 (M42 North) Compound	B4117 Gilson Road	July 2018	2	21	105-120	60-85
Satellite	Water Orton Viaducts 1 and 3 (M42 South) Compound	Track/haul route via M42-M6 Motorway Link Viaduct Compound (Central)	-	-	-	Few external movements	
Satellite	Water Orton Viaducts 1 and 3 (Central) Compound	A446 Lichfield Road	July 2018	3.5	27	145-195	90-130
Satellite	Chattle Hill Box Structure Compound	Track/haul route via Water Orton Viaduct 1 and 3 (Central) Compound	-	-	-	Few external movements	
Satellite	Water Orton Viaducts 1 and 3 (North) Compound	Track/haul route via Water Orton Viaduct 1 and 3 (Central) Compound	-	-	-	Few external movements	
Satellite	Water Orton Viaducts 1 and 3 (South) Compound	Track/haul route via Water Orton Viaduct 1 and 3 (Central) Compound	-	-	-	Few external movements	

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (Months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Road head	RH-159	Coleshill Heath Road	October 2019	2.5	30	-	750
Road head	RH-160	Maintenance slip road via Coleshill Heath Road	February 2020	2.5	30	-	750
Road head	RH-161	B4114 Birmingham Road	August 2018	5.5	63	-	2550
Road head	RH-163	B4117 Gilson Road/ A446 Lichfield Road	May 2021	1	10	-	35
Road head	RH-164	A446 Lichfield Road	July 2019	2.5	30	-	1250

12.4.11 Details of construction phasing are provided in Section 2.3. The assessment of construction traffic has considered the traffic and transport impacts and effects in four peak periods of construction activity, based on the proposed phasing of the works. The peak periods have been identified as months 42 to 43 (2019 Quarter 4), months 45 to 48 (2020 Quarter 1 to Quarter 2), months 49 to 51 (2020 Quarter 2 to Quarter 3) and month 59 (2021 Quarter 1). In months 42 to 43 and 45 to 48 there will be 15 operational compounds, in months 49 to 51 there will be 14 operational compounds and in month 59 there will be 13 operational compounds.

12.4.12 The primary HGV access and egress routes to the area will be on the motorway network, via the nearest junctions with the A446 and A452, and on the A446 itself.

12.4.13 Construction of the Proposed Scheme will result in changes in traffic flows and delays to vehicle users due to increased traffic flows from workers and construction vehicles accessing compounds and also temporary road closures and diversions.

12.4.14 Highway realignments in this area will result in various changes in journey length of up to 470m and, therefore, will not be significant.

12.4.15 There will be traffic management and overnight and/or weekend closures on Coleshill Heath Road, the B4114 Birmingham Road, Manor Drive, the B4117 Gilson Road, the B4117 Watton Lane, Attleboro Lane and the A446 Lichfield Road. The effects of these off-peak closures on traffic flows and delays to vehicle occupants, in terms of the diversions and traffic congestion[88], will not be significant.

[88] In assessing significant effects of traffic changes on congestion and delays, a major adverse effect occurs where traffic flows at a junction will be beyond or very close to capacity with the Proposed Scheme and the increases in traffic due to the Proposed Scheme will be such as to substantially increase queues and delays on a routine basis at peak times. A moderate adverse effect will occur when traffic flows at a junction will be approaching or at capacity with the Proposed Scheme and modest increases in traffic will increase the frequency of queues and more substantial delays. A minor adverse effect occurs when traffic flows at a junction are not generally exceeding capacity with the Proposed Scheme but the increase in flows will result in occasional queues and delays or small increases in existing delays.

12.4.16 A number of works will involve restrictions and closures of sections of the M6 and M42. These are described in Section 2.

12.4.17 During the construction of the M6 motorway box structure, M6 motorway south viaducts and M6 motorway north viaduct, lane closures and restrictions on the M42 Junctions 7 and 7a slip roads, M6 westbound, M6 eastbound and M6 eastbound slip road will be necessary. These closures will be of short duration and are considered individually to not have significant effects.

12.4.18 During the construction of the M42 Coleshill box structure, the number of lanes on the M42/M6 Toll southbound will be reduced from four to three for a period of 40 days. This is considered to result in a major adverse effect.

12.4.19 The construction of the M42 Coleshill box structure will also result in three further closures of the M6 to M42 southbound, M42/M6 Toll southbound and M42/M6 Toll northbound for limited night-time closures and one weekend closure. These closures are considered individually to not have significant effects.

12.4.20 During the construction of the M42-M6 motorway link east and west viaducts, lane closures will be required on both the eastbound and westbound links, plus weekend closure of both links. These closures are considered individually to not have significant effects.

12.4.21 During the construction of Water Orton No. 1 and No. 3 viaducts, it will be necessary to close sections of the northbound M42/M6 Toll carriageway and slip road, the southbound M42/M6 Toll carriageway, the westbound M42-M6 link, and Gilson Road, each for one or two weekends. These closures are considered individually to not have significant effects.

12.4.22 However, whilst the individual road closures are not considered significant (other than the 40 day reduction in M42 southbound lanes) and generally involve overnight or limited weekend restrictions, taken in combination there will be on-going disruption to the M42, M6 Toll and M6 in this area over an extended period and it is considered that this will be a major adverse effect.

12.4.23 Changes in traffic flows will lead to a significant increase in delay and congestion to vehicle users in the following locations:

- M6/A446 Stonebridge Road junction (major adverse effect);
- A446 Stonebridge Road/Coleshill Heath Road junction (major adverse effect);
- A446 Stonebridge Road/B4114 Birmingham Road junction (major adverse effect);
- A446 Lichfield Road/B4117 Gilson Road junction (major adverse effect); and
- A446 Lichfield Road/B4117 Watton Lane junction (major adverse effect).

12.4.24 Most of these junctions are predicted to be over capacity in the future baseline scenario, assuming that background traffic growth is unconstrained. The addition of construction traffic will increase congestion, but the effects reported are likely to represent a worst case scenario.

12.4.25 As a result of the construction of the highway works around Birmingham Interchange to the south of the Coleshill Junction area, temporary traffic management measures will be required. Access to strategic roads including A45 Coventry Road, A452 Chester Road and A446 Stonebridge Road will be maintained at peak times. The only road affected in the Coleshill Junction area will be the A446 Lichfield Road, on which the effect in terms of traffic congestion and delays will not be significant.

12.4.26 Construction of the Proposed Scheme is forecast to result in substantial increases in daily traffic flow (i.e. more than 30% for HGV or all vehicles) causing a significant increase in traffic-related severance[89] for non-motorised users in the following locations, as the increases in HGV traffic flows may result in users experiencing delays in crossing these roads:

- Coleshill Heath Road between Yorkminster Drive and the A446 Stonebridge Road (major adverse effect);
- B4114 Birmingham Road between the A446 Stonebridge Road and the A452 Lanchester Way (major adverse effect);
- Gilson Drive between the M42 overbridge and the B4117 Gilson Road (moderate adverse effect);
- B4117 Gilson Road between Gilson Drive and the A446 Stonebridge Road (major adverse effect); and
- A446 Lichfield Road between M6 Junction 4 and M42 Junction 9 (major adverse effect).

12.4.27 Utilities works (including diversions) have been assessed in detail where they will be major works and where the traffic and transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising from such works within the area. Smaller utilities works are expected to result in only localised traffic and pedestrian diversions, which will be of short term duration. No additional significant effects are expected.

12.4.28 The effect on accident and safety risks will not be significant. There are no locations where there are existing highway safety issues and where there will be substantial increases in traffic during construction.

12.4.29 It is not expected that construction of the Proposed Scheme will require any bus route diversions, as road closures are only proposed overnight when the bus services will not be operational.

[89] In the context of this Traffic and Transport section, severance is used to relate to a change in ease of access for non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed for access.

12.4.30 Rail possessions will aim to minimise any disruptions to passenger and freight services. As the possessions are expected to be limited and be only overnight or at weekends, the effect on public transport delay is not considered to be significant.

12.4.31 Construction of the Proposed Scheme is not expected to result in any temporary loss of pedestrian links to or between public transport. There are no stations/interchanges affected by the Proposed Scheme in this area and consequently these are not considered further in this assessment

12.4.32 There will be eight minor adverse effects on journey ambience within the Coleshill Junction area during construction. These relate to Footpath M43, where the journey ambience will be adversely affected and Footpaths M54, M57, M58, M56, M62, M60 and M72/M77 where PRoW users and construction vehicles will run alongside or cross parts of their routes.

12.4.33 There will be a minor adverse effect on non-motorised users from Footpath (M54) being realigned, resulting in approximately 420m increased travel distance.

Cumulative effects

12.4.34 The assessment includes cumulative effects of planned development during construction by taking this into account within the background traffic growth.

12.4.35 The assessment for this area also includes in-combination effects by taking into account traffic and transport impacts of works being undertaken in the neighbouring areas of Curdworth to Middleton (CFA20), Birmingham Interchange and Chelmsley Wood (CFA24) and Castle Bromwich and Bromford (CFA25). The assessment has, therefore, included inbound flows of 350 cars/LGV and 2950 HGV per day and outbound flows of 300 cars/LGV and 2950 HGV.

Permanent effects

12.4.36 Any permanent effects of construction have been considered in the operations phase assessments for traffic and transport, in Section 12.5. This is because the impacts and effects of the forecast increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

12.4.37 The implementation of the draft CoCP (see Volume 5: Appendix CT-003-000) in combination with the construction workforce travel plan will, to some degree, mitigate the transport related effects during construction of the Proposed Scheme. The reductions in effects arising from the travel plan measures have not been included in the assessment, which will mean the adverse effects may be over-stated.

12.4.38 No further traffic and transport mitigation measures during construction of the Proposed Scheme are considered necessary, based on the outcomes of this assessment.

Summary of likely residual significant effects

12.4.39 The most intensive peak periods of construction will cause increases in traffic that will affect non-motorised users crossing and using: Coleshill Heath Road between Yorkminster Road and the A446 Stonebridge Road; B4114 Birmingham Road between the A446 Stonebridge Road and the A452 Chester Road; Gilson Drive between the

M42 overbridge and the B4117 Gilson Road; B4117 Gilson Road between Gilson Drive and the A446 Stonebridge Road; and A446 Lichfield Road between its junction with Gorsey Lane and its junction with B4117 Watton Lane.

12.4.40 Similarly, temporarily increased traffic will from time to time cause additional congestion, increasing delays for road users at the following junctions: M6/A446 Stonebridge Road; A446 Stonebridge Road/Coleshill Heath Road; A446 Stonebridge Road/B4114 Birmingham Road; A446 Lichfield Road/B4117 Gilson Road; and A446 Lichfield Road/B4117 Watton Lane.

12.4.41 Motorways in this area will be subject to temporary closures resulting in adverse effects on the M42/M6 Toll southbound and on the overall M42/M6/M6 Toll corridor through the area, due to the extended period of various restrictions. The overall effect of these measures will be significant, with the reduction in M42/M6 Toll southbound lanes for 40 days of particular significance.

12.4.42 Temporary traffic diversions, when in operation, will increase travel distance and time for road users during the construction period. These include diversions to address temporary road closures at Coleshill Heath Road, B4114 Birmingham Road, Manor Drive, B4117 Gilson Road and Attleboro Lane.

12.4.43 One PRoW will be adversely affected (M54), with increased walking distances for users.

12.4.44 The significant effects that result from construction of the Proposed Scheme are shown on Map TR-03-104 (Volume 5, Map Book Traffic and Transport).

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 The following measures have been included as part of the design of the Proposed Scheme and will avoid or reduce impacts on transport users:

- retaining the majority of roads crossing the Proposed Scheme in or very close to their current location, resulting in limited diversions of traffic onto alternative routes; and
- retaining PRoW crossing the Proposed Scheme, with localised realignments kept to a minimum where reasonably practicable.

Assessment of impacts and effects

12.5.2 The following section considers the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme (as described in Section 2.4 of this report).

12.5.3 The operational traffic and transport impacts within this CFA will include:

- permanent diversion or realignment of six roads;
- one permanent road closure;
- permanent diversion or realignment of PRoW;
- two permanent footpath closures;

- provision of a new bridleway link; and
- traffic accessing the areas of the Proposed Scheme for maintenance purposes.

12.5.4 In 2041, traffic flows are expected to be similar to those forecast without the Proposed Scheme. The only changes to traffic will be occasional traffic that may access areas of the Proposed Scheme for maintenance purposes. However, these infrequent vehicle movements are expected to be very low and will therefore have no significant effect, including no effects on travel times for non-motorised users. There will also be limited increases in traffic due to access journeys to Birmingham Interchange station in the neighbouring Birmingham Interchange and Chelmsley Wood area (CFA24), but these will have no significant effects.

12.5.5 The effect on accidents and safety will not be significant as there will be no substantial increases in road traffic due to the operation of the Proposed Scheme.

12.5.6 The Proposed Scheme will have no effect on the seven bus services – route numbers 90, 97, 777, 891, 115, 223 and 757 – that will intersect with the alignment of the Proposed Scheme. There will be no significant effects on public transport within this area.

12.5.7 The road realignments and diversions will not result in any significant effects. Part of Gilson Drive will be closed, with the remaining length connected to the realigned Gilson Road, with no significant effect.

12.5.8 Eight PRoW will be realigned within this area. Of these, two will be realigned by less than 100m. The Proposed Scheme will have a minor adverse effect on five PRoW (M43, M72/M77, M56, M60 and M62) due to increased travel distance. The Proposed Scheme will have a minor beneficial effect on Footpath M58, which will be shortened by approximately 350m. Footpath M43 will be closed and users redirected via the realigned Attleboro Lane. Part of Footpath M60 will be closed and users redirected via the realigned Footpath M62.

12.5.9 The Proposed Scheme will provide a new bridleway link running around the south side of the north chord, between Attleboro Lane and Watton Lane.

12.5.10 The effects in 2041 will be the same as those in 2026.

Cumulative effects

12.5.11 The assessment allows for the cumulative effects of planned development during operation by taking this into account within the background traffic growth.

12.5.12 The assessment also considers in-combination effects by taking into account transport impacts as a result of operation of the Proposed Scheme in neighbouring CFA areas, in this case associated with the Birmingham Interchange station in Birmingham Interchange and Chelmsley Wood area (CFA24). It is estimated that 160 two-way daily additional trips will use the A446 Lichfield Road within the Coleshill Junction area.

Other mitigation measures

12.5.13 No further mitigation measures for the operation of the Proposed Scheme are considered necessary based on the outcomes of this assessment.

Summary of likely residual significant effects

12.5.14 Five PRoW will be realigned or diverted (Footpaths M72/M77, M56, M60, M62 and M54) which will increase travel distance for users. Footpath M43 and part of Footpath M60 will be closed. One new bridleway link will be provided between Attleboro Lane and Watton Lane.

12.5.15 The significant effects that result from construction of the Proposed Scheme are shown on Map TR-04-104 (Volume 5, Map Book, Traffic and Transport).

13 Water resources and flood risk

13.1 Introduction

13.1.1 This section provides a description of the current and future baseline for water resources including surface water, groundwater, and the baseline conditions for flood risk. It then reports on the likely impacts and significant effects on these aspects as a result of the construction and operation of the Proposed Scheme.

13.1.2 The main environmental features of relevance to water resources and flood risk that are present across the Coleshill Junction area (CFA19) include:

- the River Cole, classified as a main river, which will be crossed by the Proposed Scheme, as will four of its tributaries that are classified as ordinary watercourses, and their associated floodplains;
- the River Tame ,classified as a main river, which will be crossed by the Proposed Scheme, as will five of its tributaries that are classified as ordinary watercourses, and their associated floodplains;
- numerous minor springs are present across the study area; and
- a number of Secondary aquifers.

13.1.3 Key environmental issues relating to water resources and flood risk include:

- the realignment of the River Cole at Manor Drive and M42/M6 Toll to allow it to pass between the piers of the Coleshill viaducts and the River Cole viaducts;
- the realignment of a tributary of the River Cole within Junction 7a on the M42 around Coleshill embankment no.1;
- the realignments at two locations of an unnamed tributary of the River Cole at Green Lane around Coleshill embankment no.2;
- the realignment of an unnamed tributary of the River Tame at Jack O'Watton Industrial Estate, Water Orton around Watton Lane embankment;
- the realignment of an unnamed tributary of the River Tame south of Gypsy Lane and Vicarage Lane , Water Orton, around Marsh Lane embankment;
- the potential impact of the viaduct crossings over the watercourses in this study area, specifically the River Cole and the River Tame , as well as the construction works in floodplains;
- the culverting of a section of an unnamed tributary of the River Cole at Gilson Road under the realigned B4117 Gilson Road;
- the culverting of a section of a drain to the River Cole at The Belt, Green Lane;
- disruption of groundwater flow regimes as a result of groundwater drainage required for construction of the Gilson cutting (Map CT-10-066, C5);
- the potential impact on groundwater flow to issues and groundwater dependent ecological receptors in the area; and

- the potential impact caused by increased surface water run-off rates as a result of reduced infiltration capacity of the ground caused by the works, and the interruption of existing surface water run-off flow paths.

13.1.4 Volume 5: Appendix WR-001-000 contains a report on the route-wide effects including:

- generic assessments on a route-wide basis;
- stakeholder engagement;
- in combination effects;
- a draft operation and maintenance plan for water resources and flood risk;
- a Water Framework Directive (WFD)[90] compliance assessment; and
- a route-wide Flood Risk Assessment (FRA).

13.1.5 Detailed reports on water resources and flood risk within the Coleshill Junction area are also contained in the Volume 5 appendices. These include:

- Appendix WR002-019: Water Resources Assessment report;
- Appendix WR003-019: Flood Risk Assessment; and
- Appendix WR004-012: River Modelling Report.

13.1.6 Map series WR-01 to WR-06 showing details referred to in this report and those in Volume 5 are contained in Volume 5: Map Book – Water resources.

13.1.7 Discussions have been held with the Environment Agency, Warwickshire County Council (WCoC) as the Lead Local Flood Authority (LLFA), the Canal & River Trust (formerly British Waterways) and Warwickshire Wildlife Trust.

13.2 Scope, assumptions and limitations

13.2.1 The assessment scope, key assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and in the SMR and its addendum (Volume 5: Appendices CT-001-000/1 and CT-001-000/2) and appendices presented in Volume 5: WR-002-019 and Volume 5: WR-003-019. This report follows the standard assessment methodology.

13.2.2 The spatial scope of the assessment was based upon the identification of surface water and groundwater features within 1km of the centre line of the route, except where there is clearly no hydraulic connectivity. Outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme. Where works extend more than 200m from the centre line, for example at stations and depots, professional judgement has been used in selecting

[90] *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*, European Parliament and European Council, Strasbourg.

the appropriate limit to the extension in spatial scope required. For the purposes of this assessment this spatial scope is defined as the study area.

13.2.3 Due to the number of ponds and other water features present within the study area, only those either within the land required for the construction or operation of the Proposed Scheme, or within the calculated zone of influence have been detailed in the baseline in this assessment.

13.2.4 Site visits undertaken in June 2013 with the Environment Agency and Warwickshire County Council for the following locations along the route: the River Cole at the A446 Stonebridge Road and the River Tame near Water Orton.

13.2.5 Water Framework Directive (WFD) classification data has been made available by the Environment Agency. For surface water bodies that do not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), the status class has been taken as the status class for the first downstream water body for which a status class is reported. Where groundwater does not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), these are referred to as 'not assessed by the Environment Agency' in the summary of geology and hydrogeology in Table 23.

13.2.6 Groundwater level data from the Environment Agency and other monitored locations such as private abstractions are limited in the study area. It is assumed that groundwater levels vary in a similar fashion to topography throughout the study area, with groundwater level contours roughly parallel to topographic contours. In the absence of more detailed information, it has been generally assumed that groundwater levels are within 1m of the ground surface.

13.2.7 The limitations associated with flood risk within this study area are described in detail in the Volume 5: Appendix WR-003-019.

13.3 Environmental baseline

Existing baseline surface water resources

Surface water features

13.3.1 All water bodies within the study area fall within the Tame, Anker and Mease catchment, which includes Coleshill Brook, the River Cole and the River Tame. This catchment falls within the Humber River Basin District (RBD) as set out in the River Basin Management Plan[91] (RBMP).

13.3.2 The current surface water baseline is shown in Volume 5: Map WR-01-32 and all surface water features within the study area are assessed within Volume 5: Appendix WR-002-019. Table 22 includes features potentially affected by the Proposed Scheme.

[91] Environment Agency (2009), *River Basin Management Plan. Humber River Basin District*.

Table 22: Surface water features potentially affected by the Proposed Scheme

Water feature	**Location description (map reference[92])**	**Watercourse classification[93]**	**WFD water body name and number and current overall status**	**WFD status objective by 2027 as per Humber River Basin Management Plan (RBMP) unless stated)**	**Receptor value[94]**
Drain to River Cole	At Junction 7a on M42. (SWC-CFA19-001)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) – Moderate Potential.	Good potential	Moderate
Tributary to River Cole	At Green Lane. (SWC-CFA19-002)	Ordinary watercourse			Moderate
2nd crossing of tributary to River Cole	At Green Lane. (SWC-CFA19-003)	Ordinary watercourse			Moderate
Coleshill Brook – tributary to River Cole	At Coleshill Hall Bridge. (SWC-CFA19-004)	Ordinary watercourse			Moderate
River Cole	At Manor Drive, Birmingham spur (from the delta junction interchange to Curzon Street Station). (SWC-CFA19-005)	Main River			High
River Cole	At M42/M6 Toll. (SWC-CFA19-006)	Main River			High
Tributary of River Cole	At Gilson Road. (SWC-CFA19-007)	Ordinary watercourse			Moderate
Pond	At Gilson Road (SWC-CFA19-008)	Not applicable			Refer to Ecology Volume 2, CFA Report 19, Section 7

[92] Volume 5: Map Book – Water resources, Maps WR-01-032.
[93] Water-feature classifications: Section 113 of the Water Resources Act 1991 defines a main river as a watercourse that is shown as such on a main river map. Section 72 of the Land Drainage Act 1991 defines an ordinary watercourse as 'a watercourse that is not part of a main river'. Section 221 of the Water Resources Act 1991 defines a watercourse as including ' all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. Main rivers are larger rivers and streams designated by Defra on the main river map and are regulated by the Environment Agency.
[94] For examples of receptor value see Table 43 in the SMR (Volume 5: Appendix CT-001-000/2).

Water feature	Location description (map reference[92])	Watercourse classification[93]	WFD water body name and number and current overall status	WFD status objective by 2027 as per Humber River Basin Management Plan (RBMP) unless stated)	Receptor value[94]
Drain feeder to River Cole	The Belt, Green Lane, Birmingham spur (from the delta junction interchange to Curzon Street Station). (SWC-CFA19-010)	Ordinary watercourse	River Cole from Hatchford-Kingshurst Brook to River Blythe (GB104028042420) – Moderate Potential.	Good Potential	Moderate
Pond	At Green Lane Track, The Belt (SWC-CFA19-009)	Not applicable	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Refer to Ecology Volume 2, CFA Report 19, Section 7
Tributary of River Tame	Extended culvert under A446 Lichfield Road, Jack O'Watton Industrial Estate, Water Orton. (SWC-CFA19-011)	Ordinary watercourse	River Tame from confluence of the two arms to River Blythe (GB104028046840) – Moderate Potential.	Good Potential	Moderate
Tributary to River Tame	At Jack O'Watton Industrial Estate, Water Orton. (SWC-CFA19-012)	Ordinary watercourse			Moderate
River Tame	At Coleshill Industrial Estate, Edison Road. (SWC-CFA19-013)	Main River			Very high
Drain feeder to River Tame	At Watton House – Jack O'Watton, Water Orton, north chord (from Curzon Street Station to Manchester). (SWC-CFA19-014)	Ordinary watercourse	River Tame from confluence of the two arms to River Blythe (GB104028046840) – Moderate Potential.	Good Potential	Moderate
Tributary of River Tame	Extended culvert under M42/B4117 Gilson Road, Water Orton, north chord (from Curzon Street Station to Manchester). (SWC-CFA19-015)	Ordinary watercourse			Moderate
Tributary of River Tame	South of Gypsy Lane, Water Orton, north chord (from Curzon Street Station to Manchester). (SWC-CFA19-016)	Ordinary watercourse			Moderate

Water feature	Location description (map reference[92])	Watercourse classification[93]	WFD water body name and number and current overall status	WFD status objective by 2027 as per Humber River Basin Management Plan (RBMP) unless stated)	Receptor value[94]
Pond (1)	South of Gypsy Lane, Gilson, north chord, (from Curzon Street Station to Manchester). (SWC-CFA19-017)	Not applicable			Refer to Ecology Volume 2, CFA Report 19, Section 7
Pond (2)	South of Gypsy Lane, Gilson, north chord (from Curzon Street Station to Manchester). (SWC-CFA19-018)	Not applicable			Refer to Ecology Volume 2, CFA Report 19, Section 7
Tributary of River Tame	South of Vicarage Lane, Water Orton, north chord (from Curzon Street Station to Manchester) (SWC-CFA19-019)	Ordinary watercourse	River Tame from confluence of the two arms to River Blythe (GB104028046840) – Moderate Potential.	Good Potential	Moderate
Pond	South of Vicarage Lane, Gilson, north chord (from Curzon Street Station to Manchester). (SWC-CFA19-020)	Not applicable			Refer to Ecology Volume 2, CFA Report 19, Section 7
6 further Ponds	Located within the land required for the construction and operation of the Proposed Scheme.	Not applicable			Low

* Year may vary in different RBMPs.

Water Framework Directive status

13.3.3 The Environment Agency notes that the overall WFD classification of both the River Cole and the River Tame is Moderate Potential. The WFD objective status of both water bodies is Good Potential by 2027. The WFD status and objectives of water bodies that are not crossed by the Proposed Scheme are shown in Volume 5: Appendix WR-002-019.

Abstractions and permitted discharges

13.3.4 There are no locations where surface water is abstracted within 1km of the Proposed Scheme in this area, according to data from the Environment Agency[95] (details in Volume 5: Appendix WR-002-019).

[95] Surface water abstractions for public supply are not included.

13.3.5 Information from North Warwickshire Borough Council indicates that there are no unlicensed abstractions from surface water used for potable supply in their records.

13.3.6 Envirocheck data indicates that there are 57 current permitted surface water discharges within 1km of the Proposed Scheme in this study area (details in Volume 5: Appendix WR-002-019).

Existing baseline – groundwater resources

Geology and hydrogeology

13.3.7 The locations of abstractions and geological formations are shown on Volume 5: Map WR-02-019.

13.3.8 A summary of the superficial and bedrock geology and hydrogeology is presented in Table 23. Unless otherwise stated, the geological groups listed are all crossed by the route.

Table 23: Summary of geology and hydrogeology in CFA19

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	WFD status objective (for 2027* as per RBMP)	Receptor value
Superficial deposits						
Alluvium	Deposit located along the western extent of the route	Clay, silt, sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head	Deposit sparsely distributed within the north of the study area	Clay, silt, sand and gravel	Secondary (undifferentiated) aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glaciofluvial Deposits	Distributed widely across the study area	Devensian sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciolacustrine Deposits	Broad deposit situated in the north-eastern area of the study area.	Clay and silt	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
River Terrace Deposits	Distributed widely across the study area	Sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Mercia Mudstone Group- Mudstone	Underlies the entire study area	Mudstones and subordinate siltstones	Secondary B aquifer	Tame Anker Mease – Secondary Combined (GB40402G990800)	Poor	Moderate

* Year may vary in different RBMP.

Superficial deposits

13.3.9 The alluvium, river terrace deposits and the glaciofluvial deposits are classified as Secondary A aquifers. The head deposits are classified as a Secondary (undifferentiated) aquifer. The glaciolacustrine deposits are classified as unproductive strata.

13.3.10 The groundwater vulnerability of the superficial aquifers is generally low. The Secondary B aquifer within the alluvium has an aquifer vulnerability status of intermediate.

Bedrock aquifers

13.3.11 The Mercia Mudstone Group (Mudstone) is classified as a Secondary B aquifer.

13.3.12 Groundwater levels within the Secondary aquifers are unknown but are considered likely to be influenced by topography, in general, with flow towards rivers.

Water Framework Directive status

13.3.13 No WFD assessment has been given by the Environment Agency to the superficial deposits.

13.3.14 The overall WFD status of groundwater in the study area is summarised in Table 23 and is largely classified as at risk, with poor status.

13.3.15 The River Basin Management Plan for the Humber River Basin District states that: "The main reasons for Poor Status are high or rising nitrate concentrations with failures for pesticides and chemicals associated with mine workings. The main reason for poor quantitative status is that abstraction levels, mainly for drinking water, exceed the rate at which aquifers recharge".

Abstractions and permitted discharges

13.3.16 The Environment Agency reports that there are no licensed groundwater abstractions or unlicensed groundwater abstractions within the study area. There are no Source Protection Zones (SPZs) associated with the abstractions in this study area (details in Volume 5: Appendix WR-002-019).

13.3.17 There is the potential for unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20 cubic metres per day.

13.3.18 Envirocheck data indicates that there are no current permitted discharges to groundwater in the study area (further details are provided in Volume 5: Appendix WR-002-019).

Surface water/groundwater interaction

13.3.19 Surface water/groundwater interaction is widespread throughout the study area in the form of springs, issues (generally a less defined area of rising groundwater than a spring), ponds, sinks, and watercourses. Locations of these features are detailed in Volume 5: Appendix WR-002-019, Table 4. It is likely that shallow groundwater will be present in close proximity to these springs and issues.

13.3.20 Ponds which were identified within the estimated zone of influence of cuttings, or within the land required for the construction and operation of the Proposed Scheme and therefore may potentially be affected by the Proposed Scheme, are summarised in Table 22 and listed in full in Table 6 of Volume 5: Appendix WR-002-019. These ponds are assumed to be in hydraulic connectivity with groundwater, unless further assessment suggests that the ponds are situated upon low permeability strata, or lined with an impermeable layer.

Water dependent habitats

13.3.21 There are no areas with statutory ecological designations in relation to surface water or groundwater in the study area.

13.3.22 There are a number of potentially water dependent ecological sites within the Coleshill Junction study area, which are locally designated. These are detailed in Table 7 of Volume 5: Appendix WR-002-019 and include:

- Wheeley Moor Farm Meadows Local Wildlife Site (LWS);
- Coleshill Hall Farm LWS;
- Coleshill Park Belt LWS;
- Coleshill Sewage Works Grassland LWS;
- Marsh Lane Grassland and Marsh LWS; and
- Water Orton Triangle LWS.

13.3.23 Further information on the above ecological receptors is given in Section 7.

Existing baseline – flood risk

River flooding

13.3.24 The agreed data set for river flooding is the Environment Agency Flood Zone Mapping[96]. This mapping has been supplemented with the use of hydraulic modelling at locations where the Proposed Scheme will cross watercourses.

13.3.25 In the vicinity of the River Cole at the B4114 Birmingham Road, there are a number of properties located within Flood Zones 2 and 3 at Coleshill Hall Farm, including one that is more vulnerable (The Old Barn Guest House). However the Proposed Scheme involves demolition of the properties in the floodplain. In the vicinity of the River Tame, near the Proposed Scheme, the existing land uses located within Flood Zone 2 and 3 (specifically the sewage treatment works and associated infrastructure) are categorised as less vulnerable. The flood risk assessment in Volume 5: Appendix WR-003-019 provides further details of receptors within the flood zones and their vulnerability.

[96] Environment Agency, What's in your backyard: Risk of Flooding From Rivers and Sea, http://www.environment-agency.gov.uk/homeandleisure/37837.aspx, accessed: 24 September 2013.

13.3.26 For all watercourses there will be an associated Flood Zone 3b (functional floodplain) denoting a very high risk of river flooding.

13.3.27 Environment Agency Mapping, Warwickshire SFRA[97] and Warwickshire PFRA[98] indicate that there have been no incidents of historical river flooding either at the location of the route or within 1km of the route.

Surface water flooding

13.3.28 The agreed dataset for surface water flooding is the Environment Agency's Flood Maps for Surface Water (FMfSW) as shown on Volume 5: Map WR-01-032.

13.3.29 These maps have been reviewed to form the basis of the assessment of the impact of the Proposed Scheme on the risk of surface water flooding.

13.3.30 The Flood Maps for Surface Water show two rainfall events, the 1 in 30 (3.3%) and the 1 in 200 (0.5%) annual probability events. The areas susceptible to surface water flooding during the 1 in 200 (0.5%) annual probability event are shown on Volume 5: Map WR-01-032. The maps show areas currently at risk of surface water flooding and where surface water is generally collected in rural low points in topography such as following open drainage channel networks associated with the watercourses in the Coleshill Junction area.

13.3.31 Six areas identified to be at risk of surface water flooding are classed to be at a high risk and one location has been identified to be at a medium risk. The areas at risk of surface water flooding can be categorised into three types:

- areas associated with existing watercourses;
- overland flow paths; or
- isolated areas.

13.3.32 Flooding in areas that are associated with watercourses is generally considered to be dominated by river flood risk. Therefore these areas at risk are discussed in further detail in the river flooding sections above.

13.3.33 In this study area there is one location (to the north of the M6 motorway north viaduct) where overland flow paths are evident on the Environment Agency FMfSW that do not follow a watercourse. Overland flow paths which are not associated with existing watercourses are often in the upstream reaches of a watercourse catchment, where flow channels are not evident.

13.3.34 The isolated areas are often in the upstream reaches of catchment where drainage channels are not evident; at water bodies such as ponds and generally low areas in the topography. The main areas at risk from surface water flooding are associated with the River Cole, the River Tame and tributaries associated with these watercourses.

[97] Warwickshire County Council (2008), *Strategic Flood Risk Assessment. Volume 1* completed by Halcrow Group Ltd.
[98] Warwickshire County Council (2011), *Warwickshire Preliminary Flood Risk Assessment*. Completed by Royal Haskoning on behalf of Warwickshire County Council.

13.3.35 The Warwickshire SFRA and the Warwickshire PFRA indicate that there has been one incident of surface water flooding within 1km of the route.

Sewer flooding

13.3.36 The agreed datasets for sewer flooding is the Warwickshire SFRA. In this study area Severn Trent Water asset mapping has also been used.

13.3.37 The Proposed Scheme will be in the vicinity of the sewer network in nine locations, and therefore there is the potential for flood risk from this source to be affected. However, either owing to the topography of the area or the Proposed Scheme design, any potential flow paths will be restricted. Therefore the highest level of risk from this source is categorised as medium.

13.3.38 The Warwickshire SFRA and Warwickshire PFRA indicate that there have been two incidents of flooding recorded by water companies (assumed to be Severn Trent Water for this CFA) within 1km of the route.

Artificial water bodies

13.3.39 The agreed dataset for reservoir flooding is the Environment Agency reservoir inundation mapping. OS mapping has been used to determine the location of canals within the study area.

13.3.40 Flooding from artificial systems may occur from failure of a retaining structure that impounds water. The following man made features have been identified within the FRA (Volume 5: Appendix WR-003-019) as being potential source of flood risk:

- the canal system; and
- reservoirs.

13.3.41 There are no canals or flooded extent from canals in the study area and hence there is no risk of flooding from this artificial source to the Proposed Scheme within the Coleshill Junction area.

13.3.42 The probability of flooding occurring from the failure of a reservoir or large water body created by impoundment of water, by a dam or other retaining structure is extremely low. The River Tame west viaduct is identified to be at risk based on the Environment Agency Reservoir Inundation Flood Mapping, which is shown in Volume 5: Map WR-01-032. The reservoirs to which the source of risk relates are more than 15km upstream of the Proposed Scheme and the inundation mapping shows smaller flood extents at the crossing point than the 1 in 100 (1%) annual probability event with an allowance for climate change. Therefore the flood risk for the Coleshill Junction area from this source is considered low. Further details can be found in the FRA (Volume 5: Appendix WR-003-019).

13.3.43 The Warwickshire SFRA and Warwickshire PFRA indicate that there have been no incidents of flooding from artificial sources either at the location of the route or within 1km of the route.

Groundwater flooding

13.3.44 The agreed data set for groundwater flooding is the Warwickshire PFRA[99]. The Warwickshire Strategic PFRA does not report any significant groundwater flooding within the study area.

Future baseline

13.3.45 Section 2.1 and Volume 5: Appendix CT-004-019 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. The potential cumulative effects arising from committed developments in relation to water resources and flood risk have been considered as part of this assessment of the construction and operation of the Proposed Scheme.

Construction (2017)

13.3.46 All committed developments are required to comply with the NPPF[100], development plans and other legislation and guidance. As such committed developments are not expected to have a material effect on the water resources and flood risk baseline.

13.3.47 WFD future status objectives are set out in Table 22 and Table 23. This potential change in baseline is not considered to result in significant changes to the reported effects from the Proposed Scheme changing in significance.

Operation (2026)

13.3.48 For the reasons stated above for construction, the cumulative development will not result in a change in significance of the effects from operation of the Proposed Scheme.

Climate change

13.3.49 Current projections to the 2080s indicate that climate change may affect the future baseline against which the impacts of the Proposed Scheme on surface water and groundwater resources have been assessed. There may be changes in the flow and water quality characteristics of surface water and groundwater bodies as a result of changes in climate. However, except for flood flows described in this section, these changes are not considered to result in the reported effects from the Proposed Scheme changing in significance.

13.3.50 Current projections indicate that there will be more frequent, higher intensity rainfall events in the future. The probability and severity of surface water flooding could therefore increase as surface water drainage systems fail to cope with more frequent, higher intensity storms. Peak river flows during flood events are expected to increase, potentially causing greater depths and extents of flooding.

[99] Warwickshire County Council (2011), *Preliminary Flood Risk Assessment (PFRA)*, completed by Royal Haskoning on behalf of Warwickshire County Council.
[100] Department for Communities and Local Government (2012), *National Planning Policy Framework Technical Guidance.*

13.3.51 When considering the influence that climate change may have on the future baseline, against which impacts from the Proposed Scheme on flood risk have been evaluated, the assessment has used the recommended precautionary sensitivity ranges of key parameters, as given in Table 5 in the Technical Guidance to the NPPF. The sensitivity testing undertaken allows for variations in climate change factors included in other national guidance

13.3.52 Further information on the potential additional impacts of climate change for water resources and flood risk is provided in Sections 7 and 8 of Volume 1 and Table 13 of Volume 5: Appendix CT-009-000.

13.4 Effects arising during construction

Avoidance and mitigation measures

13.4.1 The general approach to mitigation is set out in Volume 1.

13.4.2 The following measures will reduce potentially significant adverse effects on water resources and flood risk to levels that will not be significant. Further details are shown in Volume 5: Appendices WR-02-019 and WR-03-019.

13.4.3 Railway drainage will be managed using sustainable drainage techniques. In the study area, surface water discharges are proposed to:

- a drain to the River Cole at Junction 7a on M42 , a tributary of the River Cole at Green Lane (Volume 5: Map WR-01-032, SWC-CFA19-003);
- the River Cole at Manor Drive and M42/M6 Toll;
- a tributary of the River Tame south of Gypsy Lane, Water Orton (Volume 5: Map WR-01-032, SWC-CFA19-016);
- a drain feeder to the River Tame at Watton House, Jack O'Watton, Water Orton (Volume 5: Map WR-01-032, SWC-CFA19-014);
- a tributary of the River Tame at Jack O'Watton Industrial Estate, Water Orton (Volume 5: Map WR-01-032, SWC-CFA19-012); and
- a tributary of the River Tame – extended culvert under A446 Lichfield Road, Jack O'Watton Industrial Estate, Water Orton (Volume 5: Map WR-01-032, SWC-CFA19-011).

13.4.4 Discharges will be predominantly restricted with balancing ponds to emulate the existing environment by reducing run-off to greenfield rates.

13.4.5 It is proposed to culvert a section of a drain feeder to the River Cole at The Belt, Green Lane (Volume 5: Map WR-01-032, SWC-CFA19-010). It is also proposed to culvert one short section of a tributary of the River Cole at Gilson Road (Volume 5: Map WR-01-032, SWC-CFA19-007), under the realigned B4117 Gilson Road.

13.4.6 Culvert length will be minimised, wherever possible, and culverts will be designed with invert levels below the firm bed of the watercourse to negate the impact on flows and sediment transfer. Where possible, consideration will be given to provide mitigation for the loss of open channel by means of sensitive design at either end of the culvert in

order to retain and, if possible, enhance the overall quality of the watercourse. Where there is loss of length due to straightening, the aim, where possible, will be to offset this by increasing channel length up or downstream of the culvert to at least match the lost length of channel. Culverts will be designed in line with Construction Industry Research and Information Association (CIRIA)[101] and Environment Agency guidance and in consultation with the Environment Agency. The mitigation specifically for the ecology of the watercourses is considered in Section 7, Ecology.

13.4.7 A realignment of the River Cole at Manor Drive (Volume 5: Map WR-01-032, SWC-CFA19-005) and M42/M6 Toll (Volume 5: Map WR-01-032, SWC-CFA19-006) is proposed. The realignment is to allow the river to pass unobstructed between the piers of the Coleshill viaducts and the River Cole viaducts. The realignment of the river is a major work that will incorporate meanders and natural banks and will contribute to the WFD objectives for the watercourse. Other realignments are also proposed along sections of:

- a drain to the River Cole (Volume 5: Map WR-01-032, SWC-CFA19-001) at Junction 7a on the M42 around Coleshill embankment no.1;
- a tributary of the River Cole at two locations (Volume 5: Map WR-01-032, SWC-CFA19-002 and 003) at Green Lane around Coleshill embankment no.2;
- a tributary of the River Tame (Map Volume 5: WR-01-032, reference SWC-CFA19-012) at Jack O'Watton Industrial Estate, Water Orton around Watton Lane; and
- a tributary of the River Tame south of Gypsy Lane (SWC-CFA19-016) and Vicarage Lane (Volume 5: Map WR-01-032, SWC-CFA19-019), Water Orton around Marsh Lane embankment.

13.4.8 Consideration will be given in the design to the objectives of the WFD as described in the River Basin Management Plan. This may include the use of soft engineering solutions for bank design, and the inclusion of natural forms such as berms or incorporation of a two-stage channel, riffles and pools and marginal planting, where reasonably practicable.

13.4.9 Road realignments are required as part of the Proposed Scheme in this area (B4114 Birmingham Road, B4117 Gilson Road and Attleboro Lane). The receiving watercourses for road run-off are as follows:

- a drain to the River Cole at Junction 7a on M42 (Volume 5: Map WR-01-032, SWC-CFA19-001) to which it is assumed that the Coleshill Heath Road outfalls;
- a tributary to the River Cole at Coleshill Hall Bridge (Volume 5: Map WR-01-032, SWC-CFA19-004) to which it is assumed that the B4114 Birmingham Road outfalls;
- a tributary to the River Cole at Manor Drive and M42/M6 Toll (Volume 5: Map

[101] Construction Industry Research and Information Association (2010), *C689 Culvert Design and Operation Guide*.

WR-01-032, SWC-CFA19-005 and 006) to which it is assumed that Manor Drive outfalls;

- a tributary to the River Cole at B4117 Gilson Road (Map WR-01-032, SWC-CFA19-007) to which it is assumed the B4117 Gilson Road outfalls; and
- a tributary of the River Tame south of Vicarage Lane, Water Orton (Map WR-01-032, SWC-CFA19-019) to which it is assumed that Attleboro Lane and the B4118 Birmingham Road outfall.

13.4.10 The minor roads do not require detailed assessment due to their relatively low traffic densities. However, appropriate sustainable drainage mitigation will be provided to address the risks to the receiving watercourses (for both flow and water quality) and will be selected using the Design Manual for Roads and Bridges (particularly HA103[102]) and CIRIA[103] guidance. For the major roads (identified through the application of the SMR), detailed assessments will be made using the guidance from the Design Manual for Roads and Bridges through the detailed design phase. Initial assessments using the Highways Agency Water Risk Assessment Tool (HAWRAT) are shown in Volume 5, Appendix-002-019.

13.4.11 Two permitted surface water discharges at Gorsey Lane are assumed to be located within the area of land required for the construction and operation of the Proposed Scheme. Construction activities could potentially result in the loss of a discharge route to the River Tame. The drainage will be re-routed.

13.4.12 The route in the area of Coleshill Manor Office Campus (Volume 2: CFA19 Map Book, Map CT-10-055, F7) has been raised, meaning that the route now runs on embankment, rather than in a cutting. The potential impact of changes to water flows to Coleshill Park Belt LWS (Volume 5: Map Book – Ecology, Map EC-01-055, E8) has been reduced as a result of this change.

13.4.13 A balancing pond close to the southern boundary of the Water Orton Triangle LWS (Volume 5: Map Book – Ecology, Map EC-01-066a, F1) was moved, reducing the potential impact from the excavation works in the vicinity of the receptor.

13.4.14 Sustainable drainage systems SuDS and infiltration trenches will be implemented to facilitate recharge to the groundwater to help maintain groundwater levels within the Secondary aquifers. Examples include, SuDS alongside the Gilson cutting (Volume 2: Map Book, Map CT-06-110, B6 and C6), and alongside the Water Orton cutting (Volume 2: Map Book, Map CT-06-134a, C7). SuDS will also reduce the risk of any potential contamination from accidental leaks or polluted surface water runoff from reaching the groundwater and, therefore, prevent deterioration in groundwater quality status. These SuDS and infiltration trenches will be located in areas where gravity transfer is achievable.

[102] DMRB (2006), *Volume 4 Section 2 Part 1 Vegetative Treatment Systems for Highway Run-off (HA103/06).*
[103] Construction Industry Research and Information Association (2006), *Control of water pollution from linear construction projects.c648.*

13.4.15 The addition of a retaining wall on the northern side of the Water Orton cutting (Volume 2: Map Book, Map CT-10-066, C6 and D6) will restrict the zone of influence to within the boundary of the cutting on the northern side.

13.4.16 Replacement floodplain storage will be provided to mitigate the impact of the Proposed Scheme on river flood risk. At the River Cole crossings, replacement floodplain storage will be provided upstream of Manor Drive and at the location between the M42 Coleshill south viaduct and River Cole east viaduct. This replacement floodplain storage will ensure that there is no significant increase in flood risk.

13.4.17 Where the Proposed Scheme will interrupt surface water flow paths, the proposed drainage will be designed to intercept and manage this water. This will be achieved through collecting water in the proposed drainage and/or balancing pond prior to being discharge to the associated watercourse. This will allow the water to follow similar path to the existing situation.

13.4.18 Section 16 of the draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme (see Volume 5: Appendix CT-003-000/1). These will provide effective management and control of the impacts during the construction period.

13.4.19 The following measures in the draft CoCP Section 16 will reduce potentially significant adverse effects on water resources and flood risk to levels that will not be significant:

- stationary plant will be used with secondary containment measures such as plant nappies to retain any leakage of oil or fuel and reduce the risk of surface water or groundwater pollution;
- spill kits shall be provided where appropriate such as: the M6 motorway main compound, all satellite compounds and at Gilson auto-transformer station to reduce the risk of surface water or groundwater pollution (Volume 2: CFA19 Map Book, Map CT-10-055, D5);
- the use of oil interceptors, if required, at site offices and work compounds; and
- appropriate measures such as use of bunds of non-erodible material or silt or sediment fences adjacent to watercourses such as the River Tame.

13.4.20 Measures defined in the CoCP Section 16 will reduce the risk of the works causing an increase in river flood risk through constricting and altering flood flow paths.

13.4.21 Measures defined in the CoCP Section 16, including detailed method statements, will ensure that there will be no effect on surface water quality or flows associated with construction; this will include release to surface waters sewers in the surrounding receptors, principally the Severn Trent Water sewer network.

13.4.22 In accordance with the draft CoCP, Section 16, monitoring will be undertaken in consultation with the Environment Agency prior to, during and post construction, if required, to establish baseline conditions for surface water and groundwater and to confirm the effectiveness of agreed temporary and permanent mitigation measures.

Assessment of impacts and effects

13.4.23 This section describes the significant effects following the implementation of avoidance and mitigation measures.

13.4.24 Further details of the potential impacts that will not have significant effects are provided in the Water Resources Assessment report in Volume 5: Appendix WR-002-019 and FRA in Volume 5: Appendix WR-003-019.

13.4.25 An assessment of the impact on the WFD status is detailed within the WFD Compliance Assessment, contained within the route-wide Water Resources Appendix (Volume 5: Appendix WR-001-000).

13.4.26 It is not considered that projected climate change effects, combined with the effects from the construction of the Proposed Scheme, will alter the significance of any of the reported effects on surface water and groundwater resources (see Volume 3: Route-wide Effects Assessment for further information).

Temporary effects

Surface water

13.4.27 The assessment shows that there will be no significant temporary adverse effects on surface water resources during the construction period.

13.4.28 As no significant effects on surface water features have been identified in the assessment, no significant adverse effects on abstractions or discharges will arise.

Groundwater

13.4.29 The assessment shows that there will be no significant temporary adverse effects on groundwater during the construction period.

13.4.30 No licensed abstractions have been identified within 1km of the land required for the Proposed Scheme, and therefore there will be no likely temporary significant effects on licensed abstractions and permitted discharges during construction.

13.4.31 The assessment shows that there will be no likely temporary significant effects on surface water/groundwater interaction.

13.4.32 The assessment shows that there will be no likely temporary significant effects on water dependent habitats.

Flood risk

13.4.33 The assessment has identified no significant increase in risks resulting from all sources of flood risk during the construction process and therefore no significant temporary effects will arise.

Cumulative effects

13.4.34 No committed developments have been identified that will result in significant cumulative effects.

Permanent effects

Surface water

13.4.35 The assessment shows that there will be no permanent significant effects on surface water features from the Proposed Scheme in the construction period.

13.4.36 Further details of the assessment, including the determination of the potential impacts that will not have significant effects, are provided in Volume 5: Appendix WR-002-019.

Groundwater

13.4.37 The assessment shows that there will be no significant effects on groundwater.

13.4.38 The assessment shows that there will be no likely permanent significant effects to abstractions, and permitted discharges.

13.4.39 The assessment shows that there will be no likely permanent significant effects to surface water/groundwater interaction.

13.4.40 The assessment shows that there will be no likely permanent significant effects on water-dependent habitats.

Flood risk

13.4.41 The assessment shows that there will be no permanent adverse significant effects on flood risk as a result of the Proposed Scheme.

13.4.42 Further details of the assessment, including the determination of the potential impacts that will not have significant effects are provided in Volume 5: Appendix WR-003-019.

Cumulative effects

13.4.43 There are no committed developments that have been identified that will result in significant cumulative permanent effects.

Other mitigation measures

13.4.44 No other mitigation measures are envisaged for surface water, groundwater or flooding.

Summary of likely residual significant effects

13.4.45 The assessment shows that there will be no residual significant effects on surface water, groundwater or flood risk during the construction period.

13.5 Effects arising from operation

Avoidance and mitigation measures

13.5.1 Generic examples of design measures that will reduce potentially significant effects on the quality and flow characteristics of surface watercourses and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1.

13.5.2 The sustainable drainage solutions used for drainage from the Proposed Scheme (predominantly balancing ponds) may have an additional benefit of providing some treatment for water quality of the runoff before it is discharged into the environment.

13.5.3 Generic examples of management measures during operation and management of the Proposed Scheme that will reduce potentially significant adverse effects on the quality and flow characteristics of surface water courses and groundwater bodies are described in Volume 1 and in the draft operation and maintenance plan for water resources and flood risk included in Volume 5 Appendix WR-001-000.

13.5.4 Operation and management of the Proposed Scheme is not likely to have a significant effect on the flood risk anywhere in the catchments through which it passes. Generic examples of management measures that may affect flood risk are described in Volume 1.

Assessment of impacts and effects

13.5.5 There are considered to be no significant adverse effects to surface water, groundwater or flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

13.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

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