LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 2 | Community Forum Area report

CFA20 | Curdworth to Middleton

November 2013

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Department for Transport

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

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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.

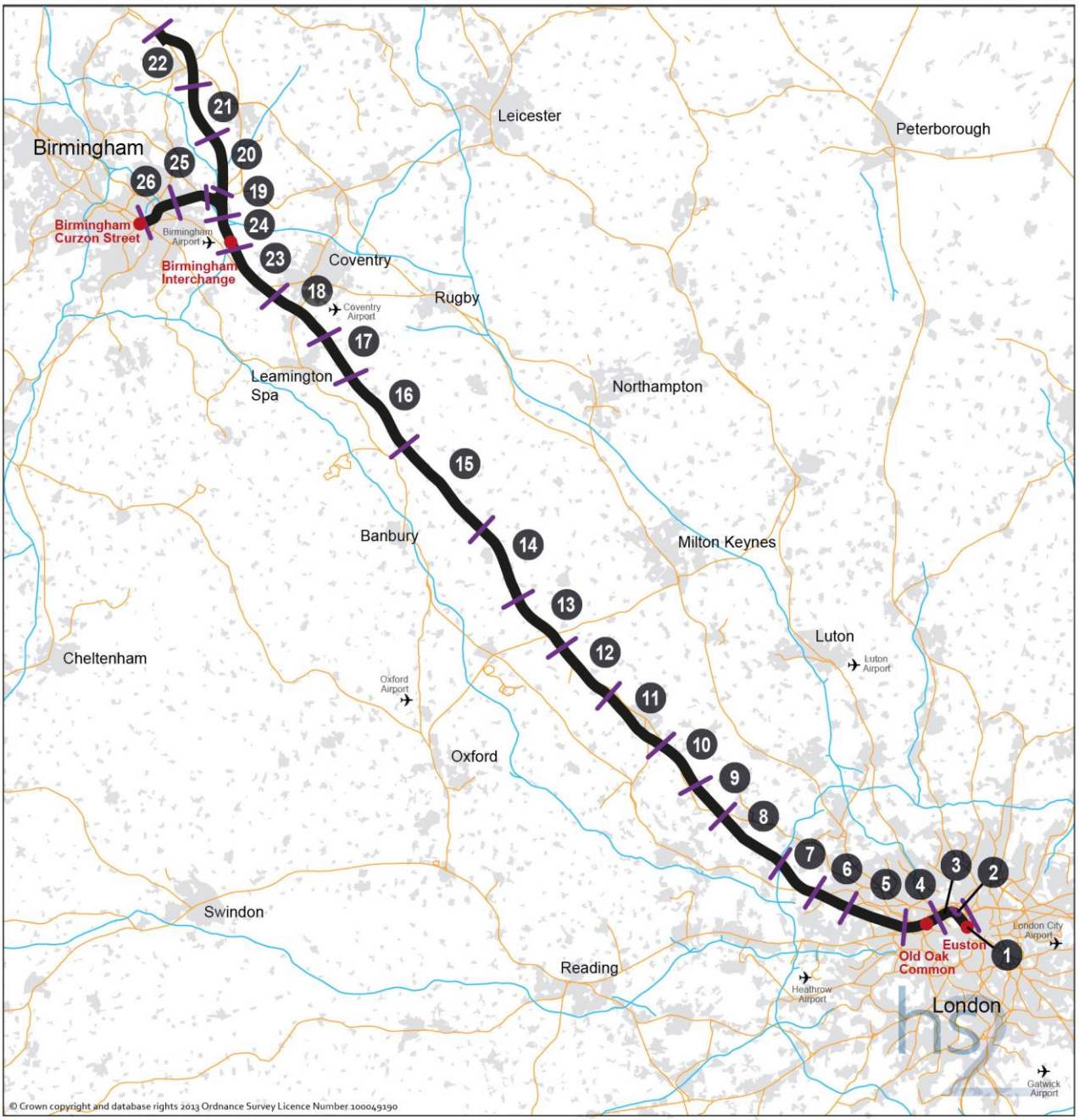
1.1.4 Phase Two will involve the construction of lines from Birmingham to Leeds and Manchester; with construction commencing approximately 2023, and planned to be operational by 2033.

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 Curdworth to Middleton area (CFA20), 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 design 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 CFA report presents the likely significant effects of the construction and operation of the Proposed Scheme on the environment within the area of Curdworth to Middleton (CFA20). The report describes the mitigation measures that are proposed for the purpose of avoiding, reducing or managing the likely significant adverse effects of the Proposed Scheme on the environment within this 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; and
- 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 (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) (Volume 5: Appendix CT-001-000/1) and the SMR Addendum (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 Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) (Volume 2: CFA20 Map Book) and CT-06 (operation) (Volume 2: CFA20 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.

1.3.6 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 assessed 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 Curdworth to Middleton area covers an approximately 8.6km section of the Proposed Scheme in the borough of North Warwickshire, where it passes to the north-east of the Birmingham urban area. The southern limit of the area is defined by the River Tame, near Coleshill Parkway station; the northern limit of the area is defined by the boundary between Warwickshire and Staffordshire. The area includes all or part of the parishes of Curdworth (Volume 2: CFA20 Map Book, Map CT-10-56, E10), Lea Marston and Marston (Volume 2: CFA20 Map Book, Map CT-10-56, D1), Wishaw, Kingsbury and Middleton (Volume 2: CFA20 Map Book, Map CT-10-58, F7).

2.1.2 The Coleshill Junction area (CFA19) lies to the south, whilst the Drayton Bassett, Hints and Weeford area (CFA21) lies to the north, as shown in Figure 2. The Castle Bromwich and Bromford area (CFA25) lies to the west.

Settlement, land use and topography

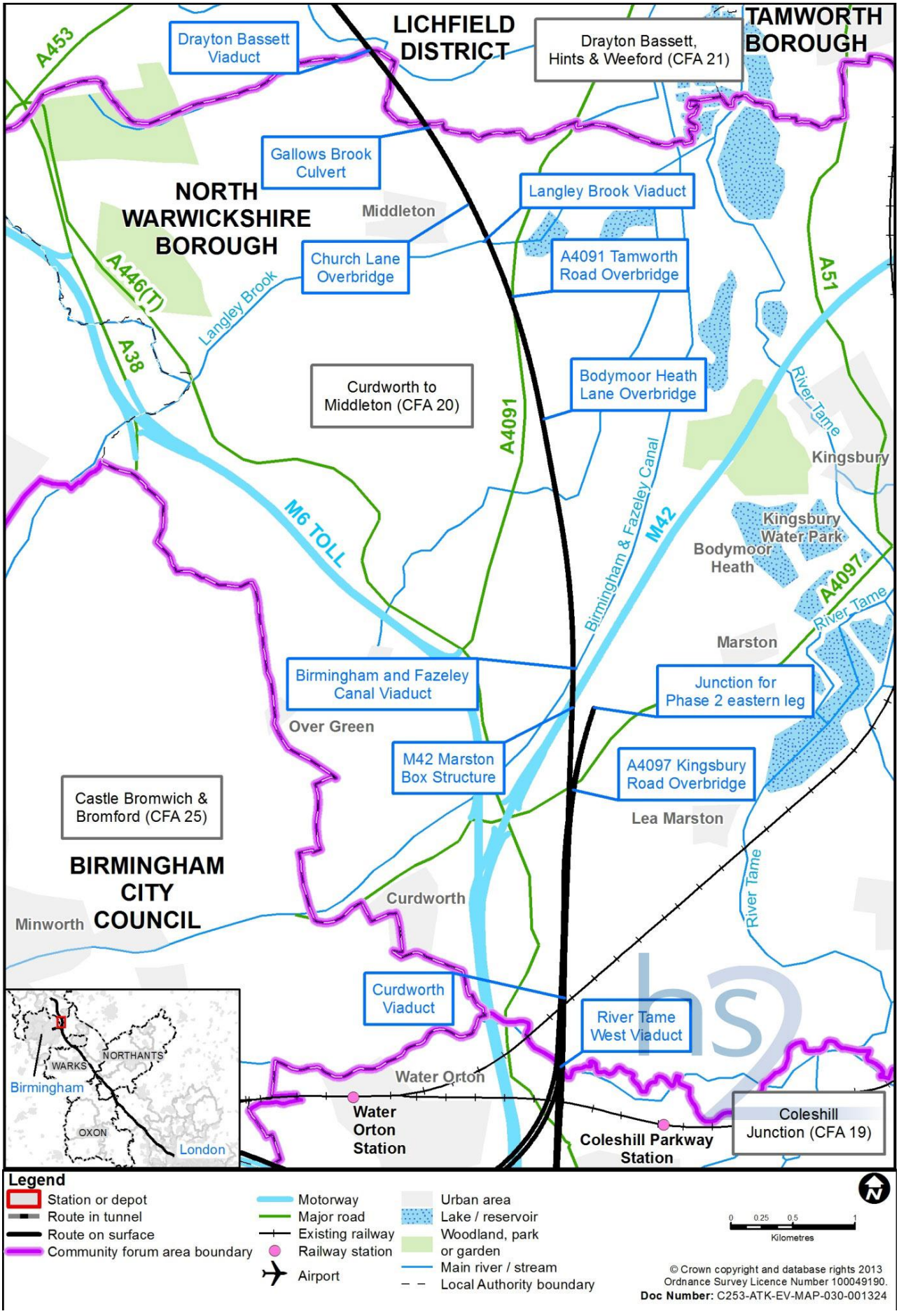
2.1.3 The topography of the area is dominated by the lowland river valley and associated wetlands of the River Tame at an elevation between 70m and 85m above Ordnance Datum (AOD), except north-east of Curdworth near junction 9 of the M42, where land rises to 103m AOD. Gallows Brook and Langley Brook flow from higher ground in the north-west of the area to the lowland river valley of the River Tame to the east.

2.1.4 The southern part of the area is urbanised and is characterised by industrial development and infrastructure, including the Hams Hall Distribution Park, the M42 and M6 Toll carriageways, a major sewage treatment works and a major electricity substation, and an aggregate processing site. Further north, the area becomes increasingly rural in nature and comprises a mix of recreational open space, agricultural land, and estate parkland, interspersed with areas of mineral workings and restored gravel pits.

2.1.5 The larger, more urban communities in the locality are Sutton Coldfield, which lies approximately 6km to the west of the Proposed Scheme, Tamworth, which lies approximately 5km to the north east, and Coleshill and the Smith's Wood and Castle Vale areas of Birmingham, which lie to the south of the area. There are no large towns close to the Proposed Scheme, although there are several villages nearby, including Curdworth, Lea Marston and Marston in the south of the area and Middleton in the north. The small hamlets of Bodymoor Heath, Wishaw, and Hunts Green are situated in the centre of the area. Curdworth is the largest of the villages with a modest range of facilities, whilst the other villages have few facilities and are more residential in nature.

2.1.6 The Birmingham and Fazeley Canal, which is classified as a main river, runs through the area along the west side of the M42, passing beneath the M6 Toll towards Curdworth. Other main rivers in the area include the River Tame, Langley Book and Gallows Brook.

Figure 2: Area context map



2.1.7 Woodland is found throughout the area most notably at: Dunton Wood (Volume 2: CFA20 Map Book, Map CT-10-56, B5) and North Wood (Volume 2: CFA20 Map Book, Map CT-10-57, E6), near Bodymoor Heath (Volume 2: CFA20 Map Book, Map CT-10-57, D2); the woodlands at Middleton Hall (Volume 2: CFA20 Map Book, Map CT-10-58, G3) and Kingsbury Water Park (Volume 2: CFA20 Map Book, Map CT-10-57, A1/B10); Rogers Coppice near Middleton (Volume 2: CFA20 Map Book, Map CT-10-58, F7); and the planting around The Belfry estate (Volume 2: CFA20 Map Book, Map CT-10-57, C8). North Wood is designated as an ancient woodland.

2.1.8 Many of the larger areas of woodland are associated with extensive areas of open water and wetland in former gravel workings along the River Tame valley. On the higher ground away from the valley floor and in the agricultural vale of Gallows Brook, the relative absence of tree cover and the sloping landform creates a sense of openness to the landscape, particularly to the north of Middleton, where there are panoramic views across the landscape.

Key transport infrastructure

2.1.9 The principal roads through the centre of this area are: the A446 Lichfield Road, which links the National Exhibition Centre at Birmingham in the south with the A38 at Carroway Head in the north-west; and the A4091 Tamworth Road, which runs northwards through the area from the A446 Lichfield Road to Tamworth. The A4097 Kingsbury Road is the main route between Curdworth and Kingsbury. The M6 Toll and M42 diverge near Curdworth, with the M6 Toll bearing north-west and the M42 bearing north-east; the M42 provides local access to the A446 Lichfield Road and A4097 Kingsbury Road at junction 9 near Curdworth. Bodymoor Heath Lane is a key link for local traffic travelling between Middleton and Kingsbury. The southern part of the area is crossed by the railway known as the Birmingham and Derby Line.

2.1.10 There is a well-developed network of public rights of way (PRoW) within the area. The Birmingham and Fazeley Canal and towpath will be crossed by the Proposed Scheme to the north of the M42; the towpath is promoted by Sustrans as part of the West Midlands Cycle Route (National Cycle Network No. 5). There are footpath, bridleway and byway linkages from Lea Marston and Marston heading northwards towards Kingsbury Water Park and Camping and Caravanning site (Volume 2: CFA20 Map Book, Map CT-10-57, D1) and Middleton Park (Volume 2: CFA20 Map Book, Map CT-10-58, G4). There are also routes that connect Curdworth north to The Belfry golf course and extend around Middleton.

Socio-economic profile

2.1.11 To provide a socio-economic context for the area, data is presented for the demographic character areas (DCA) of Middleton, Marston, and Curdworth[1]. In total, the working population of the DCA is 7,600 highlighting the low population density and rural nature of the area. The area's labour market outperforms England's as a whole; unemployment at 4.0% is significantly lower than the national level of 7.0%[2].

[1] A DCA represents a community that, depending on the area, may consist of a local ward, neighbourhood or village(s).
[2] All data comes from the Office for National Statistics (2011), *2011 Census for England and Wales*.

Notable community facilities

2.1.12 Curdworth, in the south-west part of the area, has a modest range of community facilities including a primary school, a church, a village hall, a post office and convenience store, two public houses and a recreation ground. The Chantry Industrial Estate lies to the north of the village.

2.1.13 Lea Marston and Marston (Volume 2: CFA20 Map Book, Map CT-10-56, D1), in the south-east of the area, are primarily residential villages with limited day-to-day facilities. The hamlet of Bodymoor Heath in the centre of the area has a public house and a village hall, both close to the Birmingham and Fazeley Canal. The small hamlet of Hunts Green has no day-to-day services and facilities, whilst Middleton (Volume 2: CFA20 Map Book, Map CT-10-58, F7), to the north, has a church, a day care nursery, a village shop, a public house and a community hall.

Recreation, leisure and open space

2.1.14 There are a number of recreation and leisure facilities within the area. In the south, the Lea Marston Hotel (Volume 2: CFA20 Map Book, Map CT-10-57, H1) has a spa, health club and golf course, which are located to the north and west of the village. Additional land to the west of the village at Blackgreaves Lane is used for a range of outdoor pursuits, including clay pigeon shooting, archery, fishing, and camping. The Belfry golf course lies to the north of the M6 Toll. Kingsbury Water Park and Camping and Caravanning site, in the east of the area, is a country park with trails as well as water based recreational activities on the lakes; adjoining this is the Royal Society for the Protection of Birds (RSPB) Middleton Lakes Nature Reserve (Volume 2: CFA20 Map Book, Map CT-10-58, G1).

2.1.15 Aston Villa Football Club's training ground is located in the centre of the area at Bodymoor Heath. The Curdworth to Middleton area also contains a number of visitor attractions, including the Broomey Croft Farm and Ash End House Children's Farm at Kingsbury and Middleton, respectively, together with Middleton Hall, which has extensive grounds and a craft centre. There are fishing lakes at the Cuttle Mill Fishery (Volume2: CFA20 Map Book, Map CT-10-57, F6), which lies immediately adjacent to the route, just west of the M42. Reindeer Park Lodge guest house and Campsite as well as Bella Vista, The Chestnuts, and Wedgwood lie just south of the A4097 Kingsbury Road, near Marston. There is a small fishery at Hunts Green, Pool House Farm Fishery, which is open to the public.

2.1.16 There are a number of open spaces in the Lea Marston area including Sych Wood (Volume 2: CFA20 Map Book, Map CT-10-56, E2), the golf course attached to the Lea Marston Hotel and Dunton Wood, a small area of woodland with footpaths open to the public.

Policy and planning context

Planning framework

2.1.17 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.

2.1.18 North Warwickshire Borough Council (NWBC) is the local planning authority for this area. The North Warwickshire Local Plan (NWBC Local Plan) sets out the existing planning policies, but they will be subject to change as they are due to be replaced by NWBC's Local Development Framework[3,4]. Emerging planning policy is contained in the North Warwickshire Local Plan Core Strategy – Proposed Submission (NWBC Core Strategy), which has been submitted to the Secretary of State for examination[5].

2.1.19 There are a number of key planning designations in the area, which include conservation areas, listed buildings, scheduled monuments, important archaeological sites, and ancient woodland. These are shown on the maps in Volume 2: CFA20 Map Book, Maps CT-10-56 through CT-10-58.

Committed development

2.1.20 Developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme, are shown on Volume 5: Map Book – Cross Topic Maps, Maps CT-13-056 through CT-13-058 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 have been taken into account for the purpose of assessing the likely significant effects of 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.

2.1.21 The following developments are relevant to several topics assessments in this area:

- PAP/2012/0512 (CFA20/3 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-56, G1) – BMW Hams Hall Distribution Park, B46 1GB. New logistics warehouse with external canopy, new Heavy Goods Vehicle (HGV) roadway and car park extension;
- PAP/2012/0228 (CFA20/5 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-56, B5) – Reindeer Park Lodge, A4097 Kingsbury Road, B76 0DE. Retention of five touring caravan spaces and associated hardstanding and communal facilities block; and provision of an additional 10 touring caravan spaces and associated hardstanding and track, all served from existing perimeter driveway;
- PAP/2011/0055 (CFA20/6 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, F6) – Cuttle Mill Fishery, Cuttle Mill Lane, Wishaw. Change of use from domestic and commercial fishery use of Building 1 to class B1 offices and of Building 3 to storage associated with the fishery and associated with the light industrial use of Building 2;
- NWB/12CM005 (CFA20/8 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, C5) – Middleton Hall Quarry, Bodymoor Heath Lane, Middleton. Change of use of land for a construction waste recycling facility;

[3] North Warwickshire Borough Council (2006), *North Warwickshire Local Plan 2006.*
[4] North Warwickshire Borough Council (2013), *North Warwickshire Local Plan Core Strategy Submission Version forming part of the Local Plan for North Warwickshire*, February 2013.
[5] North Warwickshire Borough Council (2012), *North Warwickshire Local Plan Core Strategy – Proposed Submission.*

- PAP/2010/0532 (CFA20/9 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, B5) – Middleton Hall, A4091 Tamworth Road, B78 2BD. Creation of an access road, car park, and picnic area and erection of education hub building and toilet block in association with the use of Middleton Lakes Nature Reserve;

- PAP/2012/0624 (CFA20/10 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, B6) – Bodymoor Heath Lane, Middleton. Construction of flood defences along the eastern side of the Birmingham and Fazeley Canal at Kingsbury, broadly comprising a series of earth embankments and walls on a 6.1 hectare (ha) site;

- NWB/13CM004 (CFA20/11 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, G1) – Marston Field Farm, A4097 Kingsbury Road, Lea Marston. Consolidation of existing planning permissions to extract underlying clay reserves with restoration to fishing ponds and associated landscaping; and

- PAP/2011/0503 (CFA20/12 in Volume 5: Map Book – Cross Topic Maps, Map CT-13-57, B6) – Bodymoor Heath Training Grounds, Bodymoor Heath. Replacement of security gatehouse/kiosk.

2.1.22 Where a committed development lies wholly or partly within the land required for the Proposed Scheme, it is assumed that the development will not be commenced or completed in its proposed form. These are noted in Volume 5: Appendix CT-004-000/1 and referred to in the relevant topic sections. In the Curdworth to Middleton area, no such developments are located within the land required for the Proposed Scheme.

2.1.23 Planning applications yet to be determined and sites that are proposed allocations in development plans that have yet to be adopted (i.e., the NWBC Core Strategy), on or close to the Proposed Scheme, are termed 'proposed developments'. These are shown on Volume 5: Map Book – Cross Topic Maps, Maps CT-13-056 through 058 and 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 Ltd and appropriate action will be taken if they are approved.

HS2 Phase Two

2.1.24 Within this area, the junction and a short length of the route for the Phase Two route towards Leeds forms part of Phase One (known as the Leeds spur dive-under in the Curdworth to Middleton area).

2.1.25 Whilst the detail of design and construction for Phase Two has not been developed, it is anticipated that if HS2 Phase Two proceeds, then it is likely to start in 2023 or 2024 and that construction would continue for up to nine years, though works in this area would not necessarily be carried out for that entire period. The Phase Two works may therefore overlap with the commissioning period of Phase One. Any effects from construction of Phase Two on receptors in this area will be described in the Phase Two Environmental Statement.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Curdworth to Middleton area. 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 Volume 2: CFA20 Map Book, Map series CT-06. Land that will also be required, but only on a temporary basis for construction, is set out in Section 2.3, Construction of the Proposed Scheme and shown on the construction map series Volume 2: CFA20 Map Book, Map series CT-05.

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

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

- lowered alignment between the M42 and Bodymoor Heath Lane;
- Faraday Avenue is now an underbridge, avoiding the need to divert the A446 Lichfield Road;
- the height of noise barriers has been substantially increased near Middleton; and
- the lengths of viaducts in the area were reduced, some to the point where they are now culverts including Hunts Green and North Wood culverts.

Overview

2.2.5 The route through the Curdworth to Middleton area will be approximately 8.6km in length. It will commence at the crossing of the River Tame (Volume 2: CFA20 Map Book, Map CT-06-112b, I6) and the Birmingham and Derby Line (Volume 2: CFA20 Map Book, Map CT-06-112b, H6), east of Curdworth. It will then proceed north onto embankment and then into cutting where a junction will be constructed for the Phase Two route to the North East, as shown in Figure 2. After crossing over the M42 and Birmingham and Fazeley Canal, the route will gradually descend and curve to the north-west, passing under the diverted Bodymoor Heath Lane, the realigned A4091 Tamworth Road, and the realigned Church Lane. Passing to the east of Middleton village it will climb gradually and continue north-west, largely on embankment and over the Langley Brook viaduct, to the edge of the area where the route crosses Gallows Brook on viaduct (Volume 2: CFA20 Map Book, Map CT-06-116a, D6).

2.2.6 The Leeds spur will include the junction off the Phase One main line and a sufficient length of the Phase Two rail line towards Leeds and would be constructed as part of Phase One. If Phase Two proceeds, this will allow easier and safer construction of Phase Two without affecting the operation of Phase One.

2.2.7 A temporary railhead will be constructed between A4097 Kingsbury Road and the M42. The earthworks associated with this will remain after the construction is

complete (see Section 2.3 for additional information related to the Kingsbury Road railhead).

River Tame to Faraday Avenue

2.2.8 On leaving the Coleshill Junction area (CFA19), the route will continue northwards for approximately 500m to cross the River Tame and the Birmingham and Derby Line on a group of viaducts and then onto embankment approximately 350m south of the Faraday Avenue underbridge (Volume 2: CFA20 Map Book, Map CT-06-112b, E6). At this point the route will consist of six tracks, comprising two through lines, two connecting lines to serve Birmingham and two connecting lines to serve the future Phase Two route to the North East.

2.2.9 Key features of this section of the route (Volume 2: CFA20 Map Book, Maps CT-06-112b) will include:

- a series of linking viaducts (River Tame east and west viaducts and Curdworth viaducts) support the lines as they enter the area. These carry the route over the River Tame, Water Orton Sewage Works, the Minworth Effluent Channel and Birmingham and Derby Line. The viaducts combine to a length of 550m. The heights will range from approximately 14m above the River Tame to approximately 10m at the north end of the viaducts. The overall width of the viaducts will taper from approximately 60m over the River Tame to approximately 45m at the north end;
- a further viaduct commencing in the previous area and carrying one of the lines from Birmingham over the HS2 through lines before descending and connecting into the viaducts described above. This viaduct will be a total of approximately 1.4km long and will enter the area at its maximum height of approximately 25m above ground level; and
- an embankment approximately 750m long high reducing in height from approximately 10m to approximately 5m.

2.2.10 An access bridge will be provided over Faraday Avenue immediately west of the Proposed Scheme. A balancing pond will be provided to the west of the route just north of the Birmingham and Derby Line crossing (map CT-06-112, H6) and another just to the north of Faraday Avenue (map CT-06-112, E6). Planting will be undertaken adjacent to the route to integrate into the landscape and provide habitat connectivity, screen the road, and similarly integrate the road into the landscape.

Faraday Avenue to Leeds spur dive-under and Marston Lane (including site of Kingsbury Road railhead)

2.2.11 Continuing to the north, the route will pass into a substantial cutting, which will be joined by the cutting for the temporary tracks between the Kingsbury Road railhead reception sidings and the main railhead siding area. Key features of this next section of the route (Volume 2: CFA20 Map Book, Maps CT-06-112b, CT-06-119, CT-06-113, CT-06-113-R1) include:

- the earthworks required for the temporary reception sidings for the Kingsbury Road railhead alongside the Birmingham and Derby Line. Section 2.3 describes the necessary temporary works;

- a cutting, approximately 1.3km long (Curdworth cutting), with an approximate depth of 15m for the main line and approximately 22m for the northbound Leeds spur. At its widest the cutting will be approximately 190m wide, just north of the A4097 Kingsbury Road. Sufficient width will be provided to allow a temporary connection between the reception sidings and the Kingsbury Road railhead;

2.2.12 the junction for the Leeds spur dive-under will drop down between retaining walls in a section of cutting approximately 1.7km long, which will diverge from the main line just before the A4097 Kingsbury Road overbridge to head north-east, roughly following the line of the M42. The cutting will vary in depth between approximately 4m and 22m. A length of the Phase Two route towards Leeds will be constructed as far as Marston Lane. This will enable the construction of Phase Two to proceed without disrupting the operation of Phase One; and

- the earthworks required for the Kingsbury Road railhead will remain after the works are complete. This will create a generally flat area of land varying from existing ground level at its eastern end to approximately 6m deep at its western extent.

2.2.13 The existing cutting of the Birmingham and Derby Line will be widened by approximately 50m over a length of approximately 700m between Hams Lane and Church Lane, Lea Marston, to accommodate the temporary reception sidings for the Kingsbury Road railhead.

2.2.14 A cutting approximately 500m long provided for the connection of the railhead to the reception sidings will remain after the works. Hams Lane will be diverted over this cutting.

2.2.15 A balancing pond will be provided to the east of Church Lane, Lea Marston and a pumping station will be located on the eastern end of the site of the temporary receptions sidings (Volume 2: CFA20 Map Book, Map CT-06-112b, D4).

2.2.16 A new accommodation overbridge will carry Footpath M16, which connects Hams Lane with the A446 Lichfield Road, over Curdworth cutting, and provide farm accommodation access (Volume 2: CFA20 Map Book, Map CT-06-119, C6). Hams Lane will be temporarily and slightly diverted offline as part of the construction of an overbridge. The Birmingham and Fazeley Canal viaducts will be constructed along with construction of the M42 Marston box structure. The A4097 Kingsbury Road will be realigned over a length of about 750m and approximately 50m north on a permanent new overbridge (A4097 Kingsbury Road overbridge) that will be at approximately the current ground level (Volume 2: CFA20 Map Book, Map CT-06-119, F6).

2.2.17 The junction for the Leeds spur dive-under will be in a section of cutting approximately 1.7km long, which will diverge from the main line after the A4097 Kingsbury Road overbridge (Volume 2: CFA20 Map Book, Map CT-06-119, F6) to head north-east, roughly following the line of the M42, as far north as the existing Marston Lane. The cutting will vary in depth between approximately 4m and 22m.

2.2.18 Marston Lane and the bridge over the M42 will be closed to all but footpath users and alternative access to the Birmingham and Fazeley Canal will be provided by upgrading the existing track parallel to the M42 to a byway open to all traffic (BOAT). A permanent overbridge will be constructed to carry Seeney Lane over the Kingsbury Road railhead track and a balancing pond will be provided to the north-east (Volume 2: CFA20 Map Book, Map CT-06-113-R1, F8). The design of the overbridge will allow for the future provision of Phase Two. Seeney Lane/Bridleway M23 will be upgraded to a BOAT to replace connectivity across the M42 lost by the stopping up of Marston Lane to vehicular traffic.

2.2.19 Planting will be undertaken along the top of the earthworks to screen the east and southern sides nearest to receptors. The excavations required for the railhead site will remain after construction, along with a new access for HS2.

Leeds spur dive-under to east of Hunts Green

2.2.20 Continuing to the north on the main line, and gradually turning to the north-west, the route will pass onto embankment, interspersed with bridges and viaducts, for the next 3.5km. The route will pass over the M42 and Birmingham and Fazeley Canal to the east of Cuttle Mill Fishery, then under Bodymoor Heath Lane. Key features of this next section of the route (Volume 2: CFA20 Map Book, Maps CT-06-119, CT-06-113 and CT-06-114 include:

- an embankment approximately 320m long up to approximately 8m high (Dunton Wood embankment);
- the M42 Marston box structure, approximately 120m long over the M42 and the Birmingham and Fazeley Canal viaducts, approximately 230m long with a maximum height of approximately 11m;
- an embankment, approximately 2.7km long, varying in height from a maximum of approximately 12m at its southern end including the following:
  - raised earthworks and planting on both sides of the railway to provide visual and noise screening;
  - the Cuttle Mill underbridge (approximately 25m long) immediately to the east of Cuttle Mill Fishery (Volume 2: CFA20 Map Book, Map CT-06-113, G6) with a height of approximately 8m, which crosses over Byway T179;
  - raised earthworks on both sides of the railway south of North Wood (Volume 2: CFA20 Map Book, Map CT-06-113, D4) and planting to provide visual screening;
  - an underbridge approximately 4m high over a watercourse (North Wood underbridge) at the floodplain north of North Wood (Volume 2: CFA20 Map Book, Map CT-06-113, B6);
  - an underbridge approximately 4m high over a watercourse (Hunts Green underbridge) at the floodplain just south of Bodymoor Heath Lane; and
  - raised earthworks and planting on the west side of the railway will be provided for noise and visual screening.

- three balancing ponds will be provided in this area, along with accesses for maintenance (Volume 2: CFA20 Map Book, Map CT-06-113). Two areas for replacement floodplain storage (flood compensation) will be provided (Volume 2: CFA20 Map Book, Map CT-06-113, A7 and F5). An auto-transformer station (Cuttle Mill mid-point autotransformer station) will be constructed on the west side of the railway immediately north of the Birmingham and Fazeley Canal (Volume 2: CFA20 Map Book, Map CT-06-113, H5), adjacent to one of the ponds.

2.2.21 A new overbridge will carry the diverted Bodymoor Heath Lane over the route (Bodymoor Heath overbridge) and the A4091 Tamworth Road (A4091 Tamworth Road overbridge) on a raised alignment up to 15m above current ground level, to join Brick Kiln Lane west of the A4091 Tamworth Road. The 180m length of Brick Kiln Lane east of the A4091 Tamworth Road will be widened along its south side. Footpath T17 will be diverted to join Brick Kiln Lane allowing pedestrians to use the new overbridge. A revised access will be provided to the Bodymoor Heath Training Ground (Volume 2: CFA20 Map Book, Map CT-06-114, C4). Further, a new access track will be provided off Bodymoor Heath Lane to the moated site near Middleton House Farm.

2.2.22 Planting of embankments will be undertaken throughout this area, adjacent to the railway, the diverted highways, associated earthworks on both sides of the railway and connecting to the severed parts of the existing woodlands. In addition, ecological mitigation planting will be provided in the old quarry near Bodymoor Heath Lane.

East of Hunts Green to Gallows Brook

2.2.23 Continuing to the north-west, the route will alternate between cutting and embankment, passing to the east of Hunts Green, under a raised and permanently realigned A4091 Tamworth Road, over Langley Brook and under Church Lane, with the village of Middleton immediately to the west, before reaching the northern extent of the area at the viaduct crossing of Gallows Brook. Key features of this next section of the route (Volume 2: CFA20 Map Book, Maps CT-06-114, CT-06-115, CT-06-and 116a) will include:

- a cutting approximately 630m long (Middleton Pool cutting) with an average depth of approximately 4m, with raised earthworks on both sides of the railway to provide visual and noise screening;
- an embankment approximately 50m long (Middleton Pool embankment) with a height up to approximately 5m;
- a viaduct approximately 90m long over Langley Brook (Langley Brook viaduct) (Volume 2: CFA20 Map Book, Map CT-06-115, E6) with a 3m noise barrier on the west side of the viaduct;
- an embankment approximately 120m long (Church Lane embankment) with a height of approximately 5m, with raised earthworks on the west side to provide visual and noise screening;
- a cutting approximately 430m long (Coppice Lane cutting) with an average depth of approximately 2m, with raised earthworks on both sides of the railway to provide visual and noise screening; and

- an embankment approximately 1.1km long (Trickley Coppice embankment) of varying height extending just past Gallows Brook, with raised earthworks on both sides of the railway to provide visual and noise screening. The south arm of Gallows Brook will be culverted below the railway embankment, with an associated diversion along the western edge of the route, south of the Drayton Bassett viaduct (Volume 2: CFA20 Map Book, Map CT-06-116a, C6). The screening embankments will be shaped to reduce the length of culvert required, with a short length of noise barrier provided on the west side of the culvert crossing for continuity. A 3m noise barrier will also be provided along the east side of the final 300m of the embankment where the raised earthworks are not provided, moving into the Drayton Bassett viaduct (located within the Drayton Bassett, Hints and Weeford area (CFA21)).

2.2.24 Two balancing ponds will be constructed in this section (Volume 2: CFA20 Map Book, Map CT-06-115). These will connect to a drainage system established along the side of the route, connecting to outfalls at Langley Brook.

2.2.25 The A4091Tamworth Road will be realigned to the west of the existing line over a length of approximately 1.1km, crossing over the route on a new overbridge approximately 7m above current ground level and crossing Langley Brook on a new bridge. Raised earthworks will extend along the west side of the A4091 Tamworth Road realignment near Hunts Green, to provide visual and noise screening. Crowberry Lane and Park Lane will be diverted locally to create a new junction with the realigned A4091 Tamworth Road. A new bridge for the realigned A4091 Tamworth Road will be provided to replace the existing bridge over Langley Brook.

2.2.26 Church Lane, one of the main routes providing access to Middleton from the A4091 Tamworth Road, will be permanently realigned over a length of approximately 720m to cross the railway cutting 30m north of its current location on a new bridge over 6m above current ground level (Volume 2: CFA20 Map Book, Map CT-06-115, D6). A new bridge will be provided to carry Footpath T15 over the railway and provide farm accommodation access to the north-east of Middleton (Volume 2: CFA20 Map Book, Map CT-06-115, B7). This will be approximately 10m above current ground level.

2.2.27 Planting will be undertaken throughout this section, adjacent to the railway, the diverted highways and on associated earthworks on both sides of the railway.

2.2.28 The route will then continue into the Drayton Bassett, Hints and Weeford area (CFA21).

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 Curdworth to Middleton 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.

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 Volume 2: CFA20 Map Book, Map series CT-05. 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; and 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; railway infrastructure installation; station fit out, tunnels, shafts and other buildings; connections to utilities; and changes to the existing railway 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 and Section 4 of the draft Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000) including:

- the approach to environmental management during construction and the role of the CoCP;
- 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 6.4. 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 archaeological field evaluation;
- site establishment with temporary fence construction;
- highway works;
- demolitions; and
- utility diversions.

Engineering works

2.3.8 Construction of the Proposed Scheme 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/or tracks and 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 compounds, 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 Curdworth to Middleton area there will be one main compound, 14 civil engineering satellite compounds and one roadhead. There will also be two railway installation satellite compounds and one main construction compound called the Kingsbury Road railhead. The two rail systems satellite compounds will share the same footprint as the Faraday Avenue underbridge satellite construction compound for the Faraday Avenue package substation compound and the Birmingham and Fazeley Canal (north) satellite construction compound for the Cuttle Mill midpoint auto-transformer station (MPATS) compound.

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.

Figure 3: Schematic of construction compounds for civil engineering works

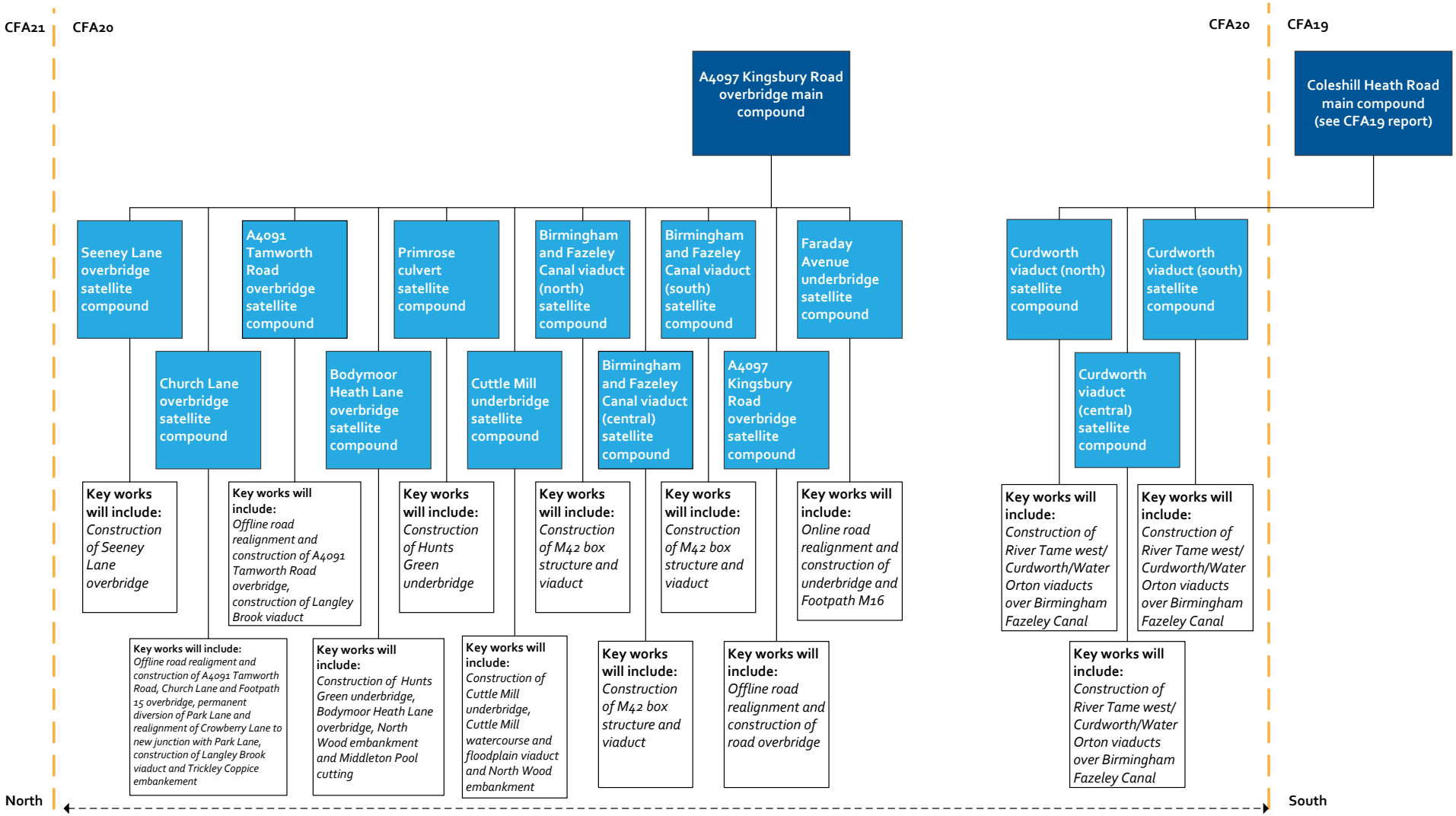
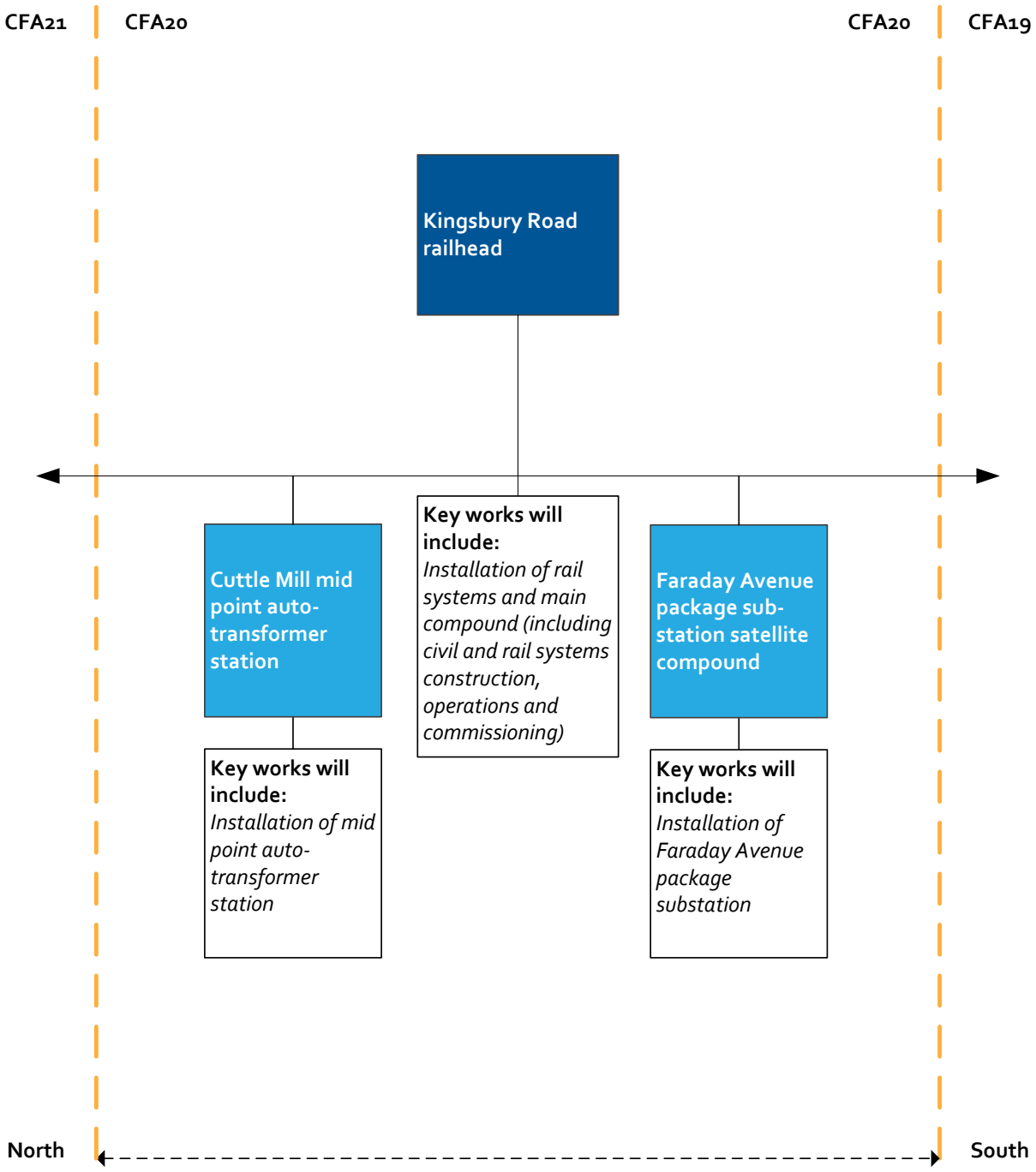


Figure 4: Schematic of construction compounds for railway installation works



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 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;
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities; and
- necessary operational parking.

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;
- 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;
- 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.

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 roadhead 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.

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

A4097 Kingsbury Road overbridge main compound

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

- Leeds spur dive-under;
- earthworks (embankments and cuttings); and
- mitigation planting and landscape earthworks.

2.3.20 Works in this section of the Proposed Scheme will be carried out in the following broad phases:

- site clearance and enabling works;
- building demolition;
- cuttings, embankments and landscaping earthworks;
- drainage and culvert works;
- overbridges and underbridges;
- viaduct and bridge construction;
- highway and footpath reinstatement;
- topsoiling and landscape planting; and
- track formation works.

2.3.21 The A4097 Kingsbury Road overbridge main compound will be operational for approximately five years and will be subject to the contractor's standard working hours, as described in the CoCP. The compound will be accessed directly from the A4097 Kingsbury Road. Construction traffic will travel southbound on the A4097 Kingsbury Road to the junction with the A446 Lichfield Road and the M42.

2.3.22 Approximately 130 workers on average and 180 workers at peak times will work from the A4097 Kingsbury Road overbridge main compound.

2.3.23 See Volume 1 for descriptions of typical cuttings and embankments (Section 5.2) and viaducts (Section 5.9), and for associated construction techniques (Section 6.8).

Demolitions

2.3.24 The buildings that will need to be demolished in this area are listed in Table 1, and shown on Volume 2: CFA20 Map Book, Map Series CT-05.

Table 1: Demolition works

Description of structure	Location
Barns at Dunton Hall, A4097 Kingsbury Road (total buildings – three)	CT-05-113, I4
The Chestnuts, Bella Vista and Wedgwood (formerly Water Park Lodge Bed and Breakfast and attached residential property called The Chestnuts) (total buildings – one, includes three residential dwellings)	CT-05-119, D5 and E5
Mullensgrove Farm (total buildings – seven, includes one residential dwelling)	CT-05-119, E4
Parklands Stud, near Barn Covert (total buildings – two, includes one residential dwelling)	CT-05-113-R1, I9
Barn Covert main buildings (total buildings – five, includes one residential dwelling)	CT-05-113-R1, G9
Cocksparrow House Farm, Cocksparrow Farmhouse, and agricultural buildings (total buildings – nine, includes two residential dwellings)	CT-05-113-R1, H8
Outbuilding near Cuttle Mill Fishery (total buildings – one)	CT-05-113, H5
Middleton House Farm (total buildings – eight)	CT-05-114, H6
Shed on west side of A4091 Tamworth Road, 100m north of Brick Kiln Lane (total buildings – one)	CT-05-114, C7

2.3.25 Additionally, the A4091 Tamworth Road Middleton Hall bridge will be demolished.

Highways and road realignments

2.3.26 The following highways and roads will be diverted or realigned in this area, associated with works managed from the A4097 Kingsbury Road overbridge main compound, illustrated on the construction map series Volume 2: CFA20 Map Book, Maps CT-05:

- Faraday Avenue – temporary (one year, six months) offline diversion of Faraday Avenue to the north. The final highway will follow the same horizontal alignment as the existing but will be lower to pass under HS2;
- A4097 Kingsbury Road – permanent realignment of the A4097 Kingsbury Road to the north of the existing;
- Hams Lane – temporary (ten months) offline diversion of Hams Lane and construction of new overbridge, over rail access to Kingsbury Road railhead;
- Bodymoor Heath Lane – permanent diversion of Bodymoor Heath Lane and new overbridge to a new connection with Brick Kiln Lane;
- A4091 Tamworth Lane – permanent realignment of the A4091 Tamworth Road and new overbridge;
- Park Lane – permanent diversion of Park Lane to connect with the realigned A4091 Tamworth Road;
- Crowberry Lane – permanent realignment of Crowberry Lane to a new junction with Park Lane; and
- Church Lane – permanent realignment of Church Lane and new overbridge.

2.3.27 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.

2.3.28 The crossings of the M42 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 area of Coleshill Junction (CFA19) will be coordinated to reduce the overall duration of disruption to the motorway. The traffic management will operate for a period of approximately two years over this length of the M42, M6 Toll and M6, and will be likely to include temporary speed restrictions for safety, temporary use of the hard shoulder, and reduced lane widths. The closures that have been considered in the assessment of the Proposed Scheme include:

- five night-time closures of the southbound carriageway for installation of the deck over that carriageway; and
- four night-time closures of the northbound carriageway for installation of the 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 is one viaduct in the Curdworth to Middleton area that will cross the Birmingham and Derby Line – River Tame (east) viaduct (Volume 2: CFA20 Map Book, Map CT-05-112b, H6). The design of this structure is proposed to minimise disruptive closures to the railway. Where possible, works will take place during planned closures of the railway. Three weekend closures for installation of the bridge deck over the railway have been considered for the Birmingham and Derby Line.

Footpath, cycleways and bridleways

2.3.31 The following footpaths and bridleways will be temporarily and/or permanently realigned in this area associated with the A4097 Kingsbury Road overbridge main compound:

- Footpath M16 will be kept open during construction until permanent realignment across a new overbridge and permanent diversion is complete;
- permanent closure of Footpath M13;
- permanent stopping up of byway M450 Marston Lane for pedestrians during construction with permanent closure for vehicles, creation of new footpath to replace after the railhead is removed;
- permanent stopping up of Footpath M23 during construction, until permanent diversion via the Seeney Lane overbridge following closure of the railhead;
- Bridleway M23a Seeney Lane will be permanently realigned around the railhead; it will also be upgraded to a byway open to all traffic (BOAT) between the A4097 Kingsbury Road and the existing track alongside the M42, which will also be upgraded to a BOAT;

- Footpath M22 will be stopped up during construction until permanent diversion via Seeney Lane overbridge is complete;
- maintenance of Birmingham and Fazeley Canal towpath during viaduct construction, may require minor adjustments to route;
- maintenance of Byway T179 during underbridge construction, may require minor adjustments to route;
- Footpath T17 will be permanently realigned over the realigned Bodymoor Heath Lane overbridge is completed; and
- Footpath T15 will be permanently diverted to a new overbridge (minor temporary rerouting around the worksite).

Utilities

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

- high-pressure gas mains:
  - high-pressure 600mm-diameter main, near Church Lane.
- high voltage electricity plant:
  - 132 kilovolt (kV) cable, at Faraday Avenue;
  - 400kV overhead cable, approximately 400m north of Faraday Avenue; and
  - 400kV O/H cable, adjacent to the A4097 Kingsbury Road.
- other services:
  - Fuel pipeline (12.75-inch diameter) at Marston Lane (also crosses the Leeds spur dive-under).

Watercourse diversions

2.3.33 Gallows Brook (south branch) will be realigned along the west side of the Proposed Scheme to a new culvert (Volume 2: CFA20 Map Book, Map CT-06-116a, D7).

2.3.34 Works to construct the viaduct over the Birmingham and Fazeley canal will be undertaken through management of traffic flows and with the provision of protection decks over the canal. There may be an occasional need to close the canals overnight to safely construct some of the works.

Finalisation works

2.3.35 Finalisation works will include landscaping and planting.

Satellite construction compounds

2.3.36 A total of 14 civil satellite construction compounds will be required to construct the works in the Curdworth to Middleton area. 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.

Table 2: Satellite construction compounds

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
Start of Curdworth to Middleton CFA to Faraday Avenue					
Curdworth viaduct (south) (Volume 2: CFA20 Map Book, Map CT-05-112b, I5)	Construction of River Tame West/Curdworth/Water Orton viaducts over Birmingham and Fazeley Canal	2019	2 years, 4months	20/30	Track/haul route via Water Orton Viaducts 1 & 3 (north) satellite compound (CFA19)
Curdworth viaduct (central) (Volume 2: CFA20 Map Book, Map CT-05-112b, G5)	Construction of River Tame West/Curdworth/Water Orton viaducts over Birmingham and Fazeley Canal	2019	2 years, 4 months	57/95	Edison Road/Faraday Avenue/A446 Lichfield Road
Curdworth viaduct (north) (Volume 2: CFA20 Map Book, Map CT-05-112b, G6)	Construction of River Tame West/Curdworth/Water Orton viaducts over Birmingham and Fazeley Canal	2019	2 years, 4 months	20/30	Faraday Avenue/A446 Lichfield Road
Faraday Avenue underbridge (Volume 2: CFA20 Map Book, Map CT-05-112b, F7)	Online road realignment and construction of road underbridge and footpath M16 Footpath	2018	1 year, 4 months	40/50	Faraday Avenue/A446 Lichfield Road
Faraday Avenue to Seeney Lane					
A4097 Kingsbury Road overbridge (Volume 2: CFA20 Map Book, MapCT-05-119, E5)	Offline road realignment and construction of road overbridge	2018	1 year, 3 months	55/80	Direct access onto the A4097 Kingsbury Road
Leeds spur junction split to east of Hunts Green					
Birmingham and Fazeley Canal viaduct (south) (Volume 2: CFA20 Map Book, Map CT-05-119, C6)	Construction of M42 Marston box structure and viaduct	2018	3 years, 1 month	20/30	Track/haul route via A4097 Kingsbury Road main compound
Birmingham and Fazeley Canal viaduct (central) (Volume 2: CFA20 Map Book, Map CT-05-119, C6)	Construction of M42 Marston box structure and viaduct	2018	3 years, 1 month	20/30	Track/haul route to A446 Lichfield Road
Birmingham and Fazeley Canal viaduct (north) (Volume 2: CFA20 Map Book, Map CT-05-119, A6)	Construction of M42 Marston box structure and viaduct	2018	3 years, 1 month	20/30	Cuttle Mill underbridge satellite compound

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
Cuttle Mill underbridge (Volume 2: CFA20 Map Book, Map CT-05-113, F5)	Construction of Cuttle Mill underbridge and floodplain viaduct and North Wood embankment	2018	2 years, 9 months	35/50	A4091 Tamworth Road
Primrose culvert (Volume 2: CFA20 Map Book, Map CT-05-114, H6)	Construction of Hunts Green underbridge	2019	8 months	35/50	Track/haul route to Cuttle Mill underbridge satellite compound
Bodymoor Heath Lane overbridge (Volume 2: CFA20 Map Book, Map CT-05-114, E8)	Construction of Hunts Green underbridge, Bodymoor Heath Lane overbridge, North Wood embankment and Middleton Pool cutting	2018	3 years, 11 months	29/50	Brick Kiln Lane/A4091 Tamworth Road/A446 Lichfield Road
East of Hunts Green to Gallows Brook					
A4091 Tamworth Road overbridge (Volume 2: CFA20 Map Book, Map CT-05-115a, G7)	Offline road realignment and construction of A4091 Tamworth Road overbridge; Construction of Langley Brook viaduct	2017	3 years, 2 months	30/30	Park Lane
Church Lane overbridge (Volume 2: CFA20 Map Book, Map CT-05-115a, D7)	Offline road realignment and construction of A4091 Tamworth Road, Church Lane, and Footpath T15 overbridges; construction of Langley Brook viaduct and Trickley Coppice embankment	2018	4 years, 3 months	36/55	Church Lane
Seeney Lane overbridge (Volume 2: CFA20 Map Book, Map CT-05-113-R1, F8)	Construction of Seeney Lane overbridge	2018	1 year	20/30	Track/haul route via A4097 Kingsbury Road main compound

Roadheads

2.3.37 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.

2.3.38 There is one roadhead within the Curdworth to Middleton area occupying land both to the north and south of Faraday Avenue. The southern portion of this stretches from the Birmingham and Derby Line to Faraday Avenue (Volume 2: CFA20 Map Book, Map CT-05-112b, F6 and G6) while the northern portion of this roadhead stretches from Faraday Avenue along the Hams Hall substation (Volume 2: CFA20 Map Book, Map CT-05-112b, C6 through E6).

2.3.39 This roadhead will be operational from 2019 for approximately four and a half years. Access to the site will be from Faraday Avenue onto the A446 Lichfield Road.

Temporary worker accommodation sites

2.3.40 One temporary worker accommodation site will be located within the Curdworth to Middleton area, as detailed in Table 3. The site will be adjacent to the A4097 Kingsbury Road overbridge main compound (Volume 2: CFA20 Map Book, Map CT-05-119, F8) and will comprise living accommodation, welfare facilities and car parking for approximately 36 workers over an approximately five year period. Temporary worker accommodation sites will adhere to measures set out within the draft CoCP.

Table 3: Location of temporary worker accommodation sites

Compound Name	Site description	Facilities provided	Estimated duration of use	Estimated number of workers
A4097 Kingsbury Road overbridge main compound	A4097 Kingsbury Road overbridge main compound temporary workers accommodation	Living accommodation, welfare facilities, car parking	4 years, 9 months	36

Kingsbury Road Railhead

2.3.41 The Kingsbury Road railhead is the main compound for the rail systems installation from the southern portal of Long Itchington Wood green tunnel (in the Ladbroke and Southam area (CFA16)) to the WCML connection at Handsacre (in the Whittington to Handsacre area (CFA22)); and Birmingham Curzon Street (in the Washwood Heath to Curzon Street (CFA26)).

2.3.42 The railway systems installation works will include track, overhead line equipment, communications equipment and traction power supply. The installation of track in open areas is assessed to be of standard ballast or slab track configuration.

2.3.43 The railhead compound will facilitate the following activities:

- permanent way (ballast or slab track) installation;
- overhead line electrification installation;
- signalling train control;
- telecommunication installation;
- low-voltage line-side power installation;
- Birmingham Interchange (Birmingham Interchange and Chelmsley Wood area (CFA24)) and Birmingham Curzon Street fit-out (Washwood Heath to Curzon Street area (CFA26));
- Burton Green green tunnel fit-out;
- Long Itchington Wood tunnel fit-out; and
- Bromford tunnel fit out (in the Castle Bromwich and Bromford CFA (CFA25)).

2.3.44 The Kingsbury Road railhead will be located to the east of the HS2 route between the A4097 Kingsbury Road and the M42.

2.3.45 The Kingsbury Road railhead will consist of three parts, the railhead, a reception siding adjacent to the existing railway and a length of track connecting the two.

2.3.46 The railhead element is the main functional part of the complex and includes the following proposed components:

- a fan of sidings for the stabling of trains and wagons;
- track element fabrication areas;
- an area for the fabrication of overhead line equipment;
- parking;
- welfare and office accommodation facilities;
- ballast storage area;
- cable storage area;
- fuel storage area;
- maintenance facility for rail plant;
- a head shunt to the north east of the site for the movement of trains; and
- connections to the HS2 route.

2.3.47 The railhead will be operational twenty four hours a day. This is required to ensure trains are ready for operations the following day. Overnight works will be reduced where possible by using a 'just in time' delivery strategy to reduce the need to load and unload wagons. Lighting will be required to provide safe working areas during hours of darkness. Low level lighting will be provided for the sidings, with floodlighting to the storage and fabrication areas. Lighting will be designed to the requirements of the draft CoCP.

2.3.48 The reception sidings provide a position to hold trains either as they arrive or depart onto the existing rail network. This enables a number of trains to be stabled in the reception sidings until space is available to release them into the railhead or onto the existing rail network.

2.3.49 The receptions sidings will consist of approximately four sidings parallel to the existing Birmingham and Derby Line with connections to the existing railway at each end. A small welfare facility will be provided for drivers.

2.3.50 The connection between the reception sidings and the railhead elements is a twin track railway which will run parallel to the proposed HS2 route.

2.3.51 Construction traffic will travel from the main railhead site southbound on the A4097 Kingsbury Road to the junction with the A446 Lichfield Road and the M42.

2.3.52 The Kingsbury Road railhead will take three years, ten months to construct (including civil engineering works and modifications to the existing railway) which is integrated with the line of route construction works.

2.3.53 The railhead will be operational for one year, eleven months. This site will be utilised for a further two and a half years as a main compound for the rail related work and testing and commissioning. Approximately 160 workers on average will be at the railhead and approximately 510 workers at peak times. Figure 4 shows the Kingsbury Road railhead and the rail system compounds that it will support. Decommissioning of the railhead and compound operations will take approximately six months. The main elements of the landform created for the railhead will remain, including the widened cutting alongside the Birmingham and Derby Line for the reception sidings, the widened Curdworth cutting and the main sidings area. These will all be grassed and the main sidings area could be returned to agricultural use.

Railhead satellite compounds

2.3.54 The Kingsbury Road railhead will provide main compound support to two satellite compounds for rail systems activities within Curdworth to Middleton (CFA20) (and one in the Coleshill Junction area (CFA19)) as shown in Figure 4 and described in Table 4. In addition, the railhead will provide support for other rail systems satellite compounds in CFA16 to CFA26.

Table 4: Satellite rail systems compounds

Compound name	Principal construction activity	Start date	Estimated duration of use	Number of workers (ave/peak)	Highways access route
Faraday Avenue packaged substation satellite compound	Installation of auxiliary transformer substation	April 2022	1 month	2/4	Faraday Avenue to A446 Lichfield Road to M42
Cuttle Mill midpoint auto transformer station (MPATS)	Installation of midpoint auto-transformer station	April 2022	1 year, 3 months	25/40	Cuttle Mill Lane to A4091 Tamworth Road

Construction waste and material resources

2.3.55 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 Curdworth to Middleton area have been prepared and are presented in Volume 5: Appendix WM-001-000.

2.3.56 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.

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

2.3.58 The quantity of surplus excavated material originating from the Curdworth to Middleton area that will require off-site disposal to landfill as excavation waste is

shown in Table 5. This is the forecast quantity of contaminated excavated material that is chemically unsuitable for reuse within the Proposed Scheme.

2.3.59 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%.

2.3.60 The quantities of demolition, construction and worker accommodation site waste that will require off-site disposal to landfill are shown in Table 5.

Table 5: 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	2,975,404	0
Demolition	31,218	3,122
Construction	24,434	2,443
Workers accommodation site	64	32
TOTAL	**3,031,120**	**5,597**

2.3.61 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

2.3.62 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. This will take place in the year prior to opening. Further details are provided in Volume 1, Section 6.26.

Construction programme

2.3.63 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				2026 quarters				2027 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advance works																																											
Advance works																																											
Civil engineering works																																											
Curdworth viaduct (south, central, north) satellite compounds																																											
River Tame west viaduct																																											
Curdworth viaduct																																											
A4097 Kingsbury Road overbridge main compound																																											
Faraday Avenue embankment																																											
Curdworth cutting																																											
Leeds spur dive-under																																											
Kingsbury Road railhead site excavation																																											
Dunton Wood embankment																																											
Faraday Avenue underbridge satellite compound																																											
Faraday Avenue underbridge																																											
Footpath M16 accommodation overbridge																																											
A4097 Kingsbury Road overbridge satellite compound																																											
A4097 Kingsbury Road overbridge																																											
Birmingham and Fazeley Canal viaduct (south, central, north) satellite compounds																																											
Birmingham and Fazeley Canal viaduct																																											
M42 Marston box structure																																											
Cuttle Mill underbridge satellite compound																																											
Cuttle Mill underbridge																																											
North Wood underbridge																																											
North Wood embankment																																											
Primrose culvert satellite compound																																											
Primrose culvert																																											
Hunts Green underbridge																																											

Construction activity	2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters				2027 quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bodymoor Heath Lane overbridge satellite compound																																											
Bodymoor Heath Lane overbridge																																											
Middleton Pool cutting																																											
Middleton Pool embankment																																											
A4091 Tamworth Road overbridge satellite compound																																											
A4091 Tamworth Road overbridge																																											
Langley Brook viaduct																																											
Church Lane overbridge satellite compound																																											
Church Lane overbridge																																											
Church Lane embankment																																											
Park Lane realignment																																											
Coppice Lane cutting																																											
Trickley Coppice embankment																																											
Footpath T15 accommodation overbridge																																											
Seeney Lane overbridge satellite compound																																											
Rail infrastructure and system works																																											
Kingsbury Road railhead																																											
Operational railhead																																											
Cuttle Mill midpoint auto-transformer station																																											
Faraday Avenue substation																																											
Commissioning																																											
Commissioning (year prior to opening)																																											

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 eight trains per hour each way passing through the Curdworth to Middleton area in the morning and evening peak hours, and fewer during other times. The first trains of the day would leave the terminus stations no earlier than 05:00 Monday to Saturday (and 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 of services could rise to 14 trains per hour each way during peak hours, and that with Phase Two in place the frequency could rise to the following trains per hour each way during peak hours:

- 22 trains per hour south of the Leeds spur;
- 12 trains per hour north of the Leeds spur towards Manchester; and
- 10 trains per hour on the route to Leeds.

2.4.4 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 through lines, and up to 270kph (170mph) on the route towards Leeds during Phase Two. 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 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. Volume 1, Section 4.3 describes the maintenance regime for HS2.

2.4.7 Railway maintenance vehicles would be parked either at the Calvert infrastructure maintenance depot, or at the Wormleighton maintenance loops. There are no maintenance loops located in the Curdworth to Middleton 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

2.4.8 Forecasts of 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.

2.4.9 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.

2.4.10 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.

2.4.11 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.

2.4.12 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%.

2.4.13 On this basis, approximately 161 tonnes of operational waste will be reused, recycled and recovered during each year of operation of the Proposed Scheme in the Curdworth to Middleton area. Approximately 33 tonnes will require disposal to landfill (see Table 6).

Table 6: 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	179	27
Ancillary infrastructure	15	6
TOTAL	**194**	**33**

2.4.14 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 CFA 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:

- 3 April 2012 at Middleton Village Hall;

- 27 June 2012 at Middleton Village Hall;
- 19 September 2012 at Middleton Village Hall;
- 14 November 2012 at Middleton Village Hall;
- 26 February 2013 at Middleton Village Hall; and
- 17 September 2013 at Middleton Village Hall.

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 to emerge from these meetings were:

- design of vertical and horizontal alignment (see Section 2.3 for further information);
- design of the Y network and future connections for Phase Two, to Manchester and Leeds (see Section 2.2 for further information);
- areas of land required for construction and operation of the Proposed Scheme (see Section 2.2 and 2.3 for further information);
- impacts on Middleton House Farm and to local employment at Middleton House Farm (see Sections 3, 4, 6, 7, 9, and 11 environmental topic sections for further information);
- noise and vibration effects (see Section 11 for further information);
- visual and landscape effects (see Section 9 for further information);
- consideration of neighbouring communities when designing mitigation, and impacts of mitigation measures on the environment (see Section 2.6, Section 5 and Volume 3 for further information);
- use of local roads during construction, short and long-term impacts due to road adjustments, maintenance of access roads to Bodymoor Heath Training Grounds (see Section 12 for further information);
- impacts on the scheduled monument (a medieval moated site south of Middleton House Farm) (see Section 6 for further information);
- duplication of impacts at Bodymoor Heath due to both Phase One and Phase Two;
- mitigation for landscape via tree/hedgerow planting (see Sections 7 and 9 for further information);
- construction: auto-transformer locations, access, drainage ponds, construction compounds and worksites (see Section 2.3 for further information);
- potential severance of PRoW from Drayton Bassett to Middleton (see Section 12 for further information); and

- potential for improvement to gas supply and broadband to Middleton and utility diversions as a result of HS2.

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 and closed on 11 July 2013. As part of these consultations, members of local communities and other interested parties were notified, provided with information and invited to engage on issues pertinent to the draft ES and the development of the Proposed Scheme. Details of the local consultation events were provided on HS2 Ltd website, social media, posters at local venues, national and regional advertising and to properties within 1km of the Proposed Scheme. In the Curdworth to Middleton area a consultation event on the draft Environmental Statement was held on Friday, 7 June 2013 at the Middleton Village Hall.

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

2.5.7 Responses from the draft ES consultation have been analysed and an overview of those received and how the ES has taken account of responses is contained in the Draft Environmental Statement 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 Volume 5: Appendix CT-002-000. The main local alternatives considered for the Proposed Scheme within this area are described in this section.

2.6.2 Since April 2012, as part of the design development process, a series of local alternatives has 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.

Grade separated junction for Leeds (Phase Two)

2.6.3 The connection from London and Birmingham to Leeds and the north-east requires a crossing over or under the HS2 main line to provide the required junction capacity and journey times. The January 2012 announced route for Phase One did not include details of the junction to Leeds. Phase Two work has developed the alignment for the Leeds spur dive-under.

2.6.4 The location is constrained by the main line, the proposed line of the Leeds spur, and the Delta junction connection to Birmingham. The line in this location is close to existing infrastructure, the grade separated M42 junction 9 and commercial developments.

2.6.5 The following two options were developed for the arrangement of the Leeds spur junction:

- Option A, Crossing under the HS2 main line – this would comprise a box structure approximately 650m long and between 13m and 23m deep; and
- Option B, passing over the HS2 main line on a box structure – this is likely to require a noise barrier, which would further increase the visual intrusion.

2.6.6 Option A would have a lower capital cost, together with less visual and noise impact than Option B. Therefore Option A, a crossing under the Hs2 main line, was taken forward for further development within the Proposed Scheme for the grade separated junction for Leeds (Phase Two).

Extent of the Leeds spur

2.6.7 It would be expensive and disruptive to make connections for Phase Two onto the HS2 Phase One route after the railway becomes operational, because the works would have to be undertaken in a combination of short night-time periods involving more extensive line closures. An interface point between the two phases has, therefore, been investigated along the spur to Leeds, to be located in order to enable Phase Two to be constructed without adversely affecting the operation of Phase One.

2.6.8 In addition to the grade-separated dive-under for Leeds, the works for the Leeds spur would comprise a partly retained cutting that will extend to a point just south of Marston Lane, which would be closed. This would be far enough so that these earthworks would no longer abut those of the Phase One line and would allow the construction of the full extent of the retaining wall required to accommodate the level change required between the Leeds northbound and southbound lines.

2.6.9 Therefore, an interface point for the Leeds spur works, just north of Marston Lane, has been taken forward for further development within the Proposed Scheme for the grade separated junction for Leeds (Phase Two).

Layout of the Delta junction

2.6.10 Alternatives for the layout and arrangement of the tracks of the Delta junction are described in Section 2.6 of the Coleshill Junction area (CFA19) report.

Location of the railhead

2.6.11 The choice of a suitable location for the provision of the railhead to facilitate the rail systems installation is subject to substantial constraints imposed by the design of the railhead. It needs to be a large facility with many rail sidings that have to be almost level, with a rail connection to the existing railway network and HS2, as well as having good access to the highway network.

2.6.12 The construction strategy of the rail systems concluded that a railhead would be required in the Warwickshire/West Midlands/Staffordshire area. An initial review was undertaken of all the locations where the Proposed Scheme runs within approximately 500m of an existing railway line to identify those sites which had adequate capacity on the existing railway, a good connection to the highway network, and provided sufficient space within existing constraints. This review concluded that the following areas should be investigated further:

- Birmingham to Nuneaton Line, east of the M42/M6 Toll;
- Birmingham and Derby Line, east of the M42/M6 Toll; and
- South Staffordshire Line, north-east of Lichfield.

2.6.13 Ten location options and two variants were identified for the potential railhead, at these locations. Of these options, six were discounted due to one or more of the following reasons:

- site constraints restricting the size and arrangement of the railhead;
- inadequate connections to either the existing railway or HS2; and
- the presence of immediately adjacent communities.

2.6.14 The following four sites where developed further and considered in greater detail.

Hams Hall

2.6.15 The main area of sidings would be aligned parallel to HS2 between the route and the M42 with a connection to the Birmingham and Derby Line. To make the site suitable for the railhead, the A446 Lichfield Road, Faraday Avenue and A4097 Kingsbury Road would need to be diverted around the works. A number of overhead power lines would also need to be diverted as this site is close to the Hams Hall electricity substation. This site slopes from north to south; as a result this option would require significant excavation and engineering works to create the flat site for the railhead. A length of temporary track would be required to the north east, broadly along the line of the route for Phase Two, to manoeuvre trains onto the route.

2.6.16 This option would have been set in a location already markedly affected by existing transport and utility routes, with a substantial aggregate and landfill site, a large sub-station, several overhead electricity transmission pylon lines and the A446 dual carriageway, which would help limit the environmental impacts. However, substantial excavation and civil engineering works would be needed to establish the necessary development levels and road layout needed to provide the railhead. Several residential buildings would be demolished and one footpath closed.

Hams Hall – alternative design

2.6.17 This option would be broadly similar to the Hams Hall option above, but with the main sidings located closer to HS2 and at a similar level. A longer connection to the existing railway would be required to accommodate this change in level, and this link would travel the perimeter of the site. The temporary track to the north-east of the route would not be required with this option as the railhead could not connect to the Leeds spur dive-under.

2.6.18 Development of the sidings areas at a higher level reduce the scale of the excavation and structural engineering works needed, albeit with the consequence of making the railhead more prominent from the west.

A4097 Kingsbury Road

2.6.19 The main sidings would be located between the A4097 Kingsbury Road and the M42 to the east of the Proposed Scheme, with highway access from the A4097 Kingsbury Road. A connection to the Birmingham and Derby Line would run south, parallel to the HS2 route. A set of reception sidings would be provided adjacent to the existing railway between Faraday Avenue and Church lane, Lea Marston. The railhead connection and reception sidings would require extensive excavation.

2.6.20 Several residential buildings would be demolished and one footpath closed. There would be increased environmental impacts on the Marston and the A4097 Kingsbury Road area.

South Staffordshire Line

2.6.21 The main sidings area and the reception sidings would be set to the east of the South Staffordshire Line and to the south-west of Alrewas, with highway access from the A513. The rail link to HS2 would run parallel to the existing railway for approximately 3km, then run parallel to the route as it climbs to the level of HS2.

2.6.22 This option would extend the influence of HS2 into a previously unaffected area, albeit close to existing transport corridors and aggregate extraction areas. There would be increased environmental impacts on the Alrewas, Fradley and Whitemoor Lakes/National Memorial Arboretum areas. Some closures and diversions of local lanes and footpaths would be needed, but no residential demolitions would occur. The earthworks and structural requirements would be considerably less than for the other options.

Choice of option

2.6.23 The original Hams Hall option required extensive modification to existing infrastructure and greater quantities of excavation than any of the other options. Additionally it was identified that this option had the potential to serve the Phase Two route towards Leeds. This has the potential benefit of avoiding the construction of a further railhead on the Phase Two route which would reduce the overall cost and environmental impacts of this option.

2.6.24 The Hams Hall alternative option required less extensive excavation which together with other refinements gave a moderate cost benefit over the original Hams Hall option. The increased environmental impact of the higher setting was offset by the reduced impacts of excavation and the removal of the temporary tracks to the north-east of the route. This option would not have the potential benefit of being able to serve Phase Two.

2.6.25 The A4097 Kingsbury Road option required less disruption to existing infrastructure and would be less likely to require the excavation of contaminated material. The overall quantity of excavated material was similar to the Hams Hall alternative option. In contrast, this option would provide a minor worsening of noise, air quality and

community impacts and a significant worsening of landscape impacts due to its proximity to a number of properties during construction. Overall this option was assessed to give rise to a minor increase in significant environmental effects compared to the original Hams Hall option. The reduced extent of works to existing infrastructure compared to both of the Hams Hall options mean that this option has a significantly reduced cost. This option would also have the potential to serve Phase Two.

2.6.26 The South Staffordshire Line option would have required the least earthworks, resulting in a significant reduction in impacts relating to the excavation and movement of material. It would also have required very little disruption to existing infrastructure. The option would have made a minor increase to biodiversity, air quality, noise and community impacts and a significant worsening of landscape impacts where it neighbours a number of properties, when compared to the original Hams Hall option. As a result of the minimal infrastructure changes and less earthwork requirements than the other sites, this option could be accomplished at the least cost. However the location of this site on HS2 would have required the installation of rail systems to proceed primarily in one direction, only to the south. This option would not have had the potential to serve Phase Two.

2.6.27 Ultimately, the A4097 Kingsbury Road option was incorporated into the Proposed Scheme as although it has slightly greater environmental impacts than other options, it still provides the desired connectivity for construction, has relatively low disruption to existing infrastructure and relatively low cost. Additionally the potential to re-use the site for Phase Two could provide further environmental and cost benefits as another site would not be required during the construction of Phase Two.

Alternatives proposed by the community

2.6.28 During the engagement process, proposals were received from members of the community for changes to the design. In this area, the following alternatives regarding revisions to the horizontal and vertical alignment as well as tunnelling were developed and compared against Option A, the January 2012 announced route.

2.6.29 The alternatives were considered in three groups for the horizontal alignment (Options B and E), vertical alignment (Options C and D) and provision of a green tunnel (Option F).

2.6.30 Options B and E both considered a horizontal realignment of the route further to the east of the village of Middleton.

2.6.31 Option B would have moved the route approximately 60m further east than Option A. To have achieved this change to the alignment would have required adjusting for approximately 8km of the line to the south, increasing the land required from a number of major landowners including Coleshill Sewage Treatment Works.

2.6.32 This option would have provided an overall minor environmental benefit, but would have required much longer viaducts to cross the various flood plains along this length of route. Together with the increased impact on major landowners, the cost of this option would have increased significantly. Overall this option provided no overall benefit compared to Option A and was not incorporated into the Proposed Scheme.

2.6.33 Option E was developed after further discussions with the community groups. This option looked to avoid the long realignment to the south by providing a smaller shift of the route away from Middleton.

2.6.34 The environmental benefits of this option would have been less than Option B as the route would have passed through the northern edge of North Wood ancient woodland and through a scheduled ancient monument. As a result, this option was assessed to have a similar overall environmental impact as Option A. The cost of this option was slightly greater than Option A as a result of increased viaduct lengths required to cross the flood plains. As there was no overall environmental benefit this option was not incorporated into the Proposed Scheme.

2.6.35 Options C and D both considered lowering the vertical alignment of the route as low as reasonably practical.

2.6.36 Option C would have realigned the M42 near to Dunton Hall to cross over HS2, which would have been lowered to the existing level of the motorway. Lowering the alignment of HS2 to this extent in this area is complicated by the need to provide a length of constant gradient track to the south for the various connections of the Delta junction. Furthermore it was considered that the construction of and operational impact of raising the M42 would introduce new environmental effects. As a result this option was not incorporated into the Proposed Scheme.

2.6.37 Option D considered lowering the alignment between the M42 to the south of Middleton to Gallows Brook on the Staffordshire/Warwickshire county boundary to the north. This would have been achieved by lowering the clearance over watercourses and their flood plains to provide a minimum height of the route.

2.6.38 For watercourses closest to the village of Middleton, flood analysis indicated that the levels of the viaducts were already provided to the practical minimum. However, to the south of Middleton there was sufficient clearance to be able to lower the height of some of the viaducts. Overall it would have been possible to lower the route between the M42 and Bodymoor Heath Lane by up to 4m.

2.6.39 Although this option would not have provided an overall environment benefit, there were minor benefits to the landscape as a result of the lowered viaducts and embankments. The cost of this alternative was broadly equal to Option A. As a result of the slight environmental benefit this option was incorporated into the Proposed Scheme.

2.6.40 Option E would have provided a green tunnel to the north of Church Lane, Middleton. This would have been approximately 400m long and used landscaping to bury the structure.

2.6.41 Although this option would have provided benefits due to reduced noise and visual impacts during operation, it increased a number of impacts during construction and would increase the impacts associated with energy use during operation. As the option would have provided no overall environmental benefit and would increase the cost of construction and operation it was not incorporated into the Proposed Scheme.

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)[6] 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 Section 7, Ecology and Section 9, Landscape and visual assessments.

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 Section 6, Cultural heritage; Section 7, Ecology; and Section 9, Landscape and visual assessments.

3.1.5 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both 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 area, are contained in Volume 5: Appendix AG-001-020.

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.

[6] 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*.

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 Curdworth to Middleton 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 Section 9, Landscape and visual assessment. The arterial drainage in the Curdworth to Middleton area is provided by the River Tame, Birmingham and Fazeley Canal, Langley Brook, Gallows Brook and their tributaries. The Proposed Scheme will cross the River Tame and the Birmingham and Fazeley Canal. It will then run parallel to the River Tame, as the valley continues northwards to Tamworth. Drainage is provided by several brooks flowing to the River Tame, including Langley Brook and Gallows Brook in the north of this area. The topography is dominated by the lowland within the valley of the River Tame at an elevation of between 70m and 85m above Ordnance Datum (AOD), except north-east of Curdworth near junction 9 of the M42, where the land rises to 103m AOD.

Geology and soil parent materials

3.3.3 The main geological features are described in detail in Section 8, Land quality and are summarised in Volume 5: Appendix AG-001-020.

3.3.4 Superficial deposits are present across much of the study area. Alluvium, variably composed of clay, silt, sand and gravel, surrounds the River Tame in the south of the study area and Langley Brook and Gallows Brook in the north. River terrace deposits, comprising predominantly sand and gravel, extend northwards from the River Tame and underlie much of the Proposed Scheme between the Birmingham and Fazeley Canal and Gallows Brook at the northern extent of the study area.

3.3.5 A cover of glacial deposits extends across an area of higher elevation to the north of the River Tame and head deposits, variably comprising clay, silt, sand and gravel,

underlies the Proposed Scheme around the area of the Leeds spur and is present in isolated pockets elsewhere in the study area. These superficial deposits give rise to mainly clayey soils.

3.3.6 Bedrock of the Mercia Mudstone Group underlies the whole of the study area. Mercia Mudstone typically comprises weak red brown silty mudstone with minor amounts of carbonate and gypsum when unweathered. Occasional beds of dolomitic siltstone occur within the Mercia Mudstone which are generally thin and, when unweathered, are a medium strong rock. These soil forming materials also give rise to clayey soils.

Description and distribution of soil types

3.3.7 The characteristics of the soils are described by the Soil Survey of England and Wales[7] and shown on the National Soil Map[8]. The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5: Appendix AG-001-020 and their distribution is shown on Volume 5: Map Book – Agriculture, forestry and soils, Map AG-02-020. The soils throughout this area are variable according to the topography and geology.

3.3.8 The Arrow association is mapped on the river terrace and glacial outwash deposits. The dominant soil type has deep permeable sandy loam topsoils and subsoils variably affected by groundwater with sands and gravels at depth. They experience slight seasonal waterlogging; Wetness Class[9] (WC) II, with lower lying areas having more prolonged waterlogging (WC III).

3.3.9 Land overlying reddish mudstones, where the route will cross the M42, has soil named as the Whimple 3 association, with medium clay loam or medium silty clay loam topsoils and upper subsoils in thin superficial drift. There is generally slight seasonal waterlogging on this land (WC II) but, on lower slopes, soils are more seasonally waterlogged (WC III to IV).

3.3.10 Land in the valley of Langley Brook has soils of the Brockhurst 2 association developed on mudstones with thin superficial drift. Topsoils and upper subsoils tend to be medium clay loams or medium silty clay loams, but the slowly permeable clayey lower subsoils cause the dominant soils to be seasonally waterlogged (WC III to IV). Narrow strips of clayey alluvium on minor valley floors, too small in extent to be identified separately on Volume 5: Map Book – Agriculture, forestry and soils, Map AG-02-020, occur within this association.

3.3.11 Extensive soils in deep reddish light and medium loamy drift occur through most of Middleton parish in the Clifton association. They have sandy clay loam and medium clay loam topsoils and, where slowly permeable, are seasonally waterlogged (WC III to IV). Locally, they are associated with deep light loamy soils affected by groundwater. Some similar reddish medium clay loam topsoils and subsoils with only slight seasonal waterlogging occur on naturally better draining land (WC II).

[7] Soil Survey of England and Wales (1984), *Soils and their Use in Midland and Western England*, Bulletin 12.
[8] Cranfield University (2001), *The National Soil Map of England and Wales* 1:250,000 scale, National Soil Resources Institute, Cranfield University, UK.
[9]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).

3.3.12 Soils on the River Tame floodplain are named as the Midelney association which comprises heavy clay loam and heavy silty clay loam topsoils over mainly stoneless clays and silty clays with peat and gravel in places. They are affected by groundwater and can be wet for long periods (WC IV to V).

3.3.13 Finally, low-lying river terraces north of the M42 have soils of the Wigton Moor association. These soils comprise deep, sandy clay loam topsoil or medium clay loam topsoil over similarly textured subsoil which are variably affected by groundwater, with drier soils on slightly raised sites (WC II to III).

Soil and land use interactions

Agricultural land quality

3.3.14 The principal soil/land use interaction in the study area is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate and the site.

3.3.15 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. There are four distinct soil characteristics within the Curdworth to Middleton area. These are light loamy textures, in some places stony, over sand and gravel on river terraces (Arrow association); poorly structured slowly permeable subsoils on mudstones (Whimple 3 and Brockhurst 2 associations); clayey, slowly permeable soils on floodplains (Midelney association); and loamy soils, some of which are affected by groundwater (Clifton and Wigton Moor associations).

3.3.16 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.

3.3.17 The local climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at two points within the Curdworth to Middleton area, set out in Appendix 5: Appendix AG-001-020. FCD range from 150 to 154 days, which is at or slightly above the average for lowland England (150 days). This is considered to be quite favourable for providing opportunities for agricultural cultivations and soil handling.

3.3.18 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 in the study area. As described in Section 13, Water resources and flood risk assessment, flooding is limited to the floodplains of the several brooks rising in the west flowing to the River Tame, including the Langley Brook and Gallows Brook in the north. This is a potential limitation but its incidence is difficult to ascertain. Flood risk is determined by the extent, duration, frequency and timing of flooding events which may not have been

recorded. However, the flood maps published by the Environment Agency can be used as a guide (see Volume 5: Map Book – Water resources and flood risk assessment, Map WR-05-056 to 058) and the frequency and duration of annual flood events is not considered to be a limitation in this CFA.

3.3.19 The principal limiting factors determining agricultural land quality in this study area are soil wetness and soil droughtiness. Overall, the assessment of agricultural land required for constructing and operating the Proposed Scheme indicates that almost 91% is in the best and most versatile (BMV) category, mainly in Subgrade 3a (47%) and the remainder in Grade 2 (44%). Grade 2 land occurs on some of the light loamy soils of Arrow association and medium loams of Wigton Moor association, where the soils are thicker over gravels and the droughtiness limitation due to a moderately small available water capacity is less severe.

3.3.20 Other light loams within the Arrow association (sandy loam) and Wigton Moor association (sandy clay loam or medium clay loam topsoil) which are shallow over sands and gravels, or have a wetness limitation due to groundwater (WCIII to WCIV), are classed as Subgrade 3a. In the Brockhurst 2 association medium clay loam topsoil or medium silty clay loam topsoil over clay and Clifton association (sandy clay loam or medium clay loam topsoil over similar textured subsoil), soils have slowly permeable subsoil (WC III). Where this occurs below a depth below around 40cm, the land is classed as Subgrade 3a. Agricultural land with soil in the Whimple 3 association (medium clay loam or medium silty clay loam topsoil), is limited by soil wetness to Subgrade 3a where the subsoil is slowly permeable and seasonally waterlogged (WCIII).

3.3.21 A total of 9% of agricultural land is lower quality Subgrade 3b, found on the seasonally waterlogged (WC IV) parts of the Brockhurst 2 association (medium clay loam topsoil or medium silty clay loam topsoil over clay), the agricultural land is limited by soil wetness to Subgrade 3b. This is also true of seasonally waterlogged (Wetness Class IV) soils in the Clifton association (sandy clay loam or medium clay loam topsoil over similar textured subsoil). Soils in the Midelney association (heavy clay loam and heavy silty clay loam topsoil over mainly stoneless clays and silty clays with peat and gravel in places) on the floodplains are limited by soil wetness to Subgrade 3b where they are waterlogged for long periods (WCIV). Full details of the ALC are provided in Volume 5: Appendix AG-001-020 and the ALC grading is shown on Volume 5: Map Book – Agriculture, forestry and soils, Map AG-01-056 to Map AG-01-058.

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

Other soil interactions

3.3.23 Soil fulfils a number of functions and services for society in addition to those of food and biomass production which are central to social, economic and environmental

[10] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land.*

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.

3.3.24 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.

3.3.25 As described in Section 13, Water resources and flood risk assessment, several brooks that flow to the River Tame, including Langley Brook and Gallows Brook in the north of this area, represent the functional flood environment. In terms of river flooding, Environment Agency mapping indicates that Langley Brook and three of its tributaries are located in areas at high risk from flooding, with the soils functioning as water stores for flood attenuation, as well providing a habitat for ecology.

3.3.26 The presence of soil-borne cultural assets is detailed in Section 6, Cultural heritage. There are few known archaeological sites from the prehistoric and Romano-British period in this area. Archaeological assets identified within the study area range from at least the Bronze Age to the post-medieval period. Medieval settlement appears to focus upon a number of small villages and nucleated settlements, notably at Curdworth and Middleton, along with more dispersed moated sites. Post-medieval assets are the most common within the study area and many represent former landscape division and management and small scale industrial extraction.

Land use

Land use description

3.3.27 Local agricultural land use is dominated by arable crops such as wheat, barley and oil seed rape in rotation. Several holdings also grow potatoes, some of which are irrigated. Arable cropping is common on heavy (clayey) land of good to moderate quality, and this enterprise is more common away from the Birmingham urban fringe in the centre and north of the Curdworth to Middleton area. The arable farms produce spring-sown arable crops and potatoes on loamy soils, such as those in the south of the study area. Interspersed within the arable farms are smaller areas given over to cattle and sheep.

3.3.28 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

[11] Defra (2009), *Soil Strategy for England.*
[12] Defra (2011), *The Natural Choice: securing the value of nature.*

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 7.

3.3.29 There are occasional stands of woodland at Middleton Pool-head Plantation, Mill Plantation and Lower Mill Plantation. Woodland covers 9% of land in the study area, which is just below the national average of 10%. Therefore, woodland in this area is a resource of medium sensitivity.

Number, type and size of holdings

3.3.30 There are 23 holdings in the study area, as set out in Table 7. Seven are mainly combinable arable enterprises, and four are general cropping (arable and field scale vegetables, including potatoes in their rotations). A total of four holdings are irrigated (CFA20/2, CFA20/5, CFA20/13 and CFA20/14). The remainder comprise livestock holdings (one cattle, one sheep), four areas of grassland, one parcel of woodland and five equestrian units. The size of the holdings range from less than 1ha to over 400ha. The larger farms are general cropping enterprises; the smallest holding is a woodland. Many of the farms are heavily diversified, running non-agricultural enterprises such as commercial lets, car boot sales, fishing lakes, farm shops and equestrian services. One holding (Dunton Hall, CFA20/1) supports a particularly wide range of diversified activities. Land at Newlands Farm has land, which straddles the Curdworth to Middleton and Coleshill Junction area boundary (CFA20 and CFA19, respectively) and is considered as Holding CFA19/8 in the CFA19 Volume 2.

3.3.31 Table 7 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. The holding/reference name provides a unique identifier and relates to Map AG-01-056 to Map AG-01-058, given in Volume 5: Map Book – Agriculture, forestry and soils.

Table 7: Summary of characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA20/1 Dunton Hall	Mainly livestock (Sheep)	40.5	Veterinary practice; kennels; dog grooming shops; car-boot sale; greyhound practice track; Equestrian (commercial)	None	High Kennels and equestrian services
CFA20/2 Mullensgrove Farm	General cropping (cereals and potatoes)	24.3	17 commercial units; car-boot sale; farm shop	None	High Irrigation
CFA20/3 Wood to the north of Mullensgrove Farm	Woodland	12.9	None	None identified	Medium
CFA20/4* Barn Covert	Grassland	6.3	None identified	None identified	Medium
CFA20/5 Land at Cuttle Mill/Rye Farm	General cropping (cereals and potatoes)	404.7	None	ELS	High Irrigation
CFA20/6* Middleton House Farm	Mainly arable	93.2	Commercial and residential lets	ELS	Medium
CFA20/9* Upper House Farm	Mainly arable	128.1	None identified	ELS	Medium
CFA20/11 Parkwood House Farm	Mainly arable	55.4	None	ELS	Medium
CFA20/12 Crowberry Stables	Equestrian (commercial)	8.1	None	ELS	Medium
CFA20/13 Bullock End Farm	General cropping (cereals and potatoes)	307.6	Game shoot; coarse fishing lake	ELS	High Irrigation
CFA20/14 Church Farm	General cropping (cereals and potatoes)	80.9	Storage	ELS	High Irrigation
CFA20/15* Dunton Stables	Equestrian (commercial)	6.6	None identified	None identified	High Equestrian services
CFA20/16* Land to the west of Cocksparrow House Farm	Grassland	2.3	None identified	None identified	Low
CFA20/18* Land between Barn Covert and M42	Equestrian (non-commercial)	1.6	None identified	None identified	Low
CFA20/19* Marston Fields Farm	Grassland	29.8	Car boot sale; mineral extraction; coarse fishery	None identified	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA20/20* Land south of Bodymoor Heath Lane (A)	Mainly arable	34.3	None identified	None identified	Medium
CFA20/21* Land south of Bodymoor Heath Lane (B)	Mainly arable	7.6	None identified	None identified	Medium
CFA20/22* Home Farm	Mainly livestock (cattle)	2.7	None identified	None identified	Medium
CFA20/23* Cocksparrow Farmhouse	Equestrian (commercial)	3.8	None identified	None identified	Medium
CFA20/25* Parklands Stud	Equestrian (commercial)	6.9	None identified	None identified	Medium
CFA20/26* Land adjacent to Wheatley House	Mainly arable	2.8	None identified	None identified	Medium
CFA20/27* Land south of Parklands Stud	Grassland	0.4	None identified	None identified	Medium
CFA20/28* Land south of Bodymoor Heath Lane (C)	Mainly arable	3.1	None identified	None identified	Medium

* No farm impact assessment interview conducted; data estimated.

Future baseline

Construction (2017)

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

3.3.33 The future of agri-environment schemes is uncertain at present due to ongoing 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)

3.3.34 No committed developments have been identified in the Curdworth to Middleton 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, measures have been incorporated to avoid or mitigate severance impacts on agriculture, forestry or soils during construction. Access across the Hs2 alignment for agricultural vehicles will be provided by:

- bridges serving the A4097 Kingsbury Road, Bodymoor Heath Lane, the A4091 Tamworth Road, Church Lane and Seeney Lane;
- accommodation bridges widened for agricultural vehicles at Footpath M16 and Cuttle Mill; and
- Birmingham and Fazeley Canal viaduct.

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 measures set out within the draft Code of Construction Practice (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.

3.4.7 The timing and duration of various construction elements are set out in Section 2.3, Construction of the Proposed Scheme. 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 255.4ha as shown in Table 8. Of this total, 66.4ha will be restored and available for agricultural use following construction.

Table 8: 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	111.8	44%	38.9
Subgrade 3a	119.9	47%	23.8
BMV SUBTOTAL	231.7	91%	62.7
Subgrade 3b	23.7	9%	3.7
Grade 4	0.0	0%	0.0
Grade 5	0.0	0%	0.0
TOTAL AGRICULTURAL LAND	255.4	100%	66.4

3.4.10 The disturbance during construction to 231.7ha 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 low sensitivity, the effect on BMV land is assessed as a moderate adverse effect of the Proposed Scheme, which is significant.

3.4.11 Following completion of construction, 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. If surplus soils are generated, they will be used where land is to be restored to agriculture or other uses with slightly thicker topsoil and subsoil layers, where appropriate.

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 Whimple 3, Brockhurst 2 and Midelney associations are more susceptible to compaction and smearing when

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

moved in wet conditions or by inappropriate equipment and need particularly careful handling to avoid damage to soil structure.

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 9. 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 scale of effect 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 Volume 5: Map Book – Agriculture, forestry and soils, Maps AG-01-056 to Map AG-01-58 and Volume 5: Appendix AG-001-020.

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 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-001-020. 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 where the main holding is located.

Table 9: 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
CFA20/1 Dunton Hall	22.7ha – 56% High	Medium	Medium	Major adverse	5.6ha
CFA20/2 Mullensgrove Farm	23.0ha – 95% High	Negligible	Negligible	Major adverse	7.1ha
CFA20/3 Wood to the north of Mullensgrove Farm	8.4ha – 66% High	Low	Negligible	Major/Moderate adverse	0.3ha
CFA20/4* Barn Covert	6.3ha – 100% High	Negligible	Negligible	Major/Moderate adverse	0.0ha
CFA20/5 Land at Cuttle Mill/Rye Farm	27.8ha – 7% Low	Low	Negligible	Moderate adverse	10.9ha

Holding reference/name	Total area required	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA20/6* Middleton House Farm	31.0ha – 33% High	Medium	Medium	Major/Moderate adverse	5.3ha
CFA20/9* Upper House Farm	17.3ha – 14% Medium	High	Negligible	Major/Moderate adverse	2.4ha
CFA20/11 Parkwood House Farm	6.2ha – 11% Medium	Negligible	Negligible	Moderate adverse	0.3ha
CFA20/12 Crowberry Stables	2.3ha – 29% High	High	Medium	Major/Moderate adverse	0.0ha
CFA20/13 Bullock End Farm	17.5ha – 6% Low	Medium	Medium	Major/Moderate adverse	5.3ha
CFA20/14 Church Farm	8.9ha – 11% Medium	Medium	Negligible	Major/Moderate adverse	3.0ha
CFA20/15* Dunton Stables	0.7ha – 11% Medium	Negligible	Medium	Major/Moderate adverse	0.3ha
CFA20/16* Land to the west of Cocksparrow House Farm	2.3ha – 100% High	Negligible	Negligible	Moderate adverse	0.0ha
CFA20/18* Land between Barn Covert and M42	1.6ha – 100% High	Negligible	Negligible	Moderate adverse	0.0ha
CFA20/19* Marston Fields Farm	17.2ha – 58% High	Negligible	High	Major/Moderate adverse	0.0ha
CFA20/20* Land south of Bodymoor Heath Lane (A)	11.9ha – 35% High	Low	Negligible	Major/Moderate adverse	0.4ha
CFA20/21* Land south of Bodymoor Heath Lane (B)	2.0ha – 27% High	Negligible	Negligible	Major/Moderate adverse	0.0ha
CFA20/22* Home Farm	0.0ha – 0% Negligible	Negligible	Low	Minor adverse	0.0ha
CFA20/23* Cocksparrow Farmhouse	3.8ha – 100% High	Negligible	Negligible	Major/Moderate adverse	0.0ha
CFA20/25* Parklands Stud	6.9ha – 100% High	Negligible	Negligible	Major/Moderate adverse	0.0ha
CFA20/26* Land adjacent to Wheatley House	1.2ha – 41% High	Negligible	Negligible	Major/Moderate adverse	0.0ha
CFA20/27* Land south of Parklands Stud	0.2ha – 54% High	Negligible	Low	Major/Moderate adverse	0.0ha
CFA20/28* Land south of Bodymoor Heath Lane (C)	0.4ha – 12% Medium	Negligible	Negligible	Moderate adverse	0.0ha

* No farm impact assessment interview conducted; data estimated.

3.4.17 Overall, it is considered that 22 holdings will experience moderate or major temporary adverse effects during construction, which are significant.

3.4.18 Six farm enterprises sensitive to noise or vibration emitted during the construction phase have been identified near to the Proposed Scheme, as described below. Commercial fishing lakes are potentially disrupted on three holdings (CFA20/6,

Middleton House Farm; CFA20/13, Bullock End Farm; and CFA20/19, Marston Field Farm). The proximity of construction to stables at Crowberry Stables (CFA20/12) and Dunton Stables (CFA20/15) is a potential concern and both the kennels and stables at Dunton Hall (CFA20/1) are also likely to be sensitive to noise but compliance with the draft CoCP will avoid or reduce such environmental impacts during construction.

3.4.19 Four affected holdings (CFA20/2, Mullensgrove Farm; CFA20/5, Land at Cuttle Mill/Rye Farm; CFA20/13, Bullock End Farm; CFA20/14, Church Farm) have irrigation systems that will be disrupted by the Proposed Scheme and will require relocation and reconnection to the water supply.

Cumulative effects

3.4.20 No significant temporary 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

3.4.21 Following construction and restoration, the area of agricultural land that will remain permanently required will be 188.9ha, as shown in Table 10.

Table 10: Agricultural and forestry land required permanently

Agricultural land quality	Total area required (ha)	Percentage of agricultural land
Grade 1	0.0	0%
Grade 2	72.9	38%
Subgrade 3a	96.0	51%
BMV SUBTOTAL	168.9	89%
Subgrade 3b	20.0	11%
Grade 4	0.0	0%
Grade 5	0.0	0%
TOTAL	188.9	100%
Forestry land	19.4	n/a

3.4.22 The permanent loss of 168.9ha 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 low sensitivity so that the permanent effect on BMV land is assessed as a moderate adverse effect of the Proposed Scheme, which is significant.

3.4.23 Areas proposed for ecological and landscape mitigation includes grassland habitat restoration at the Kingsbury Road railhead, new woodland planting near North Wood (CFA20/6) and an ecological compensation area for protected species and ponds associated with open water in a former quarry (CFA20/9), adjacent to the Bodymoor Heath Training Grounds.

3.4.24 Agricultural land will be engineered to provide additional flood compensation capacity in areas to the north of Cuttle Mill Lane (CFA20/6), west of Middleton House Farm

(CFA20/6), west of Langley Brook Viaduct (CFA2011 and CFA20/12), and to the south of Drayton Bassett Viaduct (CFA20/9).

3.4.25 There are three parcels of woodland that will be permanently affected (CFA20/3, woodland off A4097 Kingsbury Road; CFA20/5, Cuttle Mill; and CFA20/7, North Wood). Overall, the total amount of forestry land required to implement the Proposed Scheme will be 19.4ha, out of the total permanent land area required for the operation of the Proposed Scheme of 263.2ha (7%), which is a medium magnitude of impact. The extent of the forest cover in the study area is slightly less than the average national woodland cover (i.e. medium sensitivity of the resource) and so, quantitatively, the loss of this woodland will be a moderate adverse effect of the Proposed Scheme, which is significant. The qualitative assessment of loss is addressed in other relevant sections of this report.

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 11. 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 scale of effect 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-001-020.

Table 11: Summary of permanent effects on holdings from construction

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA20/1 Dunton Hall	17.1ha – 42% High	Low	High	Major adverse
CFA20/2 Mullensgrove Farm	15.9ha – 65% High	Negligible	High	Major adverse
CFA20/3 Wood to the north of Mullensgrove Farm	8.2ha – 63% High	Low	Negligible	Major/Moderate adverse
CFA20/4* Barn Covert	6.3ha – 100% High	Negligible	High	Major/Moderate adverse
CFA20/5 Land at Cuttle Mill/Rye Farm	16.9ha – 4% Negligible	Low	High	Major adverse
CFA20/6* Middleton House Farm	25.7ha – 28% High	Medium	High	Major/Moderate adverse
CFA20/9* Upper House Farm	15.0ha – 12% Medium	High	Low	Major/Moderate adverse
CFA20/11 Parkwood House Farm	5.9ha – 11% Medium	Negligible	Negligible	Moderate adverse
CFA20/12 Crowberry Stables	2.3ha – 29% High	High	Negligible	Major/Moderate adverse
CFA20/13 Bullock End Farm	12.2ha – 4% Negligible	Medium	Negligible	Major/Moderate adverse

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA20/14 Church Farm	5.9ha – 7% Low	Medium	Low	Major/Moderate adverse
CFA20/15* Dunton Stables	0.5ha – 7% Low	Negligible	Negligible	Moderate adverse
CFA20/16* Land to the west of Cocksparrow House Farm	2.3ha – 100% High	Negligible	High	Moderate adverse
CFA20/18* Land between Barn Covert and M42	1.6ha – 100% High	Negligible	High	Moderate adverse
CFA20/19* Marston Fields Farm	17.2ha – 58% High	Negligible	Negligible	Major/Moderate adverse
CFA20/20* Land south of Bodymoor Heath Lane (A)	11.5ha – 34% High	Low	Negligible	Major/Moderate adverse
CFA20/21* Land south of Bodymoor Heath Lane (B)	2.0ha – 27% High	Negligible	Negligible	Major/Moderate adverse
CFA20/22* Home Farm	0.0ha – 0% Negligible	Negligible	Negligible	Negligible
CFA20/23* Cocksparrow Farmhouse	3.8ha – 100% High	Negligible	High	Major/Moderate adverse
CFA20/25 Parklands Stud	6.9ha – 100% High	Negligible	High	Major/Moderate adverse
CFA20/26* Land adjacent to Wheatley House	1.2ha – 41% High	Negligible	Negligible	Major/Moderate adverse
CFA20/27* Land south of Parklands Stud	0.2ha – 54% High	Negligible	Negligible	Major/Moderate adverse
CFA20/28* Land south of Bodymoor Heath Lane (C)	0.4ha – 12% Medium	Negligible	Negligible	Moderate adverse

* No farm impact assessment interview conducted; data estimated.

3.4.27 Overall, it is likely that 22 holdings will experience major or moderate permanent adverse effects from the construction of the Proposed Scheme, which are significant. These effects often result from a high proportion of the farm being required by the Proposed Scheme. It is considered that seven agricultural enterprises will be rendered unviable (CFA20/2, Mullensgrove Farm; CFA20/4, Barn Covert; CFA20/12, Crowberry Stables; CFA20/16, Land to the west of Cocksparrow House Farm; CFA20/18, Land between Barn Covert and M42; CFA20/23, Cocksparrow Farmhouse and CFA20/25, Parklands Stud). With the exception of Crowberry Stables, all of these holdings are located in the vicinity of the proposed Kingsbury Road railhead and become unviable due to loss of all or most of the holding and demolition of agricultural buildings.
An irrigation reservoir is also lost to the Proposed Scheme at Cuttle Mill/Rye Farm (CFA20/5); agricultural buildings are lost at Middleton House Farm (CFA20/6).
Long term severance issues would affect Upper House Farm (CFA20/9); Crowberry Stables (CFA20/12) and Church Farm (CFA20/14).

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 findings of the

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 Other mitigation measures include additional access provisions for holdings CFA20/1, Dunton Hall; CFA20/5, Land at Cuttle Mill/Rye Farm and CFA20/14, Church Farm. Four affected holdings (CFA20/2, Mullensgrove Farm; CFA20/5, Land at Cuttle Mill/Rye Farm; CFA20/13, Bullock End Farm; CFA20/14, Church Farm) have irrigation systems that require relocation and reconnection to the water supply.

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 188.9ha, of which 168.9ha is BMV. This is assessed as a moderate adverse residual effect which is significant.

3.4.32 A total of 22 holdings have been identified that will experience major or moderate permanent adverse effects, which are significant. Of these, 15 are likely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects to not significant. A total of seven holdings are likely to be rendered unviable by the Proposed Scheme (CFA20/2, CFA20/4, CFA20/12, CFA20/16, CFA20/18, CFA20/23 and CFA20/25); demolition of agricultural buildings or infrastructure occurs at six of these holdings as well as CFA20/1, CFA20/5 and CFA20/6. Residential buildings are also lost at CFA20/2.

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 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 (PM10 and PM2.5)[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 of buildings, 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-001-020;
- Volume 5: Map Book – Air quality, Map AQ-01-020; and
- Volume 5: Map Book – Air quality, Map AQ-02-020.

4.1.4 Maps showing the location of the key environmental features can be found in the Volume 2: CFA20 Map Book, Map series CT-10.

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: AQ-001-020.

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 properties is small, e.g. fewer than 10 properties. Thus, a single property cannot experience a 'significant effect' as defined by this methodology. The assessment

[14] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 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.*

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 close to construction activity, it will still be the case that mitigation in accordance with the draft Code of Construction Practice (CoCP) will be applied.

4.2.4 The assessment of construction traffic impacts has used traffic data that is based on an estimate of the average daily flows in the peak month 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 source of air pollution in the Curdworth to Middleton area is road traffic emissions from the M42 and M6 Toll.

4.3.2 Estimates for NO2, 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 NO2, PM10 and PM2.5 for 1km grid squares across the UK.

4.3.3 The Curdworth to Middleton area lies within the West Midlands region, within the boundaries of the administrative area of Warwickshire County Council (WCC) and the local authority area of North Warwickshire Borough Council (NWBC).

4.3.4 There are no continuous air quality monitoring sites within the Curdworth and Middleton area. Annual mean NO2 concentrations are measured by NWBC using a network of 17 passive diffusion tubes. Three diffusion tubes are located within the Curdworth to Middleton area: two roadside sites on the edge of Curdworth (80om and 90om west of the centre line of the Proposed Scheme); and one roadside site on Bodymoor Heath Lane, adjacent to Kingsbury Water Park (1.3km east of the centre line of the Proposed Scheme; 10om east of the centre line of the Leeds spur of the Proposed Scheme). Further details of these monitoring sites and the five year trends in concentrations are available in Volume 5: Appendix AQ-001-020.

4.3.5 The diffusion tube monitoring data are considered to be sufficient to indicate the baseline air quality of the predominantly rural area and show good agreement with the background air quality maps produced by Defra. Data from the diffusion tube

[16] Defra; 2010 Based Background Maps for NOx, NO2, PM10 and PM2.5; http://laqm.defra.gov.uk/maps/maps2010.html; Accessed: 11 November 2013.

monitoring sites and the Defra maps indicate that the average background pollutant concentrations across the Curdworth to Middleton area are below the relevant air quality standards.

4.3.6 There are no air quality management areas (AQMA) within the Curdworth to Middleton 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 include residential properties around Newlands Farm, Faraday Avenue, Curdworth; at Dunton Hall and Elford on the A4097 Kingsbury Road, Curdworth; around Marston Lane, Curdworth; on Cuttle Mill Lane, Wishaw; at Middleton House Farm off the A4091 Tamworth Road, Middleton; at Primrose Cottage, Bodymoor Heath Lane, Middleton; at Pool House Farm, Brick Kiln Lane off the A4091 Tamworth Road, Middleton; on Church Lane, Middleton; and at Parkgate Farm, A4091 Tamworth Road, Middleton.

4.3.8 One ecological receptor with a statutory designation has been identified within the Curdworth to Middleton area that could potentially be affected by changes in air quality as a result of the Proposed Scheme. This is the Middleton Pool Site of Special Scientific Interest (SSSI), which is located to the east of the A4091 Tamworth Road. There are two local wildlife sites (LWS) within the Curdworth to Middleton area that could potentially be affected by changes in air quality as a result of the Proposed Scheme. These are Dunton Coppice LWS, south of the A4097 Kingsbury Road and North Wood LWS, south of Middleton House Farm. Further details of these sites are provided in Section 7, Ecology.

Future baseline

4.3.9 Section 2.1; Volume 5: Appendix CT-004-000; and Volume 5: Map Book – Cross Topic Maps, Maps CT-13-056, CT-13-057 and CT-13-058 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 regional traffic growth factors and consideration of major locally consented schemes, as described in Section 12.3, Traffic and transport. In this way, the assessment accounts for cumulative effects.

Construction (2017)

4.3.11 Future background pollutant concentrations have been sourced from Defra background maps for 2017, which predict NO_2 and PM_{10} 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 measures set out within the draft 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 NO2 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 in the construction period: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario.

4.4.5 In the Curdworth to Middleton area dust-generating activities will comprise the demolition of buildings around the A4097 Kingsbury Road, Curdworth and the A4091 Tamworth Road, Middleton; construction of new structures; earthworks, including the movement of materials along haul roads along the line of the Proposed Scheme; construction of the Kingsbury Road railhead; as well as possible transfer of dust and mud on to public highways from vehicles travelling to and from construction compounds.

4.4.6 A construction dust assessment was undertaken for sensitive receptors at the ten locations where residential properties were present and three locations where ecological receptors were present, due to their proximity to the dust-generating activities identified. The ten locations where residential properties were present are around Newlands Farm, Faraday Avenue, Curdworth; at Dunton Hall on the A4097 Kingsbury Road, Curdworth; at Elford on the A4097 Kingsbury Road, Curdworth; around Marston Lane, Curdworth; on Cuttle Mill Lane, Wishaw; at Middleton House Farm, off the A4091 Tamworth Road, Middleton; at Primrose Cottage on Bodymoor Heath Lane, Middleton; at Pool House Farm, Brick Kiln Lane, off A4091 Tamworth Road, Middleton; on Church Lane, Middleton; and at Parkgate Farm, A4091 Tamworth Road, Middleton. The ecological receptors are the Middleton Pools SSSI, Dunton Coppice LWS and North Wood 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 were present the magnitude of impact will be slight adverse around Newlands Farm, Faraday Avenue, Curdworth and Marston Lane, Curdworth; due to the presence of residential properties within 20m of dust-generating construction activities. The magnitude of effect will be negligible at the other locations where residential properties are present. The construction dust effect at the three ecological sites will be negligible.

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 in Volume 5: Appendix AQ-001-020.

4.4.9 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.

4.4.10 Three locations within the Curdworth to Middleton area met the criteria for assessment of a change in traffic emissions during the construction phase. The locations are Faraday Avenue, Curdworth; A446 Lichfield Road between B4418 Marsh Lane and A4091 Tamworth Road; and A4091 Tamworth Road between A446 Lichfield Road and Cuttle Mill Lane. There will be a temporary realignment of Faraday Avenue which required assessment of changes in concentrations at receptors around this road. On the A446 Lichfield Road and A4091 Tamworth Road the increase in construction traffic was sufficient to require assessment of changes in concentrations at receptors around these roads. The assessment found that the magnitude of impact will be slight adverse for NO_2 at receptors along the A446 Lichfield Road and

negligible for receptors around Faraday Avenue and the A4091 Tamworth Road. The effect will be negligible for all receptors for NO2 and PM10.

4.4.11 The effect on air quality due to construction traffic emissions will not be significant. The basis for this conclusion is presented in full in Volume 5: Appendix AQ-001-020.

4.4.12 The Kingsbury Road railhead will be constructed and will be in use for the duration of the construction period. Screening was undertaken to determine the effect on air quality due to the use of diesel trains at the railhead. The magnitude of impact will be negligible.

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 Curdworth to Middleton 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 Four locations within the Curdworth to Middleton 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 A4097 Kingsbury Road,

Curdworth; Bodymoor Heath Lane, Middleton; Church Lane, Middleton; and the A4091 Tamworth Road. At all these locations there will be permanent road realignments which required assessment of changes in concentrations at receptors around these roads. The assessment found that the effect would be negligible for NO2 and PM10 at all receptors that represent residential properties. For the receptor at Middleton Pools SSSI an assessment of changes in NOx concentrations and nitrogen deposition was undertaken. This assessment found that there will be a decrease in NOx concentrations and nitrogen deposition as a result the A4091 Tamworth Road alignment moving further away from the boundary of the Middleton Pools SSSI.

4.5.6 Overall, 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 in Volume 5: Appendix AQ-001-020.

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 for this study area comprise:

- the demolition of eight residential properties on the edge of Marston and Lea Marston in the vicinity of the A4097 Kingsbury Road;
- the impacts on the amenity of residents living close to the route of the Proposed Scheme, temporary construction compounds, construction traffic routes or the Kingsbury Road railhead;
- the impacts on the users of community facilities that are within close proximity of the Proposed Scheme, including at Reindeer Park Lodge and Dunton Stables; and
- disruption to local journeys and access to day to day facilities in the area, due to works to realign or divert roads, construct new overbridges or congestion and delays caused by the increased construction traffic generated by the Proposed Scheme.

5.1.3 Further details of the community assessments and write-ups of open space surveys and recreational public right of way (PRoW) surveys undertaken within the Curdworth to Middleton area are contained in Volume 5: Appendix CM-001-020.

5.1.4 Community assessment maps are provided in Volume 5: Maps CM-01-114 to CM-01, 116.

5.1.5 The current assessment draws on information gathered from a combination of desktop studies, site surveys and engagement with local organisations including Warwickshire County Council (WCC), Dunton Stables and Middleton Parish 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 (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.

5.2.2 Construction worker accommodation will be located at the A4097 Kingsbury Road overbridge main compound. Construction worker impacts on community resources are considered at a route wide level in Volume 5: Appendix CM-002-000. The assessment takes into account the number of workers, the type and location of accommodation, working hours, facilities provided on the construction compounds, experience from other large projects, such as HS1, and the measures contained in the Code of Construction Practice (CoCP). On this basis it is concluded that there will be no significant effects associated with construction worker accommodation.

5.2.3 The assessment of isolation effects focuses on where the construction of the Proposed Scheme will impact on routes used to access community facilities on a frequent and regular basis and from identifiable geographic catchments. On this basis, no isolation assessment has been carried out for tourism based facilities, including camp sites, hotels, visitor attractions and other recreational facilities within the Curdworth to Middleton area which have a wider than local catchment. The focus is instead on the residents of communities within the area and their access to facilities, including those in the adjoining Coleshill Junction area (CFA19), such as the Coleshill School, as well as to the Curdworth Primary School and the Kingsbury School. It also considers the effects on leisure facilities in the Bodymoor Heath and Middleton areas, which are dependent upon specific access routes which are crossed by the Proposed Scheme.

5.2.4 The construction and operation of the Proposed Scheme requires access rights over land at a number of locations within the Curdworth to Middleton area, both temporarily and permanently. Where these have been identified within the limits of land required for the Proposed Scheme, it is assumed that there would be no loss of land use from any residential property or community resource as a result.

5.2.5 The limits of land required temporarily include one residential property in the Lea Marston area, namely 1 Newlands Cottage, which is situated on the A446 Lichfield Road. In practice, it is envisaged that construction works will not need to encroach into the domestic curtilage of this property.

5.2.6 The Proposed Scheme requires modifications to overhead power lines in the vicinity of the A4097 Kingsbury Road. As a consequence, sections of the grid, including to the west of the A446 Lichfield Road will also require some modification. A corridor of land beneath some of the power lines together with a working area around a number of pylon towers have been identified as being required for these operations. Where these areas cross over residential properties, it is anticipated that there will be no requirement for the placement of plant or equipment directly within domestic curtilages.

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 route 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. This area includes land within the parishes of Curdworth, Wishaw, Lea Marston, Kingsbury and Middleton, with the focus being on community resources

situated along the A4097 Kingsbury Road and on the edges of Hunts Green and Middleton.

Curdworth

5.3.3 Curdworth village is situated in the southern part of the Curdworth to Middleton area, to the west of the M42. The village has a modest range of community facilities including a primary school, church, shop, meeting halls, pubs and a recreation ground. The village is approximately 1km to the west of the route of the Proposed Scheme and is beyond the study area for the assessment of amenity effects. However, the catchment area for the Curdworth Primary School extends beyond the village to include Lea Marston and Marston to the east, together with Hunts Green, Wishaw and Middleton to the north. Routes from these communities to Curdworth Primary School will be crossed by the Proposed Scheme and for this reason the potential isolation effects on the school are considered within the scope of this assessment. Curdworth itself falls within the catchment area for the Coleshill School (secondary), the main routes to which, including Marsh Lane and the A446 Lichfield Road, will be crossed by the Proposed Scheme. The village also falls within the catchment for general practitioner (GP) surgeries at Coleshill as well as Water Orton.

5.3.4 For the purposes of this section of the report, the Curdworth area is taken to include residential properties to the east of the M42, between the River Tame in the south and Faraday Avenue in the north, as well as the village itself which is situated to the west of the M42.

Lea Marston and Marston

5.3.5 The settlements of Lea Marston and Marston are both situated approximately 1km to the east of the centre line of the Proposed Scheme; Lea Marston is located to the south of the A4097 Kingsbury Road and Marston to the north.

5.3.6 The village of Lea Marston has a limited range of community facilities, including a church, football pitches, together with a recreation ground and play area which are located on the south side of the village. These facilities are approximately 1km from the main line for the Proposed Scheme but are close to where reception sidings are to be built along the Birmingham and Derby Line to the south, to allow for the queuing of trains destined for the Kingsbury Road railhead.

5.3.7 The village of Marston is just over 1km from the main line route for the Proposed Scheme, but lies close to the site for the Kingsbury Road railhead. The village centre has no notable community facilities.

5.3.8 There are several community resources on the western outskirts of Lea Marston and Marston that are situated partially within or close to the boundary of land required for the construction and operation of the Proposed Scheme. These are situated both to the north and south of the A4097 Kingsbury Road and to the east of the Proposed Scheme. On the south side of the A4097 Kingsbury Road, the study area includes the Lea Marston Hotel and Golf Course and the Reindeer Park Lodge guest house, caravanning and camp site. On the north side of the A4097 Kingsbury Road the study area includes Dunton Stables and the Marston Caravan and Camping Park.

5.3.9 Dunton Stables is situated off Marston Lane and occupies a narrow strip of land between the M42 and the Birmingham and Fazeley Canal. The stables provide horse-riding lessons and trekking holidays and make use of the local bridleway network and canal towpath for escorted hacks in the area, including to the Kingsbury Water Park. A small amount of land at the stables lies within the boundary of land required for the construction and operation of the Proposed Scheme.

5.3.10 There is also a scattering of residential properties situated either side of the A4097 Kingsbury Road which are included within the study area. These are accessed from a number of private driveways, between Dunton Hall and the junction with Blackgreaves Lane and some are located within the boundary of land required for the construction and operation of the Proposed Scheme.

5.3.11 To the north of the A4097 Kingsbury Road, there are a number of residential properties clustered around School Farm and Cocksparrow Farm, which lie within the area of land required for the construction of the Leeds spur and the site for the Kingsbury Road railhead.

5.3.12 The Birmingham and Fazeley Canal passes through the Lea Marston and Marston area just to the west of the M42. Its towpath is part of the West Midlands cycle network (national cycle route (NCR) no. 533) and it is also used by equestrians, including those from Dunton Stables. The canal and towpath will be crossed by the Proposed Scheme just north of the M42 in the vicinity of Marston Lane.

5.3.13 As both Lea Marston and Marston have only a limited range of community facilities, their residents are reliant upon neighbouring settlements for schooling, health care, shopping and access to community halls. As noted previously, Lea Marston and Marston are both situated within the catchment for the Curdworth Primary School and within the catchment for the Coleshill School (secondary school). The nearest GP surgeries are at Water Orton, Coleshill and Kingsbury. The Proposed Scheme crosses some of the routes used to access these facilities. For these reasons, the entire community of these two settlements is considered within the scope of the isolation assessments.

5.3.14 For the purposes of this report, the Lea Marston and Marston area is taken to include residential properties and community resources that are situated to the east of the A446 Lichfield Road and the Birmingham and Fazeley Canal, between Seeney Lane to the north and Faraday Avenue to the south.

Wishaw

5.3.15 The small hamlet of Wishaw lies to the north of Curdworth and to the west of the M6 Toll. The centre of the village is more than 1km from the route of the Proposed Scheme and is beyond the study area. Wishaw village has few community facilities and like Lea Marston and Marston, falls within the catchment area for the Curdworth Primary School and the Coleshill School (secondary school) as well as for GP surgeries at Water Orton and Coleshill. Routes between Wishaw and Coleshill will be crossed by the Proposed Scheme. For this reason the potential isolation effects which may be caused by construction of the Proposed Scheme are assessed along with the community of Curdworth.

5.3.16 The study area for the assessment includes some community resources in the countryside surrounding Wishaw, including The Belfry and Cuttle Mill Fishery. The Belfry golf club lies to the north of Wishaw and the M6 Toll and to the west of the A4091 Tamworth Road. It comprises a 324-bed hotel and spa, with associated leisure and conferencing facilities as well as the championship golf course and Professional Golfers Association (PGA) National Golf Academy.

5.3.17 Cuttle Mill Fishery is situated to the east of the A4091 Tamworth Road and to the west of the Proposed Scheme. The fishery has two fishing lakes and a total of 60 fishing pegs. The land required for the construction of the Proposed Scheme completely surrounds Cuttle Mill Fishery.

5.3.18 For the purposes of this report, residential properties and community resources accessed from the A4091 Tamworth Road, between its junction with Bodymoor Heath Lane to the north and the Birmingham and Fazeley Canal to the south, are taken as falling within the Wishaw area.

Bodymoor Heath

5.3.19 The small hamlet of Bodymoor Heath is situated on the banks of the Birmingham and Fazeley Canal, to the east of the Proposed Scheme. The hamlet includes a number of residential properties along with a pub, a village hall and a hotel with a public restaurant, wedding and conferencing facilities. These are all beyond the study area for the assessment of direct land and amenity effects. The entire hamlet of Bodymoor Heath is within the catchment area for the Kingsbury Primary School and the Kingsbury School (secondary), but as routes to these schools are not crossed by the Proposed Scheme, no isolation assessment has been carried out.

5.3.20 There is a cluster of recreational and tourism based facilities to the north of Bodymoor Heath, including the Kingsbury Water Park, the Broomey Croft Children's Farm, Kingsbury Water Park Camping and Caravanning Club and the RSPB Middleton Lakes Nature Reserve. All of these facilities and resources are beyond the study area for the assessment of amenity effects, although it is recognised that some visitors will depend on access via the A4091 Tamworth Road and Bodymoor Heath Lane, routes which are crossed by the Proposed Scheme. For this reason, these resources have been grouped together and assessed for potential isolation effects, which may arise during construction of the Proposed Scheme.

5.3.21 For the purposes of this report, properties and community resources accessed from Bodymoor Heath Lane, on both sides of the M42, together with properties at Dog Pound Lane to the south, are taken as representing the Bodymoor Heath area. The study area includes an isolated residential property to the west of the hamlet.

Hunts Green

5.3.22 Hunts Green is a small hamlet situated to the west of the A4091 Tamworth Road, between Bodymoor Heath and Middleton. The hamlet has no day-to-day services and facilities and most residential properties in the area lie beyond the study area. Pool House Farm Fishery, which is situated to the north-west of the junction of the A4091 Tamworth Road and Brick Kiln Lane, is the only community facility in the study area. It lies adjacent to the boundary of land required for the construction and operation of

the Proposed Scheme. The fishery opens to the public between March and October each year and has facilities for up to 22 anglers.

5.3.23 Hunts Green falls within the catchment area for Curdworth Primary School and the Kingsbury School (secondary school). Some of the routes likely to be used to access these schools will be crossed by the Proposed Scheme.

5.3.24 For the purposes of this report, residential properties and community resources located between Brick Kiln Lane and Park Lane to the west of the A4091 Tamworth Road are taken as representing the Hunts Green area.

Middleton

5.3.25 The village of Middleton lies to the north of Hunts Green and west of the Proposed Scheme. It has a modest range of community facilities, notably a church, a shop, a pub, a village hall and a day care nursery together with a recreation ground, known as Middleton Village Green. All of these facilities lie beyond the area of land required for the construction and are outside of the study area, with the exception of the day care nursery which is assessed for potential isolation effects.

5.3.26 A number of residential properties on the east side of the village have been included in the study area. These are situated in the vicinity of the Crowberry Lane/Church Lane junction where works are proposed to realign the junction between these two highways.

5.3.27 Middleton has no school or GP surgery; instead it lies within the catchment area for Curdworth Primary School and the Kingsbury School (secondary school) and for the GP surgery at Kingsbury. Some routes to these facilities will be crossed by the Proposed Scheme, including Church Lane, Crowberry Lane, Park Lane and the A4091 Tamworth Road. On this basis, the assessment considers the potential isolation effects on residents of the village, which may arise as a consequence of road works and increased construction traffic generated by the Proposed Scheme.

5.3.28 There are two recreational facilities located to the south of the village, namely Middleton Equestrian Centre and Ash End House Children's Farm. These are both some distance from the route of the Proposed Scheme, but as some of their customers are dependent upon access from the A4091 Tamworth Road, the assessment considers the potential implications for their operation during the construction period.

5.3.29 Middleton Hall Estate lies to the east of the village and the A4091 Tamworth Road. A small part of the Estate is adjacent to the boundary of land required for realignment works to the A4091 Tamworth Road. The hall is used for events, conferences and weddings and its grounds are open to the public periodically and a lake is used by a local angling club.

5.3.30 For the purposes of this report, residential properties and community resources located to the north of the junction between the A4091 Tamworth Road and Park Lane are taken as forming part of the Middleton area.

Future baseline

Construction (2017)

5.3.31 Volume 5: Appendix CT-004-000/1 and Appendix CT-004-000/2 provide details of the permitted developments which are assumed to have been implemented by 2017. Within the scope of the community assessment, limited change is anticipated to the baseline conditions along the Proposed Scheme in this study area before 2017.

5.3.32 There is an extant planning permission for an additional ten touring caravan spaces on the northern part of the site at Reindeer Lodge on the edge of Lea Marston, which falls partly within the boundary of land required for the construction and operation of the Proposed Scheme. Also on the edge of Marston, there is an extant permission for clay extraction at Marston Field Farm, which is situated to the north of the A4097 Kingsbury Road, adjoining the site for the Kingsbury Road railhead. The restoration proposals for the site include new fishing ponds and landscaping/open space. At Bodymoor Heath, there is an extant permission to expand visitor facilities at the RSPB Middleton Lakes Nature Reserve. This development will utilise the access from Bodymoor Heath Lane, which falls within the boundary of land required for the construction and operation of the Proposed Scheme.

Operation (2026)

5.3.33 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 have been incorporated into the Proposed Scheme as part of the design development process to avoid or reduce the environmental impacts during construction:

- designing the Proposed Scheme where it crosses Faraday Avenue in the south of the area so as to reduce disruption to the A446 Lichfield Road and the amount of land that would be required from properties in this area;
- siting the A4097 Kingsbury Road overbridge main compound away from the settlements of Curdworth and Middleton to reduce the potential disturbance on a large number of properties;
- siting the railhead facility close to the M42 and away from as many residential properties as possible;
- upgrading Seeney Lane to a byway open to all traffic (BOAT) and the construction of a bridge to carry Seeney Lane over temporary construction sidings at the Kingsbury Road railhead, to maintain access to properties and resources, both temporarily and permanently, including Dunton Stables;
- designing highway works or making provision for temporary off-line realignments during construction, to help reduce the amount of disruption to journeys in this area, including day to day access to community facilities;

- aligning the A4091 Tamworth Road to avoid encroachment into the Middleton Hall Estate;
- designing the junction of the A4091 Tamworth Road and Park Lane/Crowberry Lane to reduce temporary and permanent isolation effects on the community of Middleton; and
- provision of hoardings alongside the construction site boundary to reduce noise impacts on nearby residential properties, including at Faraday Avenue, in the A4097 Kingsbury Road area, at Bodymoor Heath Lane and near Middleton.

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

- appointment of community relations personnel (CoCP, Section 5);
- community helpline to handle enquires from the public (CoCP, Section 5);
- sensitive layout of construction sites to minimise nuisance (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 (CoCP, Section 5);
- specific measures in relation to air quality and noise to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (CoCP, Sections 7 and 13); and
- where practicable, the avoidance of large goods vehicles operating adjacent to schools during drop off and pick up periods (CoCP, Section 14).

Assessment of impacts and effects

5.4.3 Details of all assessments of community resources are included in Volume 5: Appendix CM-001-020. 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.

Curdworth

Temporary effects

Residential properties

5.4.4 The construction of the Proposed Scheme will generate significant additional traffic on the road network to the south-east of Curdworth. As explained in the traffic and transport assessment for the Coleshill Junction area (CFA19), major adverse congestion effects are predicted on the A446 Lichfield Road in the area to the north-west of Coleshill and minor congestion effects are also predicted at the junction between the A446 Lichfield Road and Marsh Lane (see Section 12 of this report). As Curdworth falls within the catchment area for the Coleshill School (secondary), along with GP surgeries in the town, this congestion will cause substantial delays to journeys made to access these facilities on a daily basis, resulting in an isolation effect on the

residents of the village. Given the lack of alternative routes for residents to avoid the congested areas, the construction of the Proposed Scheme is therefore assessed as giving rise to a moderate isolation effect on those residents dependent upon access to Coleshill, which is considered significant.

Community facilities

5.4.5 The Proposed Scheme crosses the catchment area for the Curdworth Primary School. Minor congestion effects are predicted to the north of Curdworth at the junction between the A446 Lichfield Road and the A4091 Tamworth Road, which will affect access to the school from Hunts Green and Middleton. Access from other parts of the catchment, including Lea Marston and Marston will not be affected. However, it is also understood that the school draws pupils from outside of its catchment and specifically from the Coleshill Junction area (CFA19), whose journeys will be affected by major congestion effects predicted on the A446 Lichfield Road on the north-west edge of Coleshill. Overall, as a majority of the catchment will not be significantly affected, the isolation effects on the school are assessed as minor and not significant.

Permanent effects

Residential properties

5.4.6 No significant permanent effects have been identified at Curdworth as a result of construction of the Proposed Scheme.

5.4.7 The construction of the Proposed Scheme will, however, cause a minor adverse effect in the Curdworth area, where works to realign Faraday Avenue will require the permanent loss of land from the curtilages of two residential properties, situated on the south side of the road, namely Orchard Cottage and Newlands Farm. The loss of land from two properties is not significant at the community level.

Lea Marston and Marston

Temporary effects

Residential properties

5.4.8 The settlements of Lea Marston and Marston are within the catchment area for the Curdworth Primary School and the Coleshill School (secondary). During the construction of the Proposed Scheme, substantial increases in congestion are predicted to occur on the A446 Lichfield Road at the north-west of Coleshill which will affect journeys to the secondary school (see Section 12 of both this report and the report for Coleshill Junction (CFA19) for further details).This will give rise to a minor isolation effect on the residents of Lea Marston and Marston, which is not significant.

5.4.9 One residential property, situated alongside the A4097 Kingsbury Road on the edge of Marston and Lea Marston, namely Elford, will be affected by a temporary loss of land from its curtilage during works to realign the highway. The loss of land from a single property is not significant at the community level.

Community facilities

5.4.10 Dunton Stables at Marston Lane is situated between the M42 and the Birmingham and Fazeley Canal and lies just to the north and east of the main line of the Proposed Scheme. The stables are a well-used resource which offer riding lessons to children,

adults and disabled riders of all ages on a daily basis and accompanied hacks to Kingsbury Water Park and Bodymoor Heath via local bridleway routes in the area. It also offers trekking holidays and has guest accommodation on the site. The construction of the Proposed Scheme will result in a significant temporary isolation effect on the stables.

5.4.11 During the works, the stables will be almost entirely surrounded by construction and engineering operations, including the Kingsbury Road railhead to the east, the viaduct over the Birmingham and Fazeley Canal to the south, the formation of railway embankments to the west and works to the Seeney Lane overbridge to the north. Temporary hoardings are also likely to be erected along the eastern and southern boundary of Dunton Stables which will increase the visual barrier effect caused by the works. In addition, the complete closure of Marston Lane to vehicles, pedestrians and riders during the construction period will add approximately 2.5km to journeys from the A4097 Kingsbury Road and will limit access to riding routes to the south. Riding routes to the north will also be affected by works at the bridge which carries Bridleway M23a over the M42 at Seeney Lane. Bridleway M23 which runs along Seeney Lane to connect with Marston to the east will also be affected by construction of the Kingsbury Road railhead, with a new bridge being required to carry Seeney Lane over both the Leeds spur dive-under and the additional railway sidings. The operation of the railhead will also impact on the ambience of this route, making use of this route less attractive for equestrians and sustaining the isolation effect on the stables throughout the nine year period of the railhead construction and operation.

5.4.12 Taking all of these factors into account, the construction of the Proposed Scheme is therefore assessed as giving rise to a major adverse temporary isolation effect on the stables, affecting access both from its users typically on a weekly basis and to the bridleway infrastructure upon which it depends for hacking and trekking. This effect is therefore considered to be significant and is likely to continue for approximately three years. In addition, works to permanently divert access to the stables via the trackway from Seeney Lane to the north will require some slight permanent encroachment into the boundary of the stables. This is likely to have a negligible effect on the overall function and use of the resource and is not reported separately.

5.4.13 The Reindeer Park Lodge guest house, caravanning and camp site which is situated on the south side of the A4097 Kingsbury Road will be affected by a loss of land, both permanently and temporarily. During the construction period, a small area of land will be required temporarily from the north-east corner of the site to provide sufficient working space whilst a new access road is being built to connect the camp site with the realigned A4097 Kingsbury Road. Although access will be maintained, the area affected has an extant planning permission for additional caravan bays, the loss of which will partially compromise the functionality of the resource. Whilst this is a regularly used resource, given the availability of other camp sites in the area, the temporary loss of land is assessed as a minor adverse effect, which is not significant.

Open space and recreational PRoW

5.4.14 Works to realign the A4097 Kingsbury Road will encroach into the boundary of the Marston Lakes Golf Course at the Lea Marston Hotel. This will require a slight temporary loss of land from the boundary of the course to the west of Blackgreaves

Lane. This loss of land will mostly affect the hedgerow and trees along the boundary with the A4097 Kingsbury Road but will also encroach on to the edge of the 6th fairway and tee area, which will impair play at this particular hole. As the land is likely to be required only for a short period of time within the overall one year, four months construction programme for the A4097 Kingsbury Road overbridge and given that the rest of the course is unaffected, this temporary loss of land is assessed as a minor adverse effect, which is not significant. The Proposed Scheme makes provision to reinstate the boundary vegetation and there will be no permanent loss of land from the site.

5.4.15 Construction of the reception sidings alongside the existing Birmingham and Derby Line to the south of Lea Marston will not result in any loss of land from the playing fields and play area at Church Lane.

5.4.16 The Proposed Scheme crosses over the Birmingham and Fazeley Canal and its associated towpath to the south of Dunton Stables. As it is anticipated that the canal and towpath will be maintained during construction, the effects on the function of these recreational routes will be negligible. It is however recognised that users of these recreational routes will be subject to noise impacts and visual effects given that the boundary of land required for the construction of the Proposed Scheme runs adjacent to the canal for approximately 1km in this area. Given the transitory nature of the leisure routes, the impacts of construction noise are not assessed as giving rise to a significant adverse effect on the canal and towpath users. On this basis no significant amenity effects on users have been identified within the scope of this assessment.

Permanent effects

Residential properties

5.4.17 Construction of the Proposed Scheme will require the demolition of eight residential properties on the edge of Lea Marston and Marston, which are situated along or just off the A4097 Kingsbury Road. The loss of eight dwellings is assessed as a moderate adverse effect, which is significant. The properties that are affected are:

- the dwelling at Mullensgrove Farm together with three dwellings on the south side of the A4097 Kingsbury Road which were formerly part of the Waterpark Lodge Bed and Breakfast-The Chestnuts, Bella Vista and Wedgwood; and
- Parklands Stud, Barn Covert, Cocksparrow Farm and Cocksparrow Farm Cottage which are all situated along a private road accessed from the north side of the A4097 Kingsbury Road.

5.4.18 The construction of the Proposed Scheme will require the permanent loss of land from the residential curtilage of Lock Cottage at Marston Lane on the west side of the M42. The loss of land from a single residential curtilage is not significant at the community level.

Community facilities

5.4.19 As noted above, the construction of the Proposed Scheme will require the permanent loss of land from the Reindeer Park Lodge guest house, caravanning and camping site.

As the land affected does not include any of the caravan bays, the effects of this loss of this land on users will be negligible.

5.4.20 As noted above, the Proposed Scheme will require the permanent closure of Marston Lane to vehicular traffic, which will result in an isolation effect on Dunton Stables. Whilst access will entail a diversion of approximately 2.5km, as many users will typically visit on a weekly basis, or less frequent, the isolation effects on users are assessed as minor and not significant.

Wishaw

Temporary effects

Residential properties

5.4.21 Wishaw falls within the catchment for the Coleshill School at Coleshill. Given the major adverse congestion effects predicted on sections of the A446 Lichfield Road to the north-west of Coleshill and the minor adverse effects at the A446 junctions with Marsh Lane and Faraday Avenue, daily journeys to school from Wishaw will be affected during the construction of the Proposed Scheme. This has been assessed as giving rise to a moderate adverse isolation effect on the residents of Wishaw, particularly for those with children of secondary school age, which is considered to be significant. Journeys from Wishaw to the Curdworth Primary School are unlikely to be affected.

5.4.22 One residential property in this area will be affected temporarily by a requirement to undertake some utility works within its curtilage. The property, namely Maple Leaf Farm, is situated on the west side of the A4091 Tamworth Road, just south of Bodymoor Heath Lane. The temporary encroachment into the garden area is not significant at the community level.

Community facilities

5.4.23 The Cuttle Mill Fishery, which is situated to the east of the A4091 Tamworth Road, will be entirely surrounded by the Proposed Scheme. A very small piece of land could be required at its south-west corner; however, this will not affect the function of the resource. Access to the site will be maintained and the effects on the Fishery will therefore be negligible.

Open space

5.4.24 Construction of the Proposed Scheme will necessitate access to the electricity pylon towers situated within the grounds of The Belfry golf course. Access to the pylons will be obtained via the existing tracks on the course and will not require any encroachment on to the fairways or playing areas. Whilst the limit of land required for works to the pylon immediately to the west of the A4091 appears to encroach slightly into the competition tee area for the 17th hole on the Belfry's PGA course, in practice works to apply earthing equipment on to this tower are unlikely to require the placement of any plant or machinery in this area. On this basis and given that the works are likely to be completed in a matter of days, any inconvenience caused will be negligible.

Permanent effects

5.4.25 No significant permanent effects on community resources in the Wishaw area have been identified.

Bodymoor Heath

Temporary effects

Residential properties

5.4.26 No significant temporary effects on the residents of Bodymoor Heath are likely to arise during construction of the Proposed Scheme.

Community facilities

5.4.27 There is a cluster of tourist and visitor attractions located along Bodymoor Heath Lane, the most notable of which are the Kingsbury Water Park and the RSPB Nature Reserve. These attract large numbers of visitors each year, which are drawn from a wide catchment extending across much of North Warwickshire and the wider sub-region. As no road closures are anticipated in this area and given that works to realign Bodymoor Heath Lane will be phased in such a way as to maintain access to the RSPB Middleton Lakes Nature Reserve, the isolation effects on these resources will be negligible.

Permanent effects

5.4.28 No significant permanent effects have been identified in Bodymoor Heath as a result of the construction of the Proposed Scheme.

5.4.29 Primrose Cottage, which is situated on the south side of Bodymoor Heath Lane to the east of the Proposed Scheme, will be affected by a slight permanent loss of land from the residential curtilage. The loss of land from a single dwelling is not significant at a community level.

Hunts Green

Temporary effects

Residential properties

5.4.30 Hunts Green falls within the catchment area for the Curdworth Primary School and the Kingsbury School (secondary). As no road closures are envisaged in this area and no significant congestion or delays have been predicted which cannot be avoided by taking alternative routes (see Section 12), the potential isolation effects on the community of Hunts Green during construction will be negligible.

Permanent effects

5.4.31 No permanent effects have been identified in Hunts Green as a result of the construction of the Proposed Scheme. No land will be required from the Pool House Farm Fishery which is situated adjacent to the Proposed Scheme on the west side of the A4091 Tamworth Road.

Middleton

Temporary effects

Residential properties

5.4.32 Works to realign Church Lane will give rise to a combination of significant noise and visual effects on the residents of five properties situated on the eastern edge of the village in the vicinity of the junction of Crowberry Lane and Church Lane. As the combination of effects is anticipated to last for a period of only two months, the impacts are assessed as giving rise to a moderate adverse effect on the amenity to residents which is considered significant.

5.4.33 The properties that will be affected are:

- Horse Shoes, which is situated on the west side of Crowberry Lane; and
- Ashley, Woodard, Priors Revel and The Spinney, at Church Lane.

5.4.34 One of these properties, namely the property called Horse Shoes at Crowberry Lane, will also be affected by a slight loss of land during the construction works to tie in Crowberry Lane to the realigned Church Lane to the north. The temporary loss of land from a single property is not significant at a community level.

5.4.35 Middleton falls within the catchment area for the Curdworth Primary School and the Kingsbury School (secondary). Significant congestion is not predicted to occur on the routes to Kingsbury during the construction period, and the minor congestion likely to occur at the junction of the A446 Lichfield Road and the A4091 Tamworth Road will have a negligible effect on access to the Primary School at Curdworth.

Community facilities

5.4.36 Community and recreational facilities in the Middleton area, including the Little Acorns Day Nursery, the Ash End House Children's Farm and Middleton Equestrian Centre depend upon access from the A4091 Tamworth Road. As no significant disruption or congestion is anticipated in this area, except for minor congestion at the junction of the A446 Lichfield Road and the A4091 Tamworth Road, the isolation effects on these facilities during the construction works will be negligible.

Permanent effects

5.4.37 No significant permanent effects have been identified in Middleton as a result of the construction of the Proposed Scheme.

5.4.38 Two residential properties at Middleton will lose small amounts of garden land permanently due to works to realign Church Lane. This is assessed as a minor adverse effect, which is not significant at a community level.

5.4.39 The properties that will be affected are:

- Highfields Farm which is situated on the north side of Church Lane; and
- The Spinney which is situated on the south side of Church Lane.

5.4.40 The Proposed Scheme will not require any land from the Middleton Hall Estate.

Cumulative effects

5.4.41 No cumulative or community wide effects due to the construction of the Proposed Scheme have been identified in the Curdworth to Middleton area.

Other mitigation measures

5.4.42 The assessment has concluded that the construction of the Proposed Scheme will give rise to a small number of significant adverse effects on community resources in the Curdworth to Middleton area. These are mostly temporary in nature or no further mitigation is proposed.

Summary of likely residual significant effects

5.4.43 The assessment has identified that construction of the Proposed Scheme in the Curdworth to Middleton area is likely to give rise to a small number of residual significant effects. These are identified in Volume 5: CFA20 Map Book, Maps CM-01-114 to CM-01-116.

5.4.44 The Proposed Scheme will require the demolition of eight residential properties in the A4097 Kingsbury Road area, on the edge of Lea Marston and Marston, giving rise to a moderate adverse and permanent effect on the community in this area.

5.4.45 The residents of five properties on the east side of Middleton will also experience a combination of significant noise and visual effects for a short period time during works to realign Church Lane and its junction with Crowberry Lane, giving rise to a moderate adverse amenity effect.

5.4.46 The additional construction traffic generated by the Proposed Scheme will result in significant congestion effects on the road network to the north of Coleshill and minor congestion effects to the south-east of Curdworth. The consequential delays to journeys made on a daily basis to access secondary schooling and other community facilities at Coleshill will give rise to moderate adverse isolation effect on residents of Curdworth and Wishaw.

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 minimise environmental impacts during operation:

- the incorporation of landscaped earthworks within the Proposed Scheme design to provide visual screening and noise attenuation for the occupiers of properties on either side of the railway in a number of locations, including near to the A4097 Kingsbury Road, near to the Cuttle Mill Fishery at Wishaw and in the vicinity of Hunts Green and Middleton;
- the provision of landscaping and planting alongside the route of the Proposed Scheme to screen views from nearby properties and community facilities, including to the south of Lea Marston along the Birmingham and Derby Line, at Cuttle Mill Fishery and along the Church Lane embankment to the east of Middleton Village;

- the provision of landscaping alongside realigned highways, to screen views of the roadways from nearby properties, including at Bodymoor Heath Lane, the A4091 Tamworth Road and Church Lane at Middleton; and
- the provision of noise fence barriers and/or low level barriers on underbridges and viaducts, as shown in Volume 2: Map Book – Sound noise and vibration Map series SV-05, including specifically on the Langley Brook viaduct to the east of Middleton.

Assessment of impacts and effects

5.5.2 No significant effects have been identified in the Curdworth to Middleton area as a result of the operation of the Proposed Scheme.

Cumulative effects

5.5.3 No cumulative effects have been identified within the Curdworth to Middleton area during operation.

Other mitigation measures

5.5.4 Further mitigation is not required as the assessment has not identified any significant effects on community resources during the operation of the Proposed Scheme.

Residual significant effects

5.5.5 No residual significant effects on community resources in the Curdworth to Middleton area have been identified due to 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: CFA20 Map Book. Maps showing the location of all designated and non-designated heritage assets can be found in Volume 5: Map Book – Cultural heritage, Maps CH-01 through CH-03. 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-001-020 – Baseline report;
- Appendix CH-002-020 – Gazetteer of heritage assets;
- Appendix CH-003-020 – Impact assessment table; and
- Appendix CH-004-020 – Survey reports.

6.1.4 Throughout this section, assets within the study areas are identified with a unique reference code, e.g., CWM001. Further detail on these assets can be found in the gazetteer in Volume 5: Appendix CH-002-020.

6.1.5 Engagement has been undertaken with the Warwickshire County Council (WCC) 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 from the centre line of the Proposed Scheme 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. For the purposes of this assessment, any assets within the 10mm settlement contour are included within the assessment.

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[17] data examined did not encompass the full extent of the study area; and
- all areas of survey as identified in the archaeological risk model[18] were not 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-001-020.

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 (Volume 5: Appendix CH-004-020); and
- a programme of non-intrusive surveys including geophysical surveys (Volume 5: Appendix CH-004-020).

Designated assets

6.3.3 The following designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction of the Proposed Scheme (Volume 5: Map Book – Cultural Heritage, Maps CH-01-114b to CH-01-116):

- ancient woodland at North Wood (CWM024) lies partially within the land required to construct the Proposed Scheme; and
- ancient woodland at Sych Wood (CWM008) lies partially within the land required to construct the Proposed Scheme.

[17] Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.
[18] 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.

6.3.4 The following designated heritage assets are located within the 2km study area (Volume 5: Map Book – Cultural heritage, Maps CH-02-109 and CH-02-110):

- two scheduled monuments: a medieval moat at North Wood (CWM027) and a medieval stone cross south of St. John the Baptist Church (CWM103);
- thirty-four listed buildings (Volume 5: Appendix CH-002-020 and Volume 5: Map Book – Cultural Heritage, Maps CH-01 and CH-02) including:
  - five Grade II* listed buildings at: Church of St. Nicholas and St. Peter, Curdworth (CWM057); Church of St. Chad, Wishaw (CWM072); Church of St. John the Baptist, Middleton (CWM103); and two Grade II* listed buildings at Middleton Hall (CWM100); and
  - twenty-nine Grade II listed buildings. These are largely focused within settlements at Curdworth (CWM056), Lea Marston (CWM058) and Middleton (CWM048). Within a more dispersed settlement pattern are further Grade II listed buildings including those at Dunton Hall, Barn and Pigeonhouse (CWM059) and Blackgreaves Farmhouse (CWM063). In addition a number of Grade II listed bridges and other structures are present along the Birmingham and Fazeley Canal (CWM 067; CWM081; CWM096); and
- seven areas of ancient woodland: Dunton Wood (CWM015); Sych Wood (CWM008); North Wood (CWM024); Coneybury Wood (CWM039); Rogers Coppice (CWM040); Aldermore Spinney (CWM110); and Trickley Coppice (CWM112).

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:

- the post medieval Birmingham and Fazeley Canal (CWM070) and associated locks;
- a possible rectilinear enclosure of unknown date (CWM001) west of Newlands Farm, Curdworth;
- a prehistoric ring ditch and linear features (CWM006) north-west of Newlands Farm, Curdworth;
- possible deserted medieval settlement (CWM014), north-east of Curdworth;
- linear cropmark of unknown date 500m south-east of Middleton House Farm (CWM026);
- linear features (CWM107) west of the scheduled North Wood medieval moated site that probably relate to that site; and
- one length of important hedgerow (partial) at Cuttle Mill (CWM022) of post medieval date.

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:

- two buildings at Middleton House Farm of post medieval date (CWM083) and a post medieval farm complex at Mullensgrove Farm (CWM061);
- Birch Wood ridge and furrow of medieval or post medieval date (CWM002);
- charcoal-burning site of medieval or post medieval date (CWM013);
- possible deserted medieval settlement at Curdworth of medieval date (CWM014);
- undated curvilinear and linear earthworks north of Lea Marston golf course (CWM019);
- ridge and furrow at Cocksparrow House of medieval or post medieval date (CWM020);
- ridge and furrow within North Wood of medieval date (CWM025); and
- Dunton Hall Garden (CWM060), a non-designated historic park and garden of post medieval date.

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-002-020 and identified in Volume 5: Map Book – Cultural heritage, Maps CH-01-114b to CH-01-116. There are a number of built heritage assets, the settings of which have been considered, including:

- Newlands Farm (CWM052);
- Cuttle Mill (CWM077);
- Dunton Hall Garden (CWM060);
- Lea Marston Old School (CWM064);
- a section of the Birmingham and Fazeley Canal (CWM070); and
- Primrose Cottage (CWM084).

Cultural heritage overview

6.3.8 The underlying bedrock geology of the study area is mudstone. The superficial geology is characterised by alluvial and river terrace deposits associated with the River Tame, which extends through the southern and eastern parts of the area. Further deposits of sands, silts and clays are present in the vicinity of Curdworth. The topography of the study area is characterised by the lowland river valley of the River Tame at an elevation up to 70m above Ordnance Datum (AOD), with a small area of higher ground, at 103m AOD to the north-east of Curdworth.

6.3.9 There is limited evidence for occupation in the landscape from earlier prehistory. A Lower Palaeolithic hand axe has been recorded near Middleton. Mesolithic flintwork has been recorded at Middleton, with more substantial flint assemblages recorded

beyond the study area to the west. There is potential for further evidence for this period, particularly on higher ground above watercourses.

6.3.10 There is very little evidence for activity in the Neolithic and Bronze Age and no known funerary or ceremonial monuments. A possible cropmark enclosure has been recorded, but is undated (CW001). There are, however, examples of Late Neolithic and early Bronze Age monuments in the wider region in association with the River Tame. There may be potential for the presence of Bronze Age burnt mounds in the vicinity of small watercourses, with a possible example at Middleton Hall, which has been removed by historic quarrying.

6.3.11 Possible late Bronze Age or Iron Age field systems have been recorded at Middleton Park (CWM044). Iron Age enclosures and settlement have been excavated beyond the study area on the line of the M6 Toll. An Iron Age torc at Middleton may have been an isolated deposit, but indicates activity of this period in the area.

6.3.12 The Roman fort and settlement at Wall and the Roman road Watling Street are located approximately 5-10km north of the study area. Isolated finds of Roman metalwork have been recorded in the study area. Roman pottery has also been recorded at Curdworth and Middleton. There may be some potential, therefore, for Romano-British settlement beyond the Roman road network.

6.3.13 There is very little evidence for early medieval settlement, in common with the broader region. Curdworth, Middleton and Wishaw all have names with Saxon elements and all were settlements in existence by the time of the Domesday survey in 1086.

6.3.14 Medieval churches are present at Curdworth, Lea Marston, Wishaw and Middleton. Ridge and furrow earthworks may indicate medieval or earlier post-medieval settlement at Lea Marston (CWM009), Bodymoor Heath (CWM031) and Hunts Green (CWM038). A possible deserted medieval village has also been identified to the east of Curdworth (CWM014).

6.3.15 Moated sites are likely to represent high status medieval farmsteads or manors and include the scheduled double island moat at North Wood (CWM027). Others have been recorded at Curdworth Hall Farm (CWM007), Drakenage Farm (CWM121), the former Moxhull Hall (now The Belfry; CWM123) and Middleton Hall (CWM046), with a possible moated site at Blackgreaves Farm (CWM016). Fish ponds in North Wood (CWM023) may be associated with the moated site to the north. Medieval deer parks were associated with the halls at Middleton and Moxhull. Medieval buildings and building phases survive at Middleton Hall, 500m east of the Proposed Scheme (CWM100). A medieval walled enclosure castle is located 2km to the east of the Proposed Scheme at Kingsbury.

6.3.16 Areas of ancient woodland have been identified in the vicinity of Middleton Hall (CWM039), to the west at Rogers Coppice (CWM040), Aldermore Spinney (CWM110), New Park Wood (CWM111) and Trickley Coppice (CWM112) and further south at North Wood (CWM024) and Dunton Wood (CWM015).

6.3.17 Historic buildings are located within the villages of Curdworth, Middleton and Lea Marston, and at a number of smaller settlements such as Marston and Hunts Green.

A number of individual historic farmsteads are also present, including Dunton Hall, Mullensgrove Farm and Middleton House Farm. The earlier buildings date from the 17th century and include farmhouses, cottages and barns. The majority, however, belong to the 18th and 19th century and include farm houses and associated buildings, school buildings, cottages and canal structures.

6.3.18 The post medieval period in the study area is represented by the enclosure of land through piecemeal processes and formal enclosure acts from the 18th century. One length of important hedgerow has been identified within the extent of the Proposed Scheme at Cuttle Mill (CWM022). Designed landscapes have been identified around Middleton Hall (CWM099) and the former Moxhull Hall (CWM122).

6.3.19 Small-scale industry is represented by the presence of a watermill, forges and smithies, brickworks, limekilns and an iron works. Large-scale industry did not develop in this area until the 20th century, when industry developed in the south of the study area, in close association with the River Tame. The area was connected to industrialized Birmingham to the west via the Birmingham and Fazeley Canal (CWM070), which is associated with locks, bridges and associated buildings including public houses, many of which are designated structures (e.g. CWM081).

Future baseline

Construction (2017)

6.3.20 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)

6.3.21 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 Code of Construction Practice (CoCP) sets out the provisions that will be adopted to control effects on cultural heritage assets. The provisions include the following (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:

- the alignment avoids encroaching on North Wood scheduled monument;
- the alignment avoids the principal listed buildings at Dunton Hall and a retaining wall has been provided (CWM059);
- earthwork design near the village of Middleton (CWM048) reduces impact on setting of its historic core; and
- in common with other CFAs, general landscape earthworks and planting reduces impacts on the setting of designated assets within the study area. Examples in the Curdworth to Middleton area include planting around the designated moat at North Wood (CWM027); the non-designated buildings at Cuttle Mill (CWM077), east of Hunts Green and Hunts Green Farm (CWM 097; CWM098); and at the western edge of Middleton Park (CWM099).

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 Significant effects will occur as a result of temporary impacts on the setting of designated or non-designated heritage assets as described in the subsequent paragraphs.

6.4.5 During construction the current rural setting of the ancient woodland at North Wood (CWM024), an asset of high value, will be disrupted by construction activities associated with the construction of embankments and the removal of areas of the woodland for the Proposed Scheme. Construction will be undertaken over a period of approximately 4 years and 3 months. This will result in a temporary medium adverse impact and major adverse effect.

6.4.6 During construction the rural setting of the medieval/post medieval moat at North Wood (CWM027), an asset of high value, will be disrupted by construction activity for an embankment and viaduct immediately to the west. Construction will be undertaken over a period of approximately 4 years and 3 months. This will constitute a high adverse impact and a major adverse effect.

6.4.7 During construction the setting of Newlands Farm (CWM052), an asset of low value, will be comprehensively altered by activity relating to the construction of embankments approximately 80m to the west as well as the Curdworth viaduct (north) construction compound and A446 Faraday Avenue construction compound to the west and south. Construction will be undertaken over a period of approximately 4 years. Whilst the setting of the asset is currently characterised, to a large degree, by major modern infrastructure and development, the construction works will essentially

surround the asset resulting in a temporary high adverse impact and moderate adverse effect.

6.4.8 During construction the rural setting of the 18th century Dunton Hall, Barn and Pigeonhouse (CWM059), an asset of moderate value, will be disrupted by the construction of a cutting approximately 80m to the east of the hall and immediately adjacent to a group of listed and curtilage listed barns. This will involve the operation of construction plant with potential associated noise for approximately four and a half years. Works associated with the re-alignment of the A4097 Kingsbury Road and the A4097 Kingsbury Road overbridge compound to the north, will also disrupt the rural setting of the assets. A temporary access road using the existing drive to the hall will sever the hall from its associated barns and surrounding landscape. This will result in a high adverse impact and a major adverse effect.

6.4.9 During construction the setting of the post medieval Dunton Hall Garden (CWM060), an asset of low value, will be disrupted by construction activity of a large cutting approximately 100m to the east, the re-alignment of the A4097 Kingsbury Road approximately 50m to the north, along with activity associated with the A4097 Kingsbury Road overbridge compound to the north. A temporary access road using the existing drive to the hall and connecting with the A4097 Kingsbury Road overbridge compound will also degrade the setting of the asset. This will involve the operation of construction plant with potential associated noise for approximately four and a half years. This will result in a high adverse impact and a moderate adverse effect.

6.4.10 During construction the rural setting of the post medieval Cuttle Mill (CWM077) an asset of low value, will be disrupted by construction activity for embankments and a viaduct approximately 30m to the east of the buildings and by the presence of the Cuttle Mill underbridge compound. Construction will be undertaken over a period of approximately 4 years and 3 months. This will result in a high adverse impact and moderate adverse effect.

6.4.11 The rural setting of Middleton House Farm (CWM083), an asset of low value, will be comprehensively altered during construction. Key activities will include the demolition of associated modern farm buildings, the operation of the Primrose culvert satellite compound and the construction of an embankment approximately 10m to the east. Construction works for the embankment will be undertaken over a period of approximately 4.5 years. This will result in a temporary high adverse impact and moderate adverse effect.

6.4.12 The setting of the medieval to post medieval Middleton Hall historic building complex (CWM100), an asset of high value, will be slightly affected by the construction of a cutting and embankments which will extend through associated parkland (CWM099) to the west. Construction works for the cutting will span approximately one and a half years and for the embankments, three months. This will constitute a low adverse impact and moderate adverse effect.

Temporary cumulative effects

6.4.13 There are not any cumulative effects from temporary impacts on heritage assets within the study area.

Permanent effects

6.4.14 Significant effects will occur as a result of physical impacts on heritage assets within the land required for the construction of the Proposed Scheme, as described in the subsequent paragraphs.

6.4.15 Archaeological remains associated with the cropmarks of a probable prehistoric enclosure (CWM001), an asset of moderate value, will be removed during the construction of the main line. This will constitute a high adverse impact and major adverse effect.

6.4.16 Birch Wood ridge and furrow (CWM002), an asset of low value, will be removed during construction of a cutting for reception sidings associated with the Kingsbury Road railhead. This will constitute a high adverse impact and a moderate adverse effect.

6.4.17 Ancient woodland at Sych Wood (CWM008), an asset of high value, will be partially removed by the construction of the Kingsbury Road railhead; this will constitute a low adverse impact and moderate adverse effect.

6.4.18 Part of an important hedgerow at Cuttle Mill (CWM022), an asset of moderate value will be removed to enable construction of the main line. This will constitute a medium adverse impact and moderate adverse effect.

6.4.19 Part of the North Wood ancient woodland (CWM024), an asset of high value, will be removed to enable construction of the Proposed Scheme and associated engineering embankments. These works will divide it from its historic landscape including a scheduled moated site to the north. This will permanently adversely affect the rural setting of the remaining woodland and will constitute a high adverse impact and a major adverse effect.

6.4.20 Parts of the Middleton House Farm complex (CWM083), an asset of low value, will be demolished to enable construction of the Proposed Scheme and supporting embankments. The removal of these associated buildings and the construction of the embankments will substantially alter the setting of the remaining historic elements of the complex. This will constitute a high adverse impact and moderate adverse effect.

6.4.21 Archaeological remains associated with the cropmarks of a probable prehistoric ring ditch and linear features (CWM006), an asset of moderate value, will be removed due to the construction of a balancing pond and access road. This will constitute a high adverse impact and major adverse effect.

6.4.22 Mullensgrove Farm and ancillary buildings (CWM061), an asset of low value, will be demolished to enable construction of a large cutting for the route of the Leeds spur. This will constitute a high adverse impact and moderate adverse effect.

6.4.23 The remains of charcoal burning platforms east of Dunton Hall (CWM013), an asset of low value, will be largely removed by the construction of extensive cuttings for the Proposed Scheme. This will constitute a high adverse impact and moderate adverse effect.

6.4.24 Ridge and furrow earthworks (CWM025) located within the woodland (CWM024) south of the scheduled moat at North Wood (CWM027) are an asset of low value and will be removed to enable construction of the Proposed Scheme and associated

engineering embankments. This will constitute a high adverse impact and moderate adverse effect.

6.4.25 Archaeological remains associated with the cropmarks of double linear ditches of possible medieval/post medieval date (CWM107) extending west from the scheduled moated site (CWM027), an asset of moderate value, will be removed during construction of the main line. This will constitute a high adverse impact and major adverse effect.

6.4.26 Archaeological remains of a possible deserted medieval settlement (CWM014), an asset of moderate value, will be partially removed by the construction of cuttings and embankment for the Proposed Scheme and the A4097 Kingsbury Road overbridge compound. This will constitute a high adverse impact and major adverse effect.

6.4.27 Archaeological remains associated with curvilinear and linear earthworks in woodland of post medieval date (CWM019), an asset of low value, will be removed during the construction of the cutting for the Leeds spur. This will constitute a high adverse impact and moderate adverse effect;

6.4.28 Ridge and furrow earthworks north of Cocksparrow Farm (CWM020), an asset of low value, will be removed by the cutting for the Leeds spur. This will constitute a high adverse impact and moderate adverse effect.

6.4.29 Archaeological remains in the form of a linear cropmark 500m south-east of Middleton House Farm (CWM026), an asset of moderate value, will be removed by the construction of the Proposed Scheme and associated embankments. This will constitute a high adverse impact and major adverse effect.

6.4.30 Significant effects will occur as a result of permanent impacts on the setting of heritage assets, as described in the subsequent paragraphs.

6.4.31 The Grade II listed Dunton Hall, Barn and Pigeonhouse (CWM059), assets of moderate value, will be located to the west of a large cutting, with barns immediately adjacent to the main line. The hall has views to the east across open agricultural land from all floors of the property. The construction of a large cutting will permanently adversely affect the setting of the asset and will result in the severance of the buildings from the surrounding historic landscape. This will constitute a high adverse impact and major adverse effect.

6.4.32 Dunton Hall Garden (CWM060), an asset of low value, will be located within 100m of a major cutting to the east which will alter the rural setting of the asset. This will constitute a high adverse impact and moderate adverse effect.

6.4.33 The scheduled moat at North Wood (CWM027), an asset of high value, will be immediately adjacent to embankments. This will result in the severance of the moat from its associated historic landscape. This will constitute a high adverse impact and major adverse effect.

6.4.34 Newlands Farm (CWM052), an asset of low value, will have embankments to the west and south-west which will sever the asset from its historic landscape. This will constitute a high adverse impact and moderate adverse effect.

6.4.35 Cuttle Mill (CWM077), an asset of low value, will be adjacent to embankments up to 10m above the existing ground level. The presence of embankments will be a noticeable change to the setting of the building complex. This will permanently adversely affect the setting of the asset and will result in the severance of the complex from the surrounding historic landscape. This will constitute a high adverse impact and moderate adverse effect.

6.4.36 Fishponds within North Wood (CWM023), an asset of moderate value, will be located adjacent to the Proposed Scheme to the east which will sever relationships between the fishponds and the moated site. The change will result in a medium adverse impact and moderate adverse effect.

6.4.37 Middleton Hall historic building complex of medieval to post medieval date (CWM100), an asset of high value, will have designed views disrupted by the construction of the Proposed Scheme partially extending through associated parkland to the west. This will alter the integrity of the surrounding parkland (CWM099) from which the asset draws part of its significance. This will constitute a low adverse impact and a moderate adverse effect.

Permanent cumulative effects

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

Other mitigation measures

6.4.39 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.

6.4.40 In this respect, the following areas have been currently identified:

- design of bridges and embankments over the Birmingham and Fazeley Canal (CWM070) to respond to the setting of the canal;
- design of landscape mitigation around Dunton Hall (CWM059) to reduce the visual impact of the cutting to the west;
- design of landscape mitigation earthworks around North Wood (CWM024) to reduce ground disturbance and potential impacts on archaeological remains; and
- design of landscape mitigation earthworks to the east of the undesignated and Grade II listed buildings at Middleton (CWM048) and the Grade II* listed Church of St. John the Baptist and scheduled cross (CWM103), to reduce ground disturbance and potential impacts on archaeological remains.

Summary of likely residual significant effects

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

6.4.42 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.

6.4.43 A number of archaeological assets will be permanently lost due to the construction of the Proposed Scheme. These include cropmarks of a probable prehistoric enclosure and a probable prehistoric ring ditch; areas of ridge and furrow at North Wood and north of Cocksparrow Farm; archaeological remains associated with linear ditches west of a scheduled moat; curvilinear and linear earthworks; and linear cropmarks. Assets that will be partially removed due to the construction of the Proposed Scheme include ridge and furrow at Birch Wood, medieval to post-medieval charcoal burning platforms, a possible deserted medieval settlement and parts of Dunton Hall Garden. A programme of archaeological works will be prepared to investigate, analyse, report and archive these assets.

6.4.44 The Proposed Scheme will result in the demolition of built heritage assets at the non-designated Mullensgrove Farm and ancillary buildings and parts of the Middleton House Farm complex. A programme of built heritage works will be prepared to investigate, analyse, report and archive these assets.

6.4.45 The Proposed Scheme will sever elements of the historic landscape, for example hedgerows and ancient woodland. Part of important hedgerows at the Parish boundary north of Middleton, part of the ancient woodland at North Wood and a minimal part of the ancient woodland at Sych Wood will be permanently removed. In addition, elements of the Proposed Scheme such as cuttings and embankments will affect the setting of historic settlements, buildings and monuments such as the moat at North Wood (a scheduled monument), the Grade II listed buildings at Dunton Hall, Barn and Pigeonhouse, the Grade II* listed buildings at Middleton Hall historic building complex and several non-designated buildings and groups of buildings. Further consideration will be given to the historic vegetation and landscapes as part of the detailed 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 design of the Proposed Scheme 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 in the Curdworth to Middleton area include planting around

the designated moat at North Wood (CWM027); the non-designated buildings at Cuttle Mill (CWM077), east of Hunts Green and Hunts Green Farm (CWM 097; CWM098); and at the western edge of Middleton Park (CWM099).

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, as described in the subsequent paragraphs.

6.5.4 Ancient woodland at Dunton Wood (CWM015) is an asset of high value. There will be a low adverse operational impact due to train noise affecting the quiet rural setting of the asset. This will constitute a low adverse impact and moderate adverse effect.

6.5.5 Ancient woodland at North Wood (CWM024) is an asset of high value. There will be a high adverse impact due to operational noise and the visibility of passing trains. There will also be a high adverse permanent construction impact as a result of the partial removal of the woodland and changes to its setting. The combined presence and operation of the Proposed Scheme will adversely alter key characteristics of the asset, resulting in a high adverse impact and major adverse effect.

6.5.6 A moat at North Wood (CWM027) is a scheduled monument and an asset of high value. The visibility of passing trains immediately to the west and a significant increase in noise from the introduction of trains will alter the rural setting of the asset, resulting in a high 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 asset, resulting in a high adverse impact and major adverse effect.

6.5.7 Ancient woodland at Coneybury Wood (CWM039) is an asset of high value. The introduction of train noise affecting the quiet rural setting of the asset will result in a low adverse impact and moderate adverse effect.

6.5.8 Newlands Farm (CWM052) is an asset of low value. The increase in operational noise for the introduction of trains, and the presence of the trains will substantially affect the setting of the asset resulting in a high adverse impact. There will also be a high adverse permanent 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 asset, resulting in a high adverse impact and moderate adverse effect.

6.5.9 Dunton Hall, Barn and Pigeonhouse (CWM059) are Grade II listed buildings and assets of moderate value. The introduction of train noise will adversely affect the setting and character of these assets. This will result in a high adverse impact. There will also be a high adverse permanent 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 asset, resulting in a high adverse impact and major adverse effect.

6.5.10 Dunton Hall Garden (CWM060) is an historic garden of low value. There will be significant increases in train noise that will affect the setting of the asset and result in a medium adverse impact. There will also be a high adverse permanent 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 moderate adverse effect.

6.5.11 Cuttle Mill (CWM077) is a non-designated building complex of low value. The introduction of train noise and visibility of passing trains will significantly alter the rural nature of the asset resulting in a medium adverse impact. There will also be a high adverse permanent 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 moderate adverse effect.

6.5.12 Middleton House Farm (CWM083) is an asset of low value. The introduction of train noise and visibility of passing trains in the immediate environs of the asset will considerably alter the rural setting of the farmhouse resulting in a high adverse impact. There will also be a high adverse permanent 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 moderate adverse effect.

6.5.13 Middleton Hall (CWM100) is a listed building complex of high value. The presence of passing trains within associated parkland to the west will disrupt designed views from the hall resulting in a low adverse impact. There will also be a low adverse permanent impact as a result of changes to the setting of the asset. The combined presence and operation of the Proposed Scheme will slightly alter characteristics of the setting of this asset, resulting in a low adverse impact and moderate adverse effect.

6.5.14 Upper House Farm (CWM105) is an asset of moderate value. The Proposed Scheme will be visible, at a distance, approximately 600m to the east and there will be a significant increase in noise from the introduction of trains. This will result in a low adverse impact. There will also be a low adverse permanent 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

6.5.15 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

6.5.16 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

6.5.17 The setting of several historic settlements, buildings and landscapes will be affected visually and by noise once the Proposed Scheme becomes operational. This includes Dunton Wood ancient woodland, North Wood ancient woodland, a moat at North Wood (scheduled monument), Coneybury Wood ancient woodland, Dunton Hall, Barn and Pigeonhouse (Grade II listed buildings), Dunton Hall garden, Dunton Hall, Middleton Hall historic building complex, 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.

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: loss of woodland habitat where the route of the Proposed Scheme passes in cutting through North Wood Local Wildlife Site (LWS), which is ancient woodland, and partial loss of Hams Hall Woodland LWS; loss of secondary plantation woodland near Marston Lane; loss of water bodies (ponds) which support amphibians; and loss of a Natterer's bat roost at Dunton Hall.

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 to EC-004-003); and
- register of local/parish level effects which are not described 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; the Environment Agency; and Butterfly Conservation (Warwickshire branch).

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). Further details, including the study area for individual surveys, are provided within 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: Appendix EC-001-003 to EC-004-003.

7.2.2 A Water Framework Directive (WFD) 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 North Wood LWS, Dunton Wood LWS and Middleton House Farm (due for demolition and which could support roosting bats). In addition, in the western part of the Curdworth to Middleton area around A4097 Kingsbury Road, south of Bodymoor Heath, access was not

secured until July 2013, thus limiting survey work. Further details are provided in Volume 5: Appendices EC-001-003 to 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 has been adopted to identify 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 and maps presented in Volume 5: Appendix EC-001-003 to EC-004-003 and Volume 5: Map Book – Ecology, Map series EC-01 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5: Map Book – Ecology, Maps EC-01.

7.3.2 Land required for the construction of the Proposed Scheme and that adjacent to it consists of arable farmland, hedgerows and tree lines. Improved and semi-improved grassland forms much of the remaining area, with smaller areas of semi-natural woodland and broadleaved plantations. The River Tame, the Birmingham and Fazeley Canal, Langley Brook and Gallows Brook are all crossed by the Proposed Scheme and support wetland communities. There are also numerous ponds throughout the area.

Designated sites

7.3.3 There are two statutory designated sites located within 500m of the land required for construction of the Proposed Scheme, namely Middleton Pool Site of Special Scientific Interest (SSSI) and Middleton Pool Local Nature Reserve (LNR). These sites have the same boundary, and they are located adjacent to the land required for construction of the Proposed Scheme to the east of the A4091 Tamworth Road. This 12.6ha site is an artificial 16th century lake supporting 46 species of breeding birds. The site is fed by the Langley Brook, which the route of the Proposed Scheme will cross. The site is surrounded by a high diversity of plant communities including aquatic swamp and tall herb fen, neutral grassland and wet woodland. The SSSI is of national value and the LNR is of district/borough value.

7.3.4 There are three LWS relevant to the assessment in this area; each is of county/metropolitan value. They are:

- Coleshill Sewage Works Grassland LWS – which lies adjacent to the southern boundary of this area but is entirely within the adjacent Coleshill Junction area (CFA19). It is partially within the land required for the construction of the Proposed Scheme. The site consists of damp grassland and forms part of a series of grassland and wetland LWS sites adjacent to the River Tame. As this site is within Coleshill Junction (CFA19) all impacts and effects on the site are discussed in the Volume 2 report for CFA19;
- North Wood LWS – a small damp woodland situated near Middleton House

Farm approximately 2.3km south of Middleton village. The LWS contains ancient semi-natural and replanted woodland. The wood is designated as an example of pedunculate oak-bracken-bramble community, which is characteristic woodland on the more acid soils found in this area. However, only the canopy in the central third of the wood is dominated by pedunculate oak, with the rest being dominated by ash. This LWS is partially within the land required for the construction of the Proposed Scheme; and

- Hams Hall Woodland LWS, which is approximately 1.8km east of Curdworth and consists of three sections of lowland mixed deciduous woodland. Together the three woodlands cover an area of 13.8ha and are relatively mature with a reasonable range of species typical of oak woodland and wet woodland communities. The LWS lies within the important Tame Valley corridor, with the only other similar habitat in the district being Dunton Wood LWS, 1km to the north-west. The three sections of woodland included within the LWS are:

  - Hams Lane Wood – this is within the land required for the construction of the Proposed Scheme. This consists of a small triangle of woodland between Hams Lane and the railway, referred to as the Birmingham and Derby Line;

  - Sych Wood – the north-easterly edge of this section of woodland, along the Birmingham and Derby Line, is within the land required for the construction of the Proposed Scheme. This is ancient woodland. This is damp unmanaged woodland and is dominated in the drier areas by mature pedunculate oak and silver birch, with areas of alder and sycamore at the eastern end; and

  - Church Pool Covert – this is not within the land required for the construction of the Proposed Scheme. The main block of woodland lies north of the churchyard and is dominated by mature pedunculate oak, ash, sycamore and wych elm.

7.3.5 In addition to the areas of ancient woodland which fall within designated sites, Roger's Coppice occurs within the extent of or adjacent to the Proposed Scheme and is ancient semi-natural and re-planted broadleaved woodland. This woodland is located 50m from the land required for construction of the Proposed Scheme. These ancient woodlands represent an irreplaceable resource.

7.3.6 Middleton Lakes Royal Society for Protection of Birds (RSPB) reserve is north-west of Middleton Hall Farm Quarry and contiguous with Middleton Pool SSSI. It is a wetland site that contains lakes, reedbed and woodland. It is important for overwintering wildfowl and breeding waders. This site is located 250m from the land required for construction of the Proposed Scheme. Impacts on this site are considered under the habitats and species sections below, given it is not recognised as a formal designation.

Habitats

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

Woodland

7.3.8 North Wood contains ancient semi-natural and replanted woodland. This woodland has not been surveyed due to lack of access. However, it is included on the Natural England inventory of habitats of principal importance as lowland mixed deciduous

woodland, identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[19]. Lowland mixed deciduous woodland is widespread nationally but sparse within Warwickshire and is likely to be of county/metropolitan value. This woodland is located within the land required for construction of the Proposed Scheme.

7.3.9 Hams Hall Woodland LWS comprises three smaller woodlands (Hams Lane Wood, Sych Wood, Church Pool Covert), which are split across the Birmingham and Derby Line. The woodlands are lowland mixed deciduous woodland, a habitat of principal importance, and Sych Wood is also classed as ancient woodland. Hams Lane Wood and Sych Wood are within the land required for construction of the Proposed Scheme, whereas Church Pool Covert is adjacent. A National Vegetation Classification (NVC)[20] survey within Hams Lane Wood identified a canopy dominated by pedunculate oak and silver birch. Aspen is present, as well as hazel coppice, sweet chestnut, and ash. The woodland community shows signs of disturbance and appears to have affinities to scrub communities as well as woodland of high nutrient situations. It was determined to most closely resemble a species-poor example of oak woodland community W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus*. Sych Wood is classed as ancient woodland but has not been surveyed due to lack of access. Collectively all three woodlands are of county/metropolitan value.

7.3.10 Plantation woodland at Cuttle Mill Fishery compromises Lower Mill Plantation and Mill Plantation. The plantation woodland is present around three fishery ponds, which are former mill pools for Cuttle Mill. South-west of the pools is the larger area of woodland known as Mill Plantation. This is lowland mixed deciduous woodland, a habitat of principal importance. Mill Plantation is woodland with a canopy of mixed ash, sycamore and alder. Aspen and crack willow are locally frequent, but pedunculate oak is only occasional in the canopy. The Warwickshire notable plant[21] moschatel and wood millet were recorded during surveys. This woodland community, throughout the plantation, is closest to the ash woodland W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland. The eastern edge of the woodland is adjacent to the land required for construction of the Proposed Scheme. There is a very small remnant piece of woodland along the eastern edge of the ponds, formerly known as Lower Mill Plantation that was once much larger in size but has been removed for arable use. This woodland (both Mill and Lower Mill Plantation) is of district/borough value.

7.3.11 Middleton Pool-Head Plantation is within Middleton Pool SSSI and adjacent to the land required for construction of the Proposed Scheme. A NVC survey was carried out within this woodland. It is recognised as wet woodland, habitat of principal importance, which covers an area of approximately 2ha at the south-west corner of Middleton Pool, and there is a drier woodland strip along the south and west edge of the SSSI. The wet woodland is dominated by crack willow, with frequent goat willow and alder and represents the alder woodland community W6 *Alnus glutinosa-Urtica dioica* woodland. The woodland is not a qualifying feature of the SSSI and does not

[19] *Natural Environment and Rural Communities Act 2006* (Chapter 16). Her Majesty's Stationery Office, London.
[20] NVC is a detailed survey and classification system that is used to compare plant communities with a range of defined community types.
[21] 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.

directly support qualifying features of the SSSI. The woodland is of district/borough value.

7.3.12 There is a cluster of woodlands around Hunts Green, south of Middleton. These woodlands are adjacent and within 50m of the land required for the construction of the Proposed Scheme. These are:

- Roger's Coppice, a small patch of ancient woodland and lowland mixed deciduous woodland, habitat of principal importance. This woodland is of district/borough value;
- A small unnamed broadleaved plantation woodland north-west of Roger's Coppice and south of Middleton. This woodland has been Phase 1 habitat surveyed. It is not listed on the Natural England inventory of habitats of principal importance as lowland deciduous woodland. This woodland is of local/parish value; and
- Walker's Spinney is a small isolated secondary woodland adjacent to Church Lane, Middleton. It contains lowland mixed deciduous woodland, a habitat of principal importance. A NVC survey identified a mosaic of wet and dry woodland communities with a diverse ground flora in the wetter areas. The ground flora included bluebell, wild garlic, the Warwickshire notable plants moschatel and wood millet, and occasional pignut. The wet woodland is an example of alder woodland community W6 *Alnus glutinosa-Urtica dioica* in the northern section. The drier woodland area to the south is an example of the oak woodland community W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus*. This woodland is of local/parish value.

7.3.13 An unnamed young (approximately 15 years old) plantation, between School Farm and the M42 (Volume 5: Map Book – Ecology; EC-02-057, H4) contains silver birch, hazel and field maple which are all dominant with the occasional Scot's pine and ash. There is no ground flora present and the woodland is interspersed with mown pathways of poor semi-improved grassland. This woodland is within the area of land required for the construction of the Proposed Scheme. This woodland is of local/parish value.

Grassland

7.3.14 A NVC survey was carried out at Curdworth Bridge Meadow, west of Coleshill Sewage Works and on the northern bank of the River Tame. Curdworth Bridge Meadow includes a mosaic of wet grassland depressions and drier areas of taller coarse grassland with scattered scrub. Despite the presence of great burnet, a Warwickshire notable plant[22], which is usually found on unimproved flood plain meadows, the grassland community at this site most closely resembles MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, a NVC community typical of lowland periodically inundated neutral soils. This grassland has local/parish value.

[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.

7.3.15 Coleshill Sewage Treatment Works is bisected by the River Tame and the land to the north of the river is included within the Curdworth to Middleton area (but the land to the south of the river including the Coleshill Sewage Works Grassland LWS is within the Coleshill Junction area (CFA19)). The Coleshill Sewage Treatment Works, which includes a part of Lea Marston Sludge Beds potential LWS, was NVC surveyed and contains a mosaic of vegetation communities that are semi-natural or have established on disused gravel settlement beds. The tall unmanaged grassland on the bunds between settlement beds is dominated by species-poor stands of common nettle and false oat-grass. This grassland community is indicative of unmanaged habitats on high nutrient soils. Coleshill Sewage Treatment Works are within the land required for the construction of the Proposed Scheme. The grassland habitat within Coleshill Sewage Treatment Works is of local/parish value.

7.3.16 Other areas of improved and semi-improved grassland were surveyed but none were found to be species rich or notable; these were arable set aside land or land used for grazing and have negligible value. A review of the Phase 1 habitat data from Warwickshire Biological Records Centre and aerial imagery of areas of grassland that were not surveyed, do not reveal extensive areas of notable grassland and these areas are not thought to be above local/parish level.

Watercourses

7.3.17 The River Tame and two of its unnamed tributaries, the Birmingham and Fazeley Canal, Langley Brook and three of its minor unnamed tributaries, and the Gallows Brook are crossed by the route of the Proposed Scheme.

7.3.18 The majority of the River Tame is within the adjacent Coleshill Junction area (CFA19) and is discussed within the Volume 2 report for CFA19.

7.3.19 The Langley Brook, near Middleton, is a fast flowing stream with gravel bed and locally dominant patches of river water-crowfoot, which is a Warwickshire notable plant[3]. Reed sweet-grass has developed on raised silty shelves and branched bur-reed is present in deeper water. The riverbanks are shaded with overhanging mature alder and crack willow, with a dense understorey containing common nettle and Himalayan balsam (an invasive species listed under Schedule 9 of the Wildlife and Countryside Act, 1981 as amended[23]) with occasional wild garlic and dog's mercury. The riverbank is dominated by alder woodland. Fish habitat surveys have identified moderate and good habitat quality for juvenile and spawning salmonid and coarse fish. The Langley Brook also feeds Middleton Pool SSSI and LNR, downstream of the route of the Proposed Scheme. Due to the range of habitats supported by the Langley Brook, and its importance in maintaining Middleton Pool SSSI, it is assessed as being of district/borough value. Access constraints have prevented survey of three unnamed tributaries of the Langley Brook. They are located between Cuttle Mill Fishery and Marston Field Bridge (Volume 5: Map Book – Ecology; Map EC-02-057, F5); between North Wood and Middleton House Farm (Volume 5: Map Book – Ecology; Map EC-02-057, D6) and between Middleton House Farm and Bodymoor Heath Lane (Volume 5: Map Book – Ecology; Map EC-02-057, C6). However, these are relatively minor watercourses and are unlikely to support a significantly greater range of habitats than

[23] *Wildlife and Countryside Act 1981*, Schedule 9 Part 2 Plants (HMSO).

their receiving watercourse (Langley Brook). In the absence of survey data, they are therefore assessed as being of up to district/borough value.

7.3.20 Gallows Brook, north-east of Middleton is a significantly modified channel (i.e. the physical dimensions or materials of the channel have been artificially altered or changed) with low flow and poor plant and substrate diversity. Fish habitat surveys identified poor habitat quality for fish species. However, the watercourse is considered to provide a wildlife corridor and therefore is assessed as being of local/parish value.

7.3.21 On the western side of the Birmingham and Fazeley Canal there are stands of grey willow scrub and between Marston Lane Bridge and the first lock north of the bridge, there are emerging stands of reed sweet-grass on the western edge of the canal. Close to Marston Lane, also on the western side, a small stand of sedge-dominated vegetation occurs. The disturbance caused by boats may prevent extensive growth of aquatic plants within the canal. Nevertheless, the watercourse is considered to provide a wildlife corridor and therefore is of local/parish value.

7.3.22 The two minor tributaries of the River Tame are within the land required for construction of the Proposed Scheme. They are north of Curdworth Bridge located between Coleshill Sewage Treatment Works and Hams Hall Distribution Park. They were screened out of requirement for detailed habitat survey. However, these are still likely to provide wildlife corridors and habitats for common aquatic species, and are considered, in each case, to be up to local/parish value.

Hedgerows

7.3.23 Six hedgerows have been noted within the land required for the construction of the Proposed Scheme that meet the wildlife and landscape criteria specified in the Hedgerows Regulations 1997[24]. Four of these six are located near Middleton these are: south of Walker's Spinney (Volume 5: Map Book – Ecology; Map EC-10-115, F7), south of Langley Brook (Volume 5: Map Book – Ecology; Map EC-10-115, G6); and two adjacent to Crowberry Lane (Volume 5: Map Book – Ecology; Map EC-10-115, F8). The fifth and sixth are near to Mullensgrove Farm, near the A4097 Kingsbury Road (Volume 5: Map Book – Ecology, Map EC-10-119, A5 and D4). In addition, eight species rich hedgerows were also surveyed in this area of which one is within the land required for construction of the Proposed Scheme. These hedgerows qualify as a habitat of principal importance.

7.3.24 Species-poor hedgerows are common within the arable landscape. 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.

Water bodies

7.3.25 There are 24 water bodies within the land required for construction of the Proposed Scheme including a large restored sand and gravel quarry (Middleton Hall Farm Quarry). Of these water bodies, nine have been surveyed for amphibians and four have had detailed habitat surveys. None of the water bodies surveyed qualify as a

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

habitat of principal importance and none of the four ponds which have had detailed habitat surveys meet the Warwickshire LWS selection criteria[25]. The majority of water bodies surveyed within the land required for the construction of the Proposed Scheme are of local/parish value. As a precautionary assessment, those ponds that have not been surveyed are assumed to have up to district/borough value.

Other habitats

7.3.26 Other habitats, such as scrub, are found mostly around field edges, alongside ditches and around ponds. This habitat is of no more than local/parish value.

7.3.27 Arable land is found across the land required for the construction of the Proposed Scheme. No species-rich arable margins have been noted and the arable land largely comprises heavily managed large fields with few features of interest to wildlife. This habitat is considered to have negligible value.

Protected and/or notable species

7.3.28 A summary of the species relevant to the assessment is provided in Table 12.

Table 12: Protected and/or notable species

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Bats	Regional	Population of *Myotis* species using a building roost at a farm north of A4097 Kingsbury Road	Possible maternity roost for *Myotis* species was identified from emergence surveys, with a peak emergence count of 18 in July 2012. This roost is within the extent of the Proposed Scheme. No droppings were encountered during the inspection surveys. Based on the geographic location of the building it is likely that species would be Natterer's, Daubenton's, Brandt's or whiskered. All of these *Myotis* species are considered to be rarer bats in England[26].

[25] Guidance for the selection of non-statutory SINCs in Warwickshire (Warwickshire Wildlife Sites Project, 1998).
[26] 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
	Up to regional	Assemblage of rarer bat species potentially roosting within North Wood	No access has been available to survey potential tree roosts within North Wood. Activity and static surveys confirmed a diverse assemblage of bats using habitats in proximity to the north and south of the wood. There are no barriers to dispersal between the habitats known to be utilised by these assemblages of bat species and habitats at North Wood. Bat species include common pipistrelle, soprano pipistrelle, brown long-eared bats, *Myotis* species, noctule and Leisler's, which may all roost within trees within the area. Brown long eared, soprano pipistrelle and noctule are species of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[27]. As a precaution it is assumed that the woods could support breeding colonies of both common and rarer species based upon the assemblage recorded within the area.
	County/metropolitan	Assemblage of bats using roosting, foraging and commuting habitats south of A4097 Kingsbury Road	Habitats (pasture fields and hedgerows) within land required for the Proposed Scheme support moderate levels of bat activity including common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and calls identified as *Myotis* species. A low level of Leisler's and Nathusius pipistrelle bat activity has been recorded during static surveys, considered to be rarer bat species within England and rare within Warwickshire. Three buildings were found to support a small number of Natterer's bat, likely summer (non-breeding) roosts that showed evidence of switching roost site throughout the season. A peak count of one *Myotis* bat was recorded emerging from two buildings; one building roost was confirmed through the identification of an individual Natterer's bat found during an inspection survey. Dropping numbers and distribution was consistent with a small summer, non-breeding or transient roost sites. All three building roosts lies within 100m of land required for the construction of the Proposed Scheme. Natterer's are categorised as a rarer bat species in England.
	Up to county/metropolitan	Population of bats using one tree roost: within woodland along Hams Lane	One tree roost has been confirmed through a small number of droppings found during tree climbing surveys. Species unknown, but potentially supports individuals of 'rarer' bat species confirmed as present within this area. The tree is within land required for the construction of the Proposed Scheme.

[27] *Natural Environment and Rural Communities Act 2006* (Chapter 16). Her Majesty's Stationery Office.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	District/borough	Assemblage of bats using roosting, foraging and commuting habitats associated with woodland along Hams Lane and habitats along Faraday Avenue	Surveys confirmed foraging and commuting activity within these habitats of a diverse assemblage of bat species at a low level of activity. Species included common pipistrelle, soprano pipistrelle, brown long-eared bat, Natterer's, noctule and *Myotis* species. Two confirmed tree roosts were found within woodland adjacent to Hams Lane; of these one supported a single soprano pipistrelle (found in situ during tree climbing surveys) within 100m of land required for the construction of the Proposed Scheme.
	District/borough	Assemblage of bats using foraging and commuting habitat within plantation woodland between Marston Lane and the M42	Surveys confirmed a low level of foraging and commuting activity within the woodland of a diverse assemblage of bat species, including common pipistrelle soprano pipistrelle, brown long-eared bat and *Myotis* species. Low level of activity by Leisler's has been recorded during static surveys, a rare species for Warwickshire. Roosting potential within this area of woodland was low due to the young age of trees.
	District/borough	Assemblage of bats using roosting, foraging and commuting habitat around Cuttle Mill Fishery including Birmingham and Fazeley Canal	The woodland (Lower Mill and Mill Plantation) and water bodies support low levels of activity dominated by commoner bat species (common pipistrelle, soprano pipistrelle and noctule). Low level of activity by Leisler's has been recorded during static surveys, a rare species for Warwickshire. Near to the woodland habitat within Cuttle Mill Fishery there are four building summer (non-breeding) roosts for commoner bat species (brown long-eared and common pipistrelle) with peak emergence of one or two individuals and it is likely that these habitats support bats utilising these roosts.
	District/borough	Assemblage of bats using foraging and commuting habitats that lie east and west of the A4091 Tamworth Road, including Langley Brook west of Middleton Park, and Coneybury Wood	A diverse assemblage of bats including: common pipistrelle, soprano pipistrelle, *Myotis* species, noctule recorded foraging and commuting along field boundaries, water bodies, tree lines and Langley Brook. Leisler's activity was confirmed during static surveys, a rare species within England and Warwickshire. A low density of trees with high and moderate roosting potential was recorded in hedgerows.
	Local/parish	Population of brown long-eared bat using a building roost at a farm north of A4097 Kingsbury Road	One building found to support individuals of brown long-eared bat. Roost confirmed through droppings only, no emergence confirmed. Brown long-eared bat are widespread and common within the UK.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Local/parish	Populations of common pipistrelle and brown long-eared bat using four building roosts south of A4097 Kingsbury Road	Roosts found to support individuals of common pipistrelle and brown long-eared bat (peak emergence of one). Both species are widespread and common within the UK. Three of the buildings are located within land required for the construction of the Proposed Scheme. The fourth building is located within 100m of land required for the construction of the Proposed Scheme.
	Local/parish	Population of common pipistrelle and brown long-eared bat using roosts within two buildings at a farm south of Bodymoor Heath Lane	One building found to support a small number of common pipistrelle bat, likely summer (non-breeding) roosts. Roost confirmed through DNA analysis of bat droppings only. Dropping numbers (>30) and distribution consistent with small summer non-breeding or transient roost. The second building roost was found to support feeding perch for brown long-eared bat. Species confirmed through DNA analysis of bat droppings only. Dropping numbers (50-100) were found on top of a mezzanine floor within an open sided barn below a suitable feeding perch.
	Local/parish	Assemblage of bats using commuting habitats associated with Hams Hall Distribution Centre	Low levels of commuting activity by commoner bat species such as common pipistrelle and soprano pipistrelle.
Amphibians	County/ metropolitan	Great crested newt population using a water body, east of M42 near Dunton Hall	This water body has been surveyed on four occasions (at the incorrect time of year due to access restrictions). This water body supports a confirmed breeding population of great crested newts of medium population size class (peak count of 15) and also supports smooth newts. Great crested newt is a 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 area. However, ponds which support breeding populations of great crested newt meet the criteria for LWS selection in Warwickshire[28].
	Up to county/ metropolitan	Amphibian populations in all water bodies not subject to survey	Using precautionary approach to water bodies which have not been surveyed; could support breeding populations of great crested newts of medium population size class.

[28] 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 population using a water body at Middleton Park	This single water body has been surveyed on four occasions (at the incorrect time of year due to access restrictions). This water body supports a small population size class of great crested newts (peak count of four). This single water body also supports smooth newts, common frog and common toad, a species of principal importance.
	Up to county/metropolitan	Great crested newt population at a water body south of Birmingham and Fazeley Canal	This single water body has been surveyed on six occasions (some at the incorrect time of year due to access restrictions). This water body supports a small population size class of great crested newts (peak count of seven). This water body does not support any other species of amphibian.
	Up to county/metropolitan	Great crested newt population using a water body north of Middleton Park	This single water body has been surveyed on six occasions (at the incorrect time of year due to access restrictions). This water body supports a small population size class of great crested newts (peak count of two). This water body also supports smooth newts and common toad.
	Local/parish	Amphibian populations in 29 water bodies	These water bodies do not contain great crested newt but support other amphibians such as smooth newt, common frog and common toad. All of these species are considered to be widespread within Warwickshire and within the area. None of these populations meet the Warwickshire selection criteria for LWS[28].
Birds	National	Breeding birds at Middleton Pool SSSI	This site is nationally designated for its breeding bird assemblage. It supports 46 species of breeding birds, in particular breeding waterfowl.
	County/metropolitan	Breeding barn owl near A4097 Kingsbury Road	A traditional barn owl nest site[29] was identified within a farm near A4097 Kingsbury Road. The nest site itself is 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 species[30].
	County/metropolitan	Breeding lapwing within arable fields between Cuttle Mill Fishery and Middleton Hall, to the west of Bodymoor Heath	Up to six lapwing breeding territories were recorded. The number of lapwing recorded is greater than 1% of the estimated county breeding population. Lapwings are on the Red List of Birds of Conservation Concern (BoCC)[31] and are a species of principal importance.
	County/metropolitan	Breeding little ringed plover at Middleton Hall Farm Quarry	Two little ringed plover breeding territories were recorded. The number of little ringed plover recorded is greater than 1% of the estimated county breeding population. Little ringed plover is a Schedule 1 species[30].

[29] 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 current surveys.
[30] 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.
[31] 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
	County/metropolitan	Breeding oystercatcher at Middleton Hall Farm Quarry	Three oystercatcher breeding territories were recorded. The number of oystercatcher recorded is greater than 1% of the estimated county breeding population. Oystercatchers are an Amber List BoCC species.
	District/borough	Breeding yellow wagtail within arable fields between Cuttle Mill Fishery and Middleton Hall, to the west of Bodymoor Heath	Up to four yellow wagtail breeding territories were recorded. Yellow wagtail is a Red List BoCC species and a species of principal importance. This species is thought to be widespread in the regional arable landscape, and these moderate populations are thought to be of district/borough value.
	District/borough	Breeding sand martin at Middleton Hall Farm Quarry	Three sand martin breeding territories were recorded. Sand martins are an Amber List BoCC species. This species is thought to be under-recorded within Warwickshire (with county records focusing on four colonies) and the number of sand martins recorded is thought to be of district/borough value.
	Local/parish	Breeding birds at Dunton Hall, to the northeast of Curdworth	Field surveys recorded 52 bird species within this area of which 26 are notable. Sixteen notable species are thought to have bred on site including species such as linnet 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.
	Local/parish	Breeding birds within an area of plantation woodland off Marston Lane, to the west of Marston	Field surveys recorded 34 bird species within this area of which 15 are notable. Ten notable species are thought to have bred on site, including species such as linnet 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.
	Local/parish	Breeding birds at Mullensgrove Farm, to the north-east of Curdworth	Field surveys recorded 39 bird species within this area of which 15 are notable. Nine 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 birds within arable fields between Cuttle Mill Fishery and Middleton Hall, to the west of Bodymoor Heath	Field surveys recorded 80 bird species within this area of which 42 are notable. Twenty three notable species are thought to have bred on site, including species such as linnet and reed bunting. Species recorded (with the exception of lapwing and yellow wagtail, whose populations at the site are of more than local/parish value) 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	Breeding birds at Cuttle Mill Fishery, to the west of Marston	Field surveys recorded 42 bird species within this area of which 16 are notable. Seven notable species are thought to have bred on site including species such as kingfisher which is a Schedule 1[30] bird, and song thrush, 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 birds at Middleton Hall Farm Quarry, to the southeast of Middleton	Field surveys recorded 49 bird species within this area of which 28 are notable. Thirteen notable species are thought to have bred on site including species such as little grebe and reed bunting. Species recorded (with the exception of little ringed plover, oystercatcher and sand martin whose populations at the site are of more than local/parish 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 birds at Park Gate Farm, to the east of Middleton	Field surveys recorded 29 bird species within this area of which 14 are notable. Seven notable species are thought to have bred on site, including species such as reed bunting 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 birds within arable field to the immediate north of Middleton	Field surveys recorded 44 bird species within this area of which 19 are notable. Fifteen notable species are thought to have bred on site, including species such as reed bunting and yellow wagtail, 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	Wintering birds at Dunton Hall, to the north-east of Curdworth	Field surveys recorded 36 bird species within this area of which 18 are notable, including species such as corn bunting and grey partridge. 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 birds at Mullensgrove Farm, to the north-east of Curdworth	Field surveys recorded 24 bird species within this area of which nine are notable, including species such as house sparrow, a species of principal importance, and song thrush. 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 birds within woodland off Marston Lane, to the west of Marston	Field surveys recorded 30 bird species within this area of which 14 are notable, including species such as bullfinch, a species of principal importance, and song thrush. 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 birds at arable fields to the west of Birmingham and Fazeley Canal	Field surveys recorded 37 bird species within this area of which 19 are notable, including species such as grey partridge and lapwing. 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 birds at Cuttle Mill Fishery, to the west of Marston	Field surveys recorded 34 bird species within this area of which 12 are notable, including species such as brambling and kingfisher. 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 birds at Middleton Hall Farm Quarry, to the south-east of Middleton	Field surveys recorded 49 bird species within this area of which 24 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 birds within arable field to the immediate north of Middleton	Field surveys recorded 30 bird species within this area of which 11 are notable, including species such as skylark 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.
Terrestrial Invertebrates	County/ metropolitan	Assemblage at Middleton Hall Farm Quarry	Nationally scarce[32] bees/wasps/beetles and other bare ground associated invertebrates have been recorded within this site. Two species of principal importance were recorded and the noteworthy Red Data Book 3[33], spider-hunting wasp. This species is nationally rare with one known site in Warwickshire and only one record in Staffordshire.
White-clawed crayfish	County/ metropolitan	Langley Brook population	Survey results have identified the presence of white-clawed crayfish on the Langley Brook as it passes within the land required for the construction of the Proposed Scheme. Additionally there are no records of non-native crayfish within this area. White-clawed crayfish is declining within Warwickshire and is a species of principal importance.
	Up to county/ metropolitan	Potential populations on three unnamed tributary watercourses of the Langley Brook and two connected water bodies	Due to the immediate aquatic connectivity of these watercourses to Langley Brook, it is possible that if suitable habitat conditions are present that white-clawed crayfish could have also colonised these watercourse reaches. Survey was not possible on these watercourses due to lack of access.

[32] A species is nationally scarce if it has only been recorded in 31 – 100 ten kilometre squares in Great Britain.
[33] Red Data Book category 3 – Rare, as defined in Shirt, David (1987); British Red data Books: 2. Insects; Nature Conservancy Council; Peterborough.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Otter	District/borough	Otter population on the Langley Brook	Field survey confirmed otters to be present on the Langley Brook; no holts or potential holts were identified. It is likely that otters will exploit the connecting tributaries and water bodies associated with this watercourse for commuting, refuge and foraging. Otter is a species of principal importance with a large home range and which has increasing populations nationally and in Warwickshire, although likely to still be relatively few in number and transient, but breeding.
	Up to district/borough	Potential otter population on Birmingham and Fazeley Canal	Despite no evidence of the species being found within the area during surveys to support the assessment, desk study information suggests otter presence on the Birmingham and Fazeley Canal (records between 2007 and 2009) with the closest record located within 10m of a crossing point and therefore otters could use the canal for foraging and/or commuting.
Notable plants	District/borough	River water crowfoot populations in the Langley Brook	Plant recorded during field survey of the Langley Brook and from a desk study record located at the crossing point of the Proposed Scheme. This plant is scarce within Warwickshire[34].
Reptiles	Local/parish	Population of grass snake at Hams Hall Distribution Park	Low population size class of grass snake recorded during surveys within a habitat mosaic including bare ground, open grassland, woodland and scrub. Grass snake populations are likely to be common and are widespread within Warwickshire but restricted to suitable habitat. Grass snake is a species of principal importance.
	Local/parish	Population of grass snake east of Middleton Hall Farm Quarry	Low population size class of grass snake recorded during surveys within bare ground, grassland and tall ruderals, with a mosaic of wet habitats including ditches and open water.
	Local/parish	Population of reptiles is north of White Bridge Lock near Birmingham and Fazeley Canal	High population size class of grass snake recorded during surveys within an area of rough grassland, bramble and tall ruderal vegetation surrounding two ponds in the centre of a field.
	Local/parish	Reptile populations within Plantation Woodland adjacent to the M42 near Marston Lane Bridge	Low population size class of common lizard, grass snake and slow worm recorded within the rough grassland layer of woodland particularly along the rides and boundaries. Common lizard, grass snake and slow worm are all species of principal importance.

[34] Warwickshire scarce plants are those found in four to 10 sites in the county.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
	Up to local/parish	Potential populations of common species (such as common lizard, grass snake and slow worm) within suitable habitat within the Curdworth to Middleton area not subject to survey	The majority of habitat within the land required for the construction of the Proposed Scheme appears to be close grazed pasture or arable fields and is not considered to support a large or widespread population of any common reptile species, although there is potential for several small populations in areas linked by connective hedgerow and woodland habitat.
Badger	Local/parish	At least four badger social groups with territories located wholly or partly within the land required for the construction of the Proposed Scheme	Fourteen setts identified. This included two potential main setts, five annexes, one subsidiary, and six outlier setts. Badgers are widespread in the UK and Warwickshire. The badger social groups within the area are not likely to form a critical part of the county or of the district population.
Aquatic macro-invertebrates	Local/parish	Assemblage in the Gallows Brook	Assemblage of moderate species richness, but fairly high conservation value for this area based on the presence of several notable species.
	Up to local/parish	Assemblage in the unnamed tributary watercourse of the Langley Brook	Not surveyed due to access constraints, but unlikely to exceed the highest assessment achieved for the macro-invertebrate assemblages in this area.
	Up to local/parish	Assemblages within all other watercourses in this 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 the highest assessment achieved for watercourses sampled in this area.
Fish	Local/parish	Population in the Langley Brook	Mixed coarse fishery dominated by smaller species, but capable of supporting larger species as evidenced by the presence of perch.
	Up to local/parish	Population in the unnamed tributary watercourse of the Langley Brook	Not surveyed due to access constraints, but unlikely to exceed the highest assessment achieved for the fish populations in this area.
	Up to local/parish	Populations in 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 fish populations within watercourses where no access was available are assumed to have up to the highest value achieved for this area.

Species/ species group	Value	Receptor	Baseline and rationale for evaluation
Hazel dormouse	Negligible	Potential populations in suitable woody habitat in the Curdworth to Middleton area	No survey evidence in this area. Desk study records from Kingsbury Wood SSSI are from over 3km to the east of the land required for construction of the Proposed Scheme, and there is no connecting woody habitat between Kingsbury Wood SSSI and the land required for the construction of the Proposed Scheme. This suggests that it is unlikely that any populations exist within the five areas of woody habitat surveyed within 100m of the Proposed Scheme.
Water vole	Negligible	Potential populations using water features in the area comprising adjacent reaches of the River Tame and flooded pools within Coleshill Sewage Works LWS	Evidence of water vole presence has been observed on the flooded pools within Coleshill Sewage Works Grassland LWS (CFA19). Footprints which may be attributed to water vole were observed on the River Tame, where the river passes adjacent to the pools (CFA19). It is likely that the River Tame (which falls both within CFA19 and CFA20) has historically offered dispersal corridors for water voles within the area. No evidence of water vole activity or supporting desk study records of water vole were recorded on any of the watercourses in the area, including the Birmingham and Fazeley Canal, Langley Brook, Gallows Brook and associated tributaries. The population of water vole on the River Tame fall within the Coleshill Junction area and thus are reported in CFA19. Water vole is assumed to be absent from the area of works in CFA20.

Future baseline

Construction (2017)

7.3.29 A summary of the known 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 within the area.

Operation (Year 1 2026)

7.3.30 There are no known committed developments or changes to management in the Curdworth to Middleton 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:

- design has aimed to minimise habitat loss within the North Wood LWS;
- design has aimed to reduce habitat loss within Middleton Hall Farm Quarry,

which supports breeding and wintering birds and terrestrial invertebrates;

- three viaducts over watercourses: the River Tame West viaduct, the Birmingham and Fazeley Canal viaduct, and the Langley Brook viaduct will negate the need for culverts and will retain ecological corridors for species such as otter, white-clawed crayfish and bats;
- avoidance of in-channel structures associated with viaducts and bridges will prevent impacts to watercourse habitat, form and function;
- where Langley Brook is crossed by the A4091 Tamworth Road there will be an overbridge which will improve the current connectivity along Langley Brook for otter and white-clawed crayfish. This location is an area where otter deaths have been reported on the A4091 Tamworth Road in flood conditions due to the inappropriate sizing of the existing culvert[35];
- minimising the length of culvert required through watercourse realignment works at Gallows Brook to reduce extent of stream habitat loss and degree of habitat severance; and
- all culverts will be suitable to allow passage for mammals such as otter and water vole, taking into account flood events, or will have an alternative dry tunnel installed.

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

Assessment of impacts and effects

Designated sites

7.4.3 There will be habitat loss and severance within North Wood LWS as a result of the land required for construction of the Proposed Scheme, including North Wood embankment. There will be permanent loss of 2.2ha, approximately 30% of the 7.2ha LWS which includes both areas of ancient semi-natural and replanted ancient woodland. The main effects will include direct habitat loss of ancient woodland; fragmentation and isolation of retained eastern and western sections of the woodland either side of the route of the Proposed Scheme; and reduced size of remnant blocks causing vulnerability to edge effects. These impacts will result in a permanent adverse effect on the integrity of the LWS, which will be significant at a county/metropolitan level.

7.4.4 Two of the three blocks of woodland that form Hams Hall Wood LWS, Hams Lane Wood and Sych Wood, will be partially lost as they are within the land required for the construction of the Proposed Scheme. There will be permanent loss of 1.8ha, approximately 13% of the 13.8ha LWS. All the woodland that will be lost is lowland mixed deciduous woodland; the area that will be lost from Sych Wood is also ancient woodland. The three blocks of woodland are split across the Birmingham and Derby Line and therefore connectivity between the blocks has previously been reduced. The

[35] Personal communication with Warwickshire otter and water vole recorder.

main effects will include direct habitat loss of irreplaceable ancient woodland resource as well as fragmentation and isolation of retained southern and eastern sections of Sych Wood which would be isolated by the route of the Proposed Scheme. These impacts will result in a permanent adverse effect on the integrity of the Hams Hall Wood LWS, which will be significant at a county/metropolitan level.

7.4.5 There are no anticipated impacts on Middleton Pool SSSI. Construction activities will not require groundwater pumping within any adjacent gravel pit ponds such as Middleton Hall Quarry. Survey results from wintering bird surveys suggest that wintering birds do not cross the land required for the construction of the Proposed Scheme when landing in the Middleton Pool SSSI water bodies. In addition, it is considered unlikely that birds will be subject to notable changes in visual or noise effect. The SSSI is visually screened by vegetation and already close to the busy dual carriageway of A4091 Tamworth Road, the realignment of which will be the closest works to the SSSI. It is unlikely that there will be any adverse effect on bird populations utilising the SSSI during construction.

7.4.6 No impacts are expected on the following designated sites which form part of the baseline: Middleton Pool SSSI, Middleton Pool LNR and Middleton Lakes RSPB Reserve. Any effects on Coleshill Sewage Treatment Works LWS are addressed in Volume 2 CFA report for Coleshill Junction (CFA19).

Habitats

7.4.7 There will be loss and severance of ancient woodland of approximately 30% (2.2ha) within North Wood. The loss of this woodland will cause a permanent adverse effect on the conservation status of ancient woodland which would be significant at a county/metropolitan level.

7.4.8 There will be a total loss of 0.13ha of ancient woodland from Sych Wood (within Hams Hall Woodland LWS). This will result in a permanent adverse effect on the conservation status of ancient woodland which will be significant at a county/metropolitan level.

7.4.9 There will be no impacts on Roger's Coppice which is the only other area of ancient woodland within 50m of the land required for the Proposed Scheme.

7.4.10 It is considered unlikely that any other effects on woodland habitat at more than the local/parish level will occur. Losses of woodland that will be significant at a local/parish level are reported in Volume 5: Appendix EC-005-003.

7.4.11 There are 22.5km of hedgerows within the land required for the construction of the Proposed Scheme. This includes 1.1km from six individual hedgerows that meet the wildlife and landscape criteria of the Hedgerow Regulations 1997[24]. The final length of hedgerow to be lost will depend on the detailed design and hedgerows will be retained where practical, but as a precaution for the purposes of assessment, it is assumed that all of the hedgerows would be lost. The majority of hedgerows that will be lost are species-poor. Hedgerows form wildlife corridors within a largely arable landscape and are therefore important for habitat connectivity. The combined loss and severance of hedgerows within the Proposed Scheme will cause an adverse effect on the conservation status of hedgerows which will be significant at a district/borough level.

7.4.12 The single culvert crossing and associated realignment works proposed for the unnamed tributary watercourse of the Langley Brook (spanning 20m of watercourse) will result in direct permanent adverse impacts on watercourse habitat, form and function. Culvert placement is likely to have a permanent adverse effect on the watercourse which is considered likely to be significant at up to the district/borough level.

7.4.13 The loss of 24 water bodies within the land required for the construction of the Proposed Scheme will result in a permanent adverse effect on the conservation status of water bodies that will be significant, in each case, 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. Local/parish level effects listed in Volume 5: Appendix EC-005-003.

Species

7.4.15 The construction process is likely to deter notable bird species from using the area of land required for construction of the Proposed Scheme during winter months, as a result of loss of habitat, but also from visual and noise disturbance. This avoidance will be temporary, lasting the duration of the construction process. The impacts could cause adverse effects on the conservation status of bird populations but these impacts are unlikely to be significant at more than a local/parish level.

7.4.16 The potential barn owl nest site observed near A4097 Kingsbury Road will be lost as will foraging habitats within the territory, resulting in displacement form this location. This will have an adverse effect on the conservation status of barn owl that will be significant at a county/metropolitan level.

7.4.17 There will be no significant impacts resulting from the shading of Langley Brook from Langley Brook viaduct and therefore there will be no significant effect on the population of river water crowfoot, which is scarce within Warwickshire, within this watercourse.

7.4.18 A water body near Dunton Hall (Volume 5: Map Book – Ecology; Map EC-04-056, C7) with a medium population size class of great crested newts is situated adjacent to the land required for construction of the Proposed Scheme. It is assumed this water body will be lost as part of the adjacent A4097 Kingsbury Road overbridge diversion works. This impact will result in a permanent adverse effect on the conservation status of the great crested newt population concerned that will be significant at the county/metropolitan level. No other significant effects on great crested newt populations are anticipated.

7.4.19 There are 17 water bodies within the land required for the construction of the Proposed Scheme that are deemed suitable for amphibians. Five of these water bodies have not been subject to survey and no desk study data is available. Six of these have received surveys following best practice (smooth newts found in two water bodies), three water bodies have received incomplete surveys (smooth newt and toad found in one water body) and the remaining three have received Habitat Suitability Index surveys only. Should great crested newts be present within these water bodies,

their loss could result in an adverse effect on the conservation status of great crested newt populations which would be significant at up to a county/metropolitan level.

7.4.20 No confirmed otter holts have been identified during survey. Due to the viaduct designs at the River Tame, the Birmingham and Fazeley Canal, and the Langley Brook there will be no permanent loss of navigable watercourse habitat for otters. In addition, the bridging of these watercourses may offer further cover and territorial marking sites for otters along these watercourses. However, construction activities along the Langley Brook, where evidence of otter was recorded, may result in noise and visual disturbance to otter, potentially acting as a deterrent to otter commuting and creating temporary barriers within an otter's territorial range. Nevertheless, these impacts will not lead to an adverse effect on the conservation status of otter and therefore no significant effect is expected.

7.4.21 There would be habitat loss within the groundwater filled Middleton Hall Farm Quarry near Middleton, as a result of the graded false cuttings near to the proposed A4091 Tamworth Road overbridge. This would result in the loss of approximately 4ha of open water habitats and bare sands/gravels. Nationally scarce (Red Data Book) bees, wasps and beetles and other bare ground associated invertebrates have been recorded within this site. Consequently, these impacts will result in an adverse effect on the terrestrial invertebrate assemblage using the site which will be significant at a county/metropolitan level.

7.4.22 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.

7.4.23 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.

7.4.24 Two confirmed building roosts will be affected within the land required for construction of the Proposed Scheme due to the demolition of buildings north of A4097 Kingsbury Road. One building was found to support a likely small maternity roost for *Myotis* species that showed evidence of moving roost location throughout the season. The loss of this building roost will have an adverse effect on the conservation status of *Myotis* species populations, which will be significant at a regional level. The second building was found to support a summer non-breeding roost of brown long-eared bats. Given that only individual bats of commoner bat species (brown long-eared) were found to use the building containing the other roost, the loss will not significantly affect the conservation status of brown long-eared bat.

7.4.25 Two building roosts will be affected within the land required for construction of the Proposed Scheme due to the demolition of buildings at a farm south of Bodymoor Heath Lane. Given that only individual bats of brown long-eared bat were found to

use the building roosts, the loss will not significantly affect the conservation status of brown long-eared bat.

7.4.26 A diverse assemblage of bats are associated with woodland along Hams Lane and habitats along Faraday Avenue including Natterer's, Myotis species, noctule, Leisler's and Nathusius pipistrelle. The Proposed Scheme will result in the permanent loss and severance of woodland habitats along Faraday Avenue which have been identified as key commuting and foraging features. Two confirmed tree roosts used as a summer (non-breeding) roost by soprano pipistrelle lies adjacent to land required for the construction of the Proposed Scheme within woodland along Hams Lane. Whilst the roost will not be directly removed the roost will become isolated within a retained fragment of woodland which may result in the abandonment of the roost. While the impacts on areas of key commuting and key foraging habitat would be localised, these habitats support a diverse assemblage of bats, some of which are rare within Warwickshire. These impacts will lead to an adverse effect on the conservation status of the assemblage of bats concerned that will be significant at a district/borough level.

7.4.27 A confirmed tree roost (of unknown species) within woodland along Hams Lane lies within land required for the construction of the Proposed Scheme and will be lost. The loss of roosts which may support individuals of rarer bat species could have an adverse effect on the conservation status of rarer bat species which would be significant up to county/metropolitan level.

7.4.28 Three confirmed building roosts associated with habitats south of the A4097 Kingsbury Road lie within between 5 and 30m of land required for construction of the Proposed Scheme. The three buildings were found to support a small number of Myotis with one confirmed as Natterer's bat that showed evidence of transitional use. Noise and vibration arising during construction will result in disturbance and could lead to temporary displacement of bats from the roosts. The route of the Proposed Scheme will isolate the three building roosts from suitable foraging habitat located to the west, outside of land required for the construction of the Proposed Scheme and may result in the permanent abandonment of these roosts. The loss of this collection of roosts will have an adverse effect on the population of *Myotis* species, which will be significant at a county/metropolitan level.

7.4.29 Habitats south of the A4097 Kingsbury Road within land required for the construction of the Proposed Scheme support a diverse assemblage of bats including common pipistrelle, soprano pipistrelle, noctule, brown long eared, Leisler's, Nathusius pipistrelle and *Myotis* species. It is likely that these bat species use these habitats for foraging and commuting due to the proximity of the roosts. The Proposed Scheme will result in the permanent loss and severance of key commuting routes along hedgerows. While the impacts on areas of key foraging and key commuting habitat would be localised, the habitat supports a diverse assemblage of bats, some of which are rare within the UK, and the combination of these impacts will lead to an adverse effect on the conservation status of the assemblage of bats concerned that will be significant at a district/borough level.

7.4.30 Woodland habitat will be lost within plantation woodland between Marston Lane and the M42 used by the assemblage of bats recorded including common pipistrelle, soprano pipistrelle, brown long-eared, *Myotis* species, noctule and Leisler's. Within

this plantation no known tree roosts will be lost or trees with high or moderate potential to be used by roosting bats. The Proposed Scheme will result in the permanent loss and severance of key commuting routes along this woodland edge which provide habitat links to confirmed *Myotis* species and common pipistrelle roosts to the south, within a farm building north of the A4097 Kingsbury Road. These disturbance and severance impacts may deter bats from using the habitats and move bat populations away from preferred foraging and commuting habitats. While the impacts on areas of key foraging and key commuting habitat would be localised, the woodland and surrounding habitat supports a diverse assemblage of bats, some of which are rare within the UK, and the combination of these impacts could lead to an adverse effect on the conservation status of the assemblage of bats concerned that would be significant at a district/borough level.

7.4.31 The route of the Proposed Scheme will cross key commuting routes and foraging habitats around Cuttle Mill Fishery including the Birmingham and Fazeley Canal used by a diverse assemblage of bats including common pipistrelle, soprano pipistrelle, noctule; brown long eared and Leisler's. Three buildings located adjacent to land required for the construction of the Proposed Scheme support individuals of common pipistrelle and brown long eared bats and it is likely that habitats within the land take support these roosts. The Proposed Scheme will result in the permanent loss and severance of key commuting routes along hedgerows but connectivity along the Birmingham and Fazeley Canal will be retained. Disturbance and severance impacts may deter bats from using the habitats and move bat populations away from preferred foraging and commuting habitats. While the impacts on areas of key foraging and key commuting habitat would be localised, the habitat supports a diverse assemblage of bats, some of which are rare within the UK, and the combination of these impacts will lead to an adverse effect on the conservation status of the assemblage of bats concerned that will be significant at a district/borough level.

7.4.32 A diverse assemblage of bats, such as common pipistrelle, soprano pipistrelle, *Myotis* species, noctule and Leisler's, were recorded using foraging and commuting habitat west of Middleton Park and Coneybury Wood and south of Church Lane, including Langley Brook. No known tree roosts will be lost in this area. However, trees with moderate potential to be used by roosting bats will be lost along hedgerows within the land required for the construction of the Proposed Scheme. The Proposed Scheme will result in the permanent loss and severance of key commuting routes along hedgerows but connectivity along Langley Brook will be retained. Disturbance and severance impacts may deter bats from using the habitats and move bat populations away from preferred foraging and commuting habitats. While the impacts on areas of key foraging and key commuting habitat would be localised, the surrounding habitat supports a diverse assemblage of bats, some of which are rare within the UK, and the combination of these impacts will lead to an adverse effect on the conservation status of the assemblage of bats concerned that will be significant at a 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. Local/parish level effects are listed in Volume 5: Appendix EC-005-003.

Other mitigation measures

7.4.34 This section describes additional elements designed to reduce or compensate for significant ecological effects. These include measures such as habitat creation, habitat enhancement and wildlife underpasses.

7.4.35 Ancient woodland is irreplaceable. The loss of ancient woodland within North Wood and Sych Wood will result in a significant adverse effect at a county/metropolitan level. However, this loss of woodland will be compensated through a range of measures. At North Wood, ancient woodland soil with its associated seed bank will be salvaged and translocated to a 3.0ha receptor site that is adjacent to the retained westerly section of North Wood and will also link to the secondary woodland around Cuttle Mill Fishery (Volume 2: CFA20 Map Book, Map CT-06-113, E6). For the small loss of habitat at Sych Wood, ancient woodland soil with its associated seed bank will be salvaged and translocated to a receptor site that is between the A4097 Kingsbury Road and Seeney Lane (Volume 2: CFA20 Map Book, Map CT-06-113-R1, I6). This will increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, and translocation of coppice stools and dead wood, will be undertaken as appropriate.

7.4.36 The area around Seeney Lane is a woodland creation area and as well as mitigating for the small loss of Sych Wood, it will mitigate for the loss of woodland habitat at Hams Lane Wood.

7.4.37 To mitigate for the loss of woodland habitat there will be a number of woodland creation areas. These will be:

- woodland planting near Faraday Avenue (Volume 2: CFA20 Map Book, Map CT-06-112b, F5) which will offset the effect of woodland lost east of Faraday Avenue;
- woodland planting near to Dunton Wood LWS (Volume 2: CFA20 Map Book, Map CT-06-119, E4) to compensate for the loss of woodland along the A4097 Kingsbury Road and Marston Lane (compensating for a local/parish effect as identified in Volume 5: Appendix EC-005-003);
- woodland planting around Cuttle Mill Fishery (Volume 2: CFA20 Map Book, Map CT-06-113, H5) to extend the existing woodland cover around Cuttle Mill Fishery and improve habitat connectivity with North Wood LWS;
- extension of Walker's Spinney (Volume 2: CFA20 Map Book, Map CT-06-115, D7-D5) to compensate for the loss of woodland near to Hams Lane.

7.4.38 The target condition for the woodland planting will be lowland mixed deciduous woodland, a habitat of principal importance.

7.4.39 In addition to the woodland creation areas included within the Proposed Scheme to compensate loss of ecologically valuable habitats, there are other woodland areas which are being created primarily for landscape purposes. Whilst these areas will not be managed specifically for the benefit of wildlife, they will still be of value to wildlife. The larger areas of woodland landscape planting included in the Proposed Scheme are located on the Dunton Wood and Mill Pool embankments; along Seeney Lane next to

the Kingsbury Road railhead; near the A4091 Tamworth Road overbridge and along the Trickley Coppice embankment, just south of Gallows Brook.

7.4.40 Following establishment and maturity of the woodland planting, which would take 50 years or more, it is anticipated that any adverse impacts on woodland will not result in any significant effect on the conservation status of the habitat and the compensation measures would have a residual positive beneficial effect on woodland habitats that will be significant at a district/borough level.

7.4.41 New hedgerow creation will be undertaken and connective habitat is provided within the landscape scheme to compensate for losses of wildlife corridors that hedgerows provide. Mitigation measures to address the loss of hedgerows will be provided in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). There will be temporary adverse effects whilst the new hedges become established and mature (approximately 15 years). Following establishment and maturation of planting it is anticipated 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.

7.4.42 Compensatory habitat to address impacts on ponds and great crested newt populations in the area will be provided within the ecological compensation areas near North Wood and near Gallows Brook, south-west of the route, 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 the population affected.

7.4.43 Some habitat creation will benefit breeding birds such as tree sparrow, bullfinch and song thrush, including the area of woodland to be planted to mitigate for losses at North Wood LWS and Sych Wood, as well as woodland creation to extend Walker's Spinney and address secondary woodland losses.

7.4.44 The ecological compensation area incorporating the disused Middleton Hall Farm Quarry (Volume 2: CFA20 Map Book, Map CT-06-114, D5) will provide an improvement to retained habitat, particularly for breeding and wintering birds and terrestrial invertebrates. Existing embankments around the edge of the lake will be re-engineered to improve their suitability for breeding birds, and within the site an artificial sand martin nest colony will be created to provide increased nesting opportunities. These enhancement measures will result in a residual beneficial effect, at the district/borough level.

7.4.45 Middleton Hall Farm Quarry possesses many habitat features and assemblage types applicable to brownfield land. Therefore suitable new features that will benefit many invertebrate groups such as bees, wasps and bare ground loving beetles will be created. Following the implementation of the measures proposed it is anticipated that any adverse impacts on the assemblage of invertebrates 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 concerned.

7.4.46 The re-planting of trees on watercourse banks at the viaduct over Langley Brook will provide refuges for white-clawed crayfish. Mitigation measures will be provided in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2). These enhancement measures will result in a residual positive benefit, at the district/borough level, as there are no impacts associated with this species.

7.4.47 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 within the SMR Addendum (Volume 5: Appendix CT-001-000/2).

7.4.48 To mitigate for the loss of the *Myotis* maternity roost at Mullensgrove Farm and the Natterer's roost at Dunton Hall, alternative roosting provision will be provided in accordance with the principles of ecological mitigation identified within the SMR Addendum (Volume 5: Appendix CT-001-000/2).

7.4.49 The ecological mitigation areas will enhance habitat links and foraging opportunities for nearby bat roosts particularly near North Wood and Cuttle Mill Fishery, the area near Walker's Spinney, woodland planting near to Dunton Wood LWS, planting near the A4097 Kingsbury Road, Seeney Lane and near Gallows Brook. Whilst the planting areas establish and mature, there will be a temporary residual effect on bats from the loss of foraging and commuting habitat within these areas. However, some bats will be able to use the planting areas for foraging and commuting prior to these habitats reaching maturity and therefore the temporary residual effect is not deemed to be significant.

7.4.50 Planting adjacent to Birmingham and Fazeley Canal viaduct, Cuttle Mill underbridge, North Wood underbridge and the Langley Brook viaduct will be designed to encourage species such as bats to use these crossing points. Following the implementation of the measures proposed it is anticipated that any adverse impacts on bats during the construction of the Proposed Scheme will be reduced to a level which will not result in any significant effect on the conservation status of the species concerned.

7.4.51 Mitigation measures to address the potential killing, injury and disturbance of badgers will be provided 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 badger proof fencing and replacement setts where necessary.

7.4.52 There will be an adverse effect on the conservation status of barn owl at the county/ metropolitan level due to the loss of one territory. To offset the likely loss of barn owl roosts 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. As the availability of nesting sites is a limiting factor for this species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.

Summary of likely residual significant effects

7.4.53 The mitigation, compensation and enhancement measures described reduce the effects to a level that is not significant, except for loss of ancient woodland at North Wood and Sych Wood and the loss of a barn owl territory.

7.4.54 The permanent loss of one barn owl territory represents a residual significant effect. However, if the proposed mitigation measures for barn owl are implemented through liaison with landowners, the residual effect on barn owl would be reduced to a level that is not significant.

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 River Tame West viaduct, Birmingham and Fazeley Canal viaduct and Langley Brook viaduct. The 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 Curdworth cutting will reduce the risk of bat species crossing over the railway and colliding with moving trains; and
- the 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 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.

7.5.3 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.

7.5.4 Due to the large areas over which bats forage it is likely that any loss of, or displacement from, suitable foraging habitat in the vicinity of the Proposed Scheme 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.

7.5.5 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.

7.5.6 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.

7.5.7 Bat species may fly across the route of the Proposed Scheme along a number of watercourses within this area. Three viaducts will cross habitats used by foraging and commuting bats: namely the River Tame West viaduct, the Birmingham and Fazeley Canal viaduct and the Langley Brook viaduct. Most bat species will fly underneath structures by following the watercourse under them whilst the higher flying noctule, Leisler's and serotine are likely to navigate over the structures. Although there is a risk of individual bats being killed or injured by collision with trains, the risks are considered to be minimal and there is not expected to be a significant effect on the conservation status of any of the bat species concerned.

7.5.8 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 significant.

7.5.9 It is considered unlikely that any other effects on species receptors at more than the local/parish level will occur. Local/parish level effects are listed in Volume 5: Appendix EC005-003.

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 the mitigation, compensation and enhancement measures proposed, no significant residual ecological effects during operation are expected.

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 the Curdworth to Middleton area relevant to this topic include: the River Tame, Birmingham and Fazeley Canal, Middleton Pool SSSI and widespread areas of sand and gravel 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:

- sludge beds and sewage tanks at Coleshill Sewage Works;
- a number of historical landfills; and
- two Preferred Areas for sand and gravel extraction at Lea Marston and Middleton (Volume 5: Map Book – Land Quality, LQ-01-055b and LQ-01-056 to 058).

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-001-020: Land quality appendices.

8.1.6 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources not related to land contamination are addressed in Section 13, Water resources and flood risk. 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 the Environment Agency and North Warwickshire Borough Council (NWBC) regarding contaminated land and with Warwickshire County Council (WCC) regarding mineral resources and petroleum tanks.

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 the SMR addendum presented in Volume 5: Appendix CT-001-000/1 and CT-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 re-instatement will be made 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. Due to access constraints not all sites considered to have the greatest potential for contamination were visited. However, the purpose of site visits is to verify desktop information and the lack of complete site walkovers is considered unlikely to have substantially affected the land quality assessment.

8.3 Environmental baseline

Existing baseline

8.3.1 Unless stated otherwise, all features described in this land quality section are presented on Volume 5: Map Book – Land quality, Maps LQ-01-055b and LQ-01-056 to 058.

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 Volume 5: Map Book – Water resources and flood risk assessment, Map WR-02-20.

8.3.3 The Proposed Scheme in the Curdworth to Middleton area mainly crosses agricultural land. The British Geological Survey (BGS) mapping indicates the presence of made ground at Coleshill Sewage Works, Hams Hall Distribution Park and in the locations of infilled pits, infilled ponds and quarries scattered throughout the study area. A wedge of land between the M42 and the Birmingham and Fazeley Canal that is bisected by the Proposed Scheme is also identified as made ground. Although not shown on geological mapping, there are likely to be other areas of made ground associated with highways and the Birmingham and Derby railway line which will be crossed by the route in this area.

8.3.4 There are 13 landfill sites located in the study area which are shown on Volume 5: Map book – Land quality, Maps LQ-01-055b and LQ-01-056 to 058.

8.3.5 Superficial deposits are present across much of the study area.

8.3.6 Alluvium, variably composed of clay, silt, sand and gravel, surrounds the River Tame in the south of the study area and Langley Brook and Gallows Brook in the north of the study area. River terrace deposits, comprising predominantly sand and gravel, extend northwards from the River Tame and underlie much of the Proposed Scheme between the Birmingham and Fazeley Canal and Gallows Brook.

8.3.7 A cover of glacial deposits extends across an area of higher elevation to the north of the River Tame and head deposits, variably comprising clay, silt, sand and gravel, underlie the Proposed Scheme around the area of the Leeds spur and are present in isolated pockets elsewhere in the study area.

8.3.8 Bedrock of the Mercia Mudstone Group underlies the whole of the study area. Mercia Mudstone typically comprises weak red brown silty mudstone with minor amounts of carbonate and gypsum when unweathered. Occasional beds of dolomitic siltstone occur within the Mercia Mudstone which are generally thin and when unweathered are a medium strong rock.

Groundwater

8.3.9 There are four categories of aquifer identified within the study area. Alluvium, river terrace deposits and glaciofluvial deposits are classified as Secondary A aquifers. Head deposits are classified as a Secondary (undifferentiated) aquifer and the Mercia Mudstone Group is classified as a Secondary B aquifer.

8.3.10 The predominantly cohesive glaciolacustrine deposits in the south of the study area are classed as an unproductive stratum. Unproductive strata have low permeability and are not significant in terms of water supply or supporting base flow to rivers.

8.3.11 There are no groundwater source protection zones (SPZ) within the study area.

8.3.12 There are six licensed groundwater abstractions and two unlicensed potable supplies located within the study area.

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

Surface waters

8.3.14 The Proposed Scheme will cross the River Tame at the southern end of the Curdworth to Middleton area, the Birmingham and Fazeley Canal to the north of the M42 and Langley Brook, adjacent to Middleton Pool SSSI. Gallows Brook marks the northern end of the Curdworth to Middleton area, adjacent to the Drayton Bassett, Hints and Weeford area (CFA21).

8.3.15 There are several other minor watercourses and surface water bodies within the study area, with Mill Pools and Middleton Pool lying adjacent to the area required for construction of the Proposed Scheme.

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

Current and historical land use

8.3.17 All potentially contaminated sites, identified from both current and historical land uses, are shown on Volume 5: Map Book – Land quality, Maps LQ-01-055b and LQ-01-056 to LQ-01-058. Each potentially contaminative land use is annotated on the maps using the code 20-XX, where 20 denotes the CFA number and XX denotes the individual site reference.

8.3.18 Current potentially contaminative land uses within the study area include Coleshill Sewage Works (20-02, Volume 5: Map Book – Land quality, Map LQ-01-056, I5) and Dunton Island registered landfill which is to the east of Curdworth (20-62, Volume 5: Map Book – Land quality, Map LQ-01-056, D7). Dunton Island landfill is understood to accept only inert waste related to a minerals processing facility at this location.

8.3.19 The principal historical land uses identified within the study area which may have caused contamination include former sludge beds at Coleshill Sewage Works in the south of the study area (20-02, Volume 5: Map Book – Land quality, Map LQ-01-056, I5), the former Hams Hall Power Station (20-09, Volume 5: Map Book – Land quality, centred on Map LQ-01-056, G3), Cocksparrow Farm historical landfill which lies adjacent to the route of the proposed Leeds spur at Marston (20-41, Volume 5: Map Book – Land quality, Map LQ-01-057, G4) and historical landfills at Middleton Hall Estate (20-48 and 20-50, Volume 5: Map Book – Land quality, centred on Map LQ-01-058, I2 and E2).

8.3.20 Other potentially contaminative historical land uses identified within the study area include numerous infilled pits, infilled ponds or infilled domestic water wells. These are scattered along the length of the Proposed Scheme and may have been manually infilled with a variety of waste.

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 an entry on the substantiated pollution incident register relating to a significant pollution incident at Mill Pools, adjacent to the area required for construction of the Proposed Scheme. The impact related to controlled waters (assumed to be Mill Pools Map LQ-01-057, G6) but there are no details relating to the type of contamination or the date of the incident.

Mining/minerals resources

8.3.22 The Minerals Local Plan for Warwickshire[36] 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.

[36] Warwickshire County Council (1995), *Minerals Local Plan for Warwickshire*.

8.3.23 Middleton Hall Estate is listed as a permitted mineral site by WCC. However, it is now listed as 'minerals exhausted – undergoing restoration'.

8.3.24 The Minerals Local Plan for Warwickshire identifies two Preferred Areas[37] within the study area. In both cases, the Proposed Scheme cuts directly through the Preferred Area:

- Lea Marston (Volume 5: Map Book – Land quality, Map LQ-01-056, E6) – for sands and gravels. The Preferred Area is located between Hams Hall electricity substation and the A446 Lichfield Road as it joins junction 9 of the M42. The Proposed Scheme passes through the Preferred Area in retained cutting; and
- Middleton Hall Extension (Volume 5: Map Book – Land quality, centred on Map LQ-01-058, H3) – for sands and gravels. The Preferred Area is immediately to the east of the A4091 Tamworth Road as it passes Hunts Green. The Proposed Scheme will be on embankment as it enters the Preferred Area before passing into cutting. Minerals in the northern part of this Preferred Area have been extracted. The area to the south-east of the Bodymoor Heath Training Grounds, adjacent to the area required for construction of the Proposed Scheme, has not been worked.

8.3.25 There is an Area of Search at Bodymoor Heath for sand and gravel (Volume 5: Map Book – Land quality, Map LQ-01-057, E1). The area required for construction of the Proposed Scheme relating to the Leeds spur and the Kingsbury Road railhead encroaches on the western edge of the Bodymoor Heath Area of Search. Areas of Search are analogous to Preferred Areas but are used in the Warwickshire Minerals Local Plan where there is less information about available resources.

8.3.26 The Minerals Safeguarding Areas (MSA) for Warwickshire report[38] specifies an extensive MSA for sand and gravel that covers the entire route in the Curdworth to Middleton area along with a significant portion of the entire county.

Geo-conservation resources

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

Receptors

8.3.28 The sensitive receptors that have been identified within this study area are summarised in Table 13.

[37] Areas where mineral deposits are known to exist and where the County Council considers there would be least planning objection to mineral extraction taking place.
[38] British Geological Survey (2009), Minerals Safeguarding Areas for Warwickshire. *Economic Minerals Programme Open Report OR/08/065*.

Table 13: 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 and canals	High
		Other surface watercourses and water bodies	Moderate
	Built environment	Buildings and property	Low to high
		Underground structures and services	Low
	Mineral resources	Preferred areas	High
		Area of search	High
		Sand and gravel MSA	Moderate
	Ecological	Middleton Pool SSSI	High
Impacts on mining/mineral sites (severance and sterilisation of mineral sites)	Mining/mineral sites	Preferred areas	High
		Area of search	High
		Sand and gravel MSA	Moderate

Future baseline

8.3.29 There are no relevant committed development sites within the study area which are likely to alter the land use sufficiently to impact on the land quality baseline during either construction or operation of the Proposed Scheme. In all cases the overriding land use will remain the same or similar and will not change the overall baseline conditions against which the assessment is undertaken. All the committed developments described in Section 2.1, Overview of the area and description of the Proposed Scheme are expected to be complete by 2017 when construction starts. Committed developments are also listed in Volume 5: Appendix CT-004-000.

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 Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000). 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:

- methods to control noise, waste, dust, odour, gasses 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).

8.4.3 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)[39]; and
- British Standard BS10175 Investigation of Potentially Contaminated Sites (2011)[40].

8.4.4 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)[41]. The preferred option will then be developed into a remediation strategy, in consultation with regulatory authorities prior to implementation.

8.4.5 Contaminated soils excavated from the site, wherever feasible, will be treated as necessary to remove or render any contamination inactive and reused within the

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

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 re-use) or to an appropriately permitted landfill.

Assessment of impacts and effects

8.4.6 The main construction features of the Proposed Scheme in the Curdworth to Middleton area include viaducts spanning Coleshill Sewage Treatment Works, the Birmingham and Fazeley Canal and various other minor surface watercourses and a box structure at the M42 crossing. The remainder of the Proposed Scheme will be constructed predominantly on embankment, although there will be a 1.3km long cutting extending almost from Faraday Avenue to Mullensgrove Farm. The Leeds spur will also be constructed in cutting adjacent to the Kingsbury Road railhead and two more minor cuttings will be located between Middleton Park and Middleton village.

8.4.7 Construction works will include construction of the Kingsbury Road railhead, earthworks, utility diversions, deep foundations, temporary dewatering and other activities. In addition, road infrastructure works will be required within this section of the Proposed Scheme.

8.4.8 Construction compounds for the Curdworth to Middleton area will be located at various points along the Proposed Scheme (see Section 2.3, Construction of the Proposed Scheme).

Land contamination

8.4.9 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 area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. In total, 72 areas were considered during this screening process; 30 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 and ponds. All areas assessed are shown on Volume 5: Map Book – Land quality, Maps LQ-01-55b and LQ-01-056 to 058 and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

8.4.10 Conceptual site models (CSM) have been produced for the 30 areas taken to Stage C and D assessments. The detailed CSM are provided in Volume 5: Appendix LQ-001-020, 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 cutting 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.

8.4.11 A summary of the baseline CSM are provided in Table 14. The impacts and baseline risks quoted are before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, it is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists.

Table 14: Summary of baseline CSM * sites which may pose a contaminative risk for the Proposed Scheme

Area ref.**	**Area name**	**Main potential impacts**	**Main baseline risk*****
20-02 (Map LQ-01-056, I5)	Coleshill Sewage Treatment Works	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-04 (Map LQ-01-056, I6)	Infilled pond	Potential impacts identified to off-site residents, groundwater, surface water receptors and property receptors	Low
20-06 (Map LQ-01-056, H5)	Coleshill Water Reclamation Works historical landfill	Potential impacts identified to current site users, groundwater, surface water receptors and property receptors	Low
20-09 (centred on Map LQ-01-056, G4)	Former Hams Hall Power Station	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-10 (Map LQ-01-056, G6)	Infilled pond	Potential impacts identified to off-site residents, groundwater and property receptors	Low
20-15 (Map LQ-01-056, E3)	Infilled pit	Potential impacts identified to groundwater, surface water and property receptors	Low
20-16 (Map LQ-01-056, E4)	Dog Kennel Belt historical landfill	Potential impacts identified to current site users, groundwater, surface water receptors and property receptors	Low
20-17 (Map LQ-01-056, D3)	Land west of Hams Lane historical landfill	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-18 (Map LQ-01-056, D2)	Land east of Hams Lane historical landfill	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-24 (Map LQ-01-057, I4)	Infilled pond	Potential impacts identified to off-site residents, groundwater and property receptors	Low
20-25 (Map LQ-01-057, I5)	Infilled pond	Potential impacts identified to off-site residents, groundwater, surface water and property receptors	Low

Area ref.**	Area name	Main potential impacts	Main baseline risk***
20-28 (Map LQ-01-057, H3)	Infilled pit	Potential impacts identified to off-site residents, groundwater and property receptors	Low
20-29 (Map LQ-01-057, H1)	Lea Marston No.2 historical landfill	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-30 (Map LQ-01-055b, A7)	Infilled pond	Potential impacts identified to off-site residents, groundwater, surface water receptors and property receptors	Low
20-31 (Map LQ-01-057, F2)	Infilled pond	Potential impacts identified to groundwater and property receptors	Low
20-32 (Map LQ-01-055b, A7)	Infilled pond	Potential impacts identified to off-site residents, groundwater, surface water receptors and property receptors	Low
20-33 (Map LQ-01-057, H5)	Infilled well	Potential impacts identified to off-site residents, groundwater and property receptors	Low
20-38 (Map LQ-01-057, H3)	Infilled pond	Potential impacts identified to adjacent site users, groundwater and property receptors	Low
20-39 (Map LQ-01-057, G3)	Infilled pond	Potential impacts identified to off-site residents, groundwater and property receptors	Low
20-40 (Map LQ-01-057, G4)	M42 Mullensgrove Farm historical landfill	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors and property receptors	Low
20-41 (Map LQ-01-057, G4)	Cocksparrow Farm historical landfill	Potential impacts identified to groundwater receptors	Moderate/Low
20-45 (Map LQ-01-057, C7)	Infilled well	Potential impacts identified to off-site residents, groundwater, surface water receptors and property receptors	Low
20-48 (Map LQ-01-58, H5)	Middleton Hall No. 2 Historical Landfill	Potential impacts identified to current site users, groundwater, surface water receptors and ecological receptors	Low
20-49 (Map LQ-01-058, E7)	Infilled well	Potential impacts identified to on-site residents, off-site residents, groundwater and property receptors	Low
20-50 (Map LQ-01-058, E2)	Middleton Hall Sand and Gravel historical landfill	Potential impacts identified to current site users, off-site residents, groundwater, surface water receptors, property receptors and ecological receptors	Low
20-53 (Map LQ-01-058, E4)	Former petrol filling station	Potential impacts identified to on-site residents, off-site residents, groundwater, surface water receptors and property receptors	Low
20-58 (Map LQ-01-056, G6)	Birmingham and Derby Line	Potential impacts identified to off-site residents, groundwater and surface water receptors	Low
20-61 (Map LQ-01-056, E5)	Hams Hall electricity substation	Potential impacts identified to current site users, off-site residents, groundwater and surface water receptors	Low

Area ref.**	Area name	Main potential impacts	Main baseline risk***
20-62 (Map LQ-01-056, D7)	Dunton Island landfill	Potential impacts identified to current site users, groundwater, surface water receptors and property receptors	Low
20-63 (Map LQ-01-057, I5)	Mullensgrove Farm	Potential impacts identified to current site users, off-site residents, groundwater and surface water receptors	Low
20-73 (Map LQ-01-055b, E7)	Birmingham Road historical landfill	Potential impacts identified to off-site human receptors, groundwater and surface water receptors	Low

*CSM have been prepared as part of the detailed land contamination methodology (Volume 5: Appendix LQ-001-020) for baseline, construction and post-construction.
** Each area is assigned a unique identification number (Volume 5: Appendix LQ-001-020).
*** 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.

Temporary effects

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

8.4.13 Table 15 presents the summary of the construction effects obtained from a comparison of the baseline and construction impacts. The construction risk assessment takes into account the implementation of the mitigation measures set out within the draft CoCP. The details of these comparisons are presented in Volume 5: Appendix LQ-001-020.

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. 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 15: Summary of temporary effects

Area ref	Area Name	Main Baseline risk	Main Construction risk*	Temporary effect and significance
20-02 (Map LQ-01-056, I5)	Coleshill Sewage Treatment Works	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-04 (Map LQ-01-056, I6)	Infilled pond	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-06 (Map LQ-01-056, H5)	Coleshill Water Reclamation Works historical landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)

Area ref	Area Name	Main Baseline risk	Main Construction risk*	Temporary effect and significance
20-09 (centred on Map LQ-01-056, G4)	Former Hams Hall Power Station	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-10 (Map LQ-01-056, G6)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-15 (Map LQ-01-056, E3)	Infilled pit	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-16 (Map LQ-01-56, E4)	Dog Kennel Belt historical landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-17 (Map LQ-01-056, D3)	Land west of Hams Lane historical landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-18 (Map LQ-01-56, D2)	Land east of Hams Lane historical landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-24 (Map LQ-01-057, I4)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-25 (Map LQ-01-057, I5)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-28 (Map LQ-01-057, H3)	Infilled pit	Low	Low	Negligible (not significant)
20-29 (Map LQ-01-057, H1)	Lea Marston No.2 historical landfill	Low	Low	Negligible (not significant)
20-30 (Map LQ-01-055b, A7)	Infilled pond	Low	Low	Negligible (not significant)
20-31 (Map LQ-01-057, F2)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-32 (Map LQ-01-055b, A7)	Infilled pond	Low	Low	Negligible (not significant)
20-33 (Map LQ-01-057, H5)	Infilled well	Low	Low	Negligible (not significant)
20-38 (Map LQ-01-057, H3)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-39 (Map LQ-01-057, G3)	Infilled pond	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-40 (Map LQ-01-057, G4)	M42 Mullensgrove Farm historical landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)

Area ref	Area Name	Main Baseline risk	Main Construction risk*	Temporary effect and significance
20-41 (Map LQ-01-057, G4)	Cocksparrow Farm historical landfill	Moderate/Low	Moderate (groundwater)	Negligible to minor adverse (not significant)
20-45 (Map LQ-01-057, C7)	Infilled well	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-48 (Map LQ-01-058, H5)	Middleton Hall No. 2 historical landfill	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-49 (Map LQ-01-058, E7)	Infilled well	Low	Low	Negligible (not significant)
20-50 (Map LQ-01-058, E2)	Middleton Hall Sand and Gravel historical landfill	Low	Low	Negligible (not significant)
20-53 (Map LQ-01-058, E4)	Former petrol filling station	Low	Low	Negligible (not significant)
20-58 (Map LQ-01-056, G6)	Birmingham and Derby Line	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-61 (Map LQ-01-056, E5)	Hams Hall electricity substation	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-62 (Map LQ-01-056, D7)	Dunton Island landfill	Low	Moderate/low (groundwater)	Negligible to minor adverse (not significant)
20-63 (Map LQ-01-057, I5)	Mullensgrove Farm	Low	Moderate/low (groundwater and surface water)	Negligible to minor adverse (not significant)
20-73 (Map LQ-01-055b, E7)	Birmingham Road historical landfill	Low	Low	Negligible (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 15 indicates that based upon the assessment, no significant effects have been identified during the construction phase in relation to potential land contamination. No temporary risks to human receptors have been identified. However potential temporary risks to groundwater only have been identified at the following areas during construction:

- Coleshill Sewage Treatment Works;
- Coleshill Water Reclamation Works historical landfill;
- former Hams Hall Power Station;
- Dog Kennel Belt historical landfill;
- land west of Hams Lane historical landfill;
- land east of Hams Lane historical landfill;

- M42 Mullensgrove Farm historical landfill;
- Cocksparrow Farm historical landfill;
- Middleton Hall No. 2 historical landfill;
- Birmingham and Derby railway line;
- Hams Hall electricity substation;
- Dunton Island landfill;
- Mullensgrove Farm; and
- minor areas of infilled ground such as infilled ponds.

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

8.4.17 The minor adverse effects do not imply an unacceptable risk to groundwater. The risks show that there is a potential linkage between a contamination source and groundwater, but it is likely at worst, that if the linkage is realised the impact on the receptor is minor.

8.4.18 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.

8.4.19 The main and satellite construction compounds may also be used for temporary storage of potentially contaminated soils. The measures outlined in the draft CoCP will manage potential risks from the storage of such materials. The location of construction compounds can be found in Section 2.3, Construction of the Proposed Scheme.

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

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

Permanent effects

8.4.22 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.

8.4.23 Table 16 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-002-020.

Table 16: Summary of permanent (post-construction) effects

Area ref	Area Name	Main Baseline risk	Main Post-Construction risk	Post-construction effect and significance
20-02 (Map LQ-01-056, I5)	Coleshill Sewage Treatment Works	Low	Low	Negligible (not significant)
20-04 (Map LQ-01-056, I6)	Infilled pond	Low	Low	Negligible (not significant)
20-06 (Map LQ-01-056, H5)	Coleshill Water Reclamation Works historical landfill	Low	Low	Negligible (not significant)
20-09 (centred on Map LQ-01-056, G4)	Former Hams Hall Power Station	Low	Low	Negligible (not significant)
20-10 (Map LQ-01-056, G6)	Infilled pond	Low	Low	Negligible (not significant)
20-15 (Map LQ-01-056, E3)	Infilled pit	Low	Low	Negligible (not significant)
20-16 (Map LQ-01-56, E4)	Dog Kennel Belt historical landfill	Low	Low	Negligible (not significant)
20-17 (Map LQ-01-056, D3)	Land west of Hams Lane historical landfill	Low	Low	Negligible (not significant)
20-18 (Map LQ-01-56, D2)	Land east of Hams Lane historical landfill	Low	Low	Negligible (not significant)
20-24 (Map LQ-01-057, I4)	Infilled pond	Low	Low	Negligible (not significant)
20-25 (Map LQ-01-57, I5)	Infilled pond	Low	Low	Negligible (not significant)
20-28 (Map LQ-01-57, H3)	Infilled pit	Low	Low	Negligible (not significant)
20-29 (Map LQ-01-57, H1)	Lea Marston No.2 historical landfill	Low	Low	Negligible (not significant)
20-30 (Map LQ-01-055b, A7)	Infilled pond	Low	Low	Negligible (not significant)
20-31 (Map LQ-01-057, F2)	Infilled pond	Low	Low	Negligible (not significant)
20-32 (Map LQ-01-055b, A7)	Infilled pond	Low	Low	Negligible (not significant)
20-33 (Map LQ-01-057, H5)	Infilled well	Low	Low	Negligible (not significant)
20-38 (Map LQ-01-057, H3)	Infilled pond	Low	Very low	Negligible to minor beneficial (not significant)
20-39 (Map LQ-01-057, G3)	Infilled pond	Low	Low	Negligible (not significant)
20-40 (Map LQ-01-057, G4)	M42 Mullensgrove Farm historical landfill	Low	Low	Negligible (not significant)

Area ref	Area Name	Main Baseline risk	Main Post-Construction risk	Post-construction effect and significance
20-41 (Map LQ-01-057, G4)	Cocksparrow Farm historical landfill	Moderate/Low	Very low	Negligible to moderate beneficial (significant)
20-45 (Map LQ-01-057, C7)	Infilled well	Low	Low	Negligible (not significant)
20-48 (Map LQ-01-058, H5)	Middleton Hall No. 2 historical landfill	Low	Low	Negligible (not significant)
20-49 (Map LQ-01-058, E7)	Infilled well	Low	Low	Negligible (not significant)
20-50 (Map LQ-01-058, E2)	Middleton Hall Sand and Gravel historical landfill	Low	Low	Negligible (not significant)
20-53 (Map LQ-01-058, E4)	Former petrol filling station	Low	Low	Negligible (not significant)
20-58 (Map LQ-01-056, G6)	Birmingham and Derby Line	Low	Low	Negligible (not significant)
20-61 (Map LQ-01-056, E5)	Hams Hall electricity substation	Low	Low	Negligible (not significant)
20-62 (Map LQ-01-056, D7)	Dunton Island landfill	Low	Low	Negligible (not significant)
20-63 (Map LQ-01-057, I5)	Mullensgrove Farm	Low	Very low	Negligible to minor beneficial (not significant)
20-73 (Map LQ-01-055b, E7)	Birmingham Road historical landfill	Low	Low	Negligible (not significant)

8.4.24 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. 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.

8.4.25 Table 16 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.

8.4.26 Table 16 indicates that following remediation, there will be overall negligible to moderate beneficial impacts. Depending on the type of remediation undertaken, the beneficial effect could include an improvement in groundwater quality, the breaking of a gas migration pathway or a reduction in the volume of contaminants present in soil.

8.4.27 A significant beneficial effect has been identified where the Proposed Scheme will be constructed at the location of Cocksparrow Farm historical landfill. Contaminated material encountered will be removed or remediated which will prevent any further leaching to groundwater and will remove ground gas risks to property or humans. The result is a moderate beneficial effect, which is significant in this location.

8.4.28 Minor beneficial effects are anticipated at an infilled pond adjacent to Parklands Stud and at Mullensgrove Farm. These areas lie within the area required for construction of the Proposed Scheme and any contaminated material disturbed during construction will have been removed or remediated, therefore reducing the risk to the identified receptors.

8.4.29 There are anticipated to be no significant cumulative permanent effects from construction.

Mining/mineral resources

8.4.30 Construction of the Proposed Scheme has the potential to impact existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource, direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[42] that may occur during the construction phase of the Proposed Scheme, possibly continuing through to the operation.

Temporary effects

8.4.31 Temporary adverse effects are anticipated on MSA, Preferred Areas and Areas of Search where land will be temporarily used for construction of the Proposed Scheme then returned to the landowner. In the Curdworth to Middleton area this includes the Kingsbury Road railhead and construction compounds. These areas are summarised in Table 17.

Table 17: Summary of temporary effects on mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance
Middleton Hall Extension	Preferred Area	Preferred Area for sand and gravel	High	Negligible	Negligible (not significant)
Lea Marston	Preferred Area	Preferred Area for sand and gravel	High	n/a*	n/a*
Entire study area	MSA	MSA for sand and gravel	Moderate	Negligible	Negligible (not significant)
Bodymoor Heath	Area of Search	Area of Search for sand and gravel	High	Negligible	Negligible (not significant)

* All effects on Lea Marston Preferred Area are permanent.

Permanent effects

8.4.32 Works will have a permanent effect on the Middleton Hall Extension Preferred Area and part of the Lea Marston Preferred Area, deemed to be of high sensitivity/value. With some loss of the resource, the impact will be moderate giving a moderate adverse effect.

[42] 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.

8.4.33 Although the Sand and Gravel MSA is of moderate sensitivity/value, it covers approximately half of Warwickshire and the impact will be minor (minor loss of resource with no severance). This leads to a negligible effect.

8.4.34 The western edge of the Bodymoor Heath Area of Search will be crossed by the Proposed Scheme. With minor loss of the resource, the impact will be minor giving a minor adverse effect.

8.4.35 Table 18 presents a summary of the assessment of effects on the mining and mineral resources identified.

Table 18: Summary of permanent effects for mining and mineral resources

Site Name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance
Middleton Hall Extension	Preferred Area	Preferred Area for sand and gravel	High	Moderate	Moderate adverse (significant)
Lea Marston	Preferred Area	Preferred Area for sand and gravel	High	Moderate	Moderate adverse (significant)
Entire study area	MSA	MSA for sand and gravel	Moderate	Minor	Negligible (not significant)
Bodymoor Heath	Area of Search	Area of Search for sand and gravel	High	Minor	Minor adverse (not significant)

8.4.36 There are anticipated to be no significant cumulative effects from construction or operation on the mineral resource. 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

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

Other mitigation measures

8.4.38 At this stage, no additional mitigation measures are considered necessary to mitigate risks from land contamination at construction phase beyond those set out in the draft CoCP and instigated as part of required remediation strategies.

8.4.39 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 WCC and any other interested parties to assist in achieving an effective management of minerals within the affected location of the Preferred Areas and the MSA.

8.4.40 Prior extraction of the mineral resource within the Preferred Areas (e.g. Lea Marston and Middleton Hall Extension) will reduce the effect from significant to not significant.

Summary of likely residual significant effects

8.4.41 A permanent residual moderate beneficial effect, which is significant, has been identified where the Proposed Scheme will be constructed at the location of Cocksparrow Farm historical landfill. The landfill will be disturbed by construction of the Leeds spur dive-under, meaning that any contamination encountered will be removed or remediated, thereby reducing potential impacts to the underlying groundwater and human and property receptors.

8.4.42 Residual significant adverse effects are predicted to be associated with the loss of potential mineral extraction at the Middleton Hall Extension and Lea Marston Preferred Areas. The significance of the effect on the mineral resource at these Preferred Areas could be reduced should an agreement for prior extraction be reached.

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 be 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 The Cuttle Mill midpoint auto-transformer station will be situated to the west of the Proposed Scheme just to the north of the Birmingham and Fazeley Canal. 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 receptors due to 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 Curdworth to Middleton 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 this area include:

- temporary effects to LCAs and visual receptors arising during construction from the presence of construction plant, removal of existing vegetation, severance of agricultural land and the Kingsbury Road railhead and associated lighting; 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 established 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 in Volume 5: Appendix LV-001-020, which comprises the following parts:

- 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 have been informed with the North Warwickshire Borough Council (NWBC) and Warwickshire County Council (WCC) although only WCC has formally responded. Landscape characterisation for the study area has been discussed with Natural England. Summer field surveys, including photographic studies of LCAs and visual assessment of viewpoints were undertaken from May to September 2012 and from May to July 2013. Winter surveys were undertaken from December 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 on Volume 5: Map Book – Landscape and visual assessment, Maps LV-07-084b to LV-07-088a and LV-08-084b to LV-08-088a. 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, extensive vegetation cover will mean the actual visibility is substantially less than that 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 in to 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 topography is influenced by the river valley and associated wetlands of the River Tame, at an elevation between 70m and 85m above Ordnance Datum (AOD), except north-east of Curdworth near junction 9 of the M42, where the land rises to 103m AOD. Rising slopes define the northern side of the area. Most of the area is designated as green belt, and the eastern section is designated a Special Landscape Area. Agriculture is predominantly arable, with smaller areas of pasture amongst water bodies including pools, lakes, ponds and the River Tame. Woodlands, including ancient woodlands, tend to be located on the upper slopes of the valley. Principal historic landscape elements include numerous listed buildings. Transport routes include the M6 Toll, M42, several 'A' roads, the Birmingham and Fazeley Canal and a network of Public Rights of Way (PRoW) including the Centenary Way and Heart of England Way long distance footpaths. Notable open spaces within the area include Kingsbury Water Park (a country park), The Belfry golf club and Middleton Hall and Lakes.

9.3.2 The LCA within the area have been determined with reference to the Warwickshire Landscape Guidelines[43], the North Warwickshire Landscape Character Assessment[44] and the Warwickshire, Coventry and Solihull Green Infrastructure Strategy[45].

9.3.3 Descriptions of all LCAs are provided in Volume 5: Appendix LV-001-020, Part 2. For the purposes of this assessment the study area has been sub-divided into four discrete LCAs. The LCAs most likely to be affected are summarised below. The LCAs are shown in Volume 5: Map Book – Landscape and visual assessment, Maps LV-02-084b to LV-02-088a. The remaining LCAs will not be significantly affected.

Cole Valley LCA

9.3.4 This LCA has been derived from the NWLCA, and falls predominantly within the Coleshill Junction area (CFA19), but also partially within the Curdworth to Middleton area (CFA20). The landform of this 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, and 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.

9.3.5 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 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.

Middleton to Curdworth Tame Valley Farmland LCA

9.3.6 This area is predominately open arable land on the slopes of the western Tame Valley. It is fragmented by existing major infrastructure including several 'A' roads, especially in the south. Fields are bounded by often gappy hedgerows. It is sparsely settled with hamlets and villages connected by narrow lanes. The landscape away from the settlements is more open as a result of the paucity of tree cover and the sloping landform. In higher locations, mainly to the north near Middleton, the land rises to allow open panoramic views across the landscape. The dense network of motorways,

[43] Warwickshire County Council and The Countryside Commission (1993), *The Warwickshire Landscape Guidelines*, http://www.warwickshire.gov.uk/landscapeguidelines. Accessed 11 November 2013.
[44] North Warwickshire Borough Council (2010), *Landscape Character Assessment, Final Report*, https://secure.northwarks.gov.uk/site/scripts/download_info.php?downloadID=1668. Accessed 11 November 2013.
[45] Warwickshire County Council (2013), *The Warwickshire, Coventry & Solihull Sub-Regional Green Infrastructure Strategy* (Consultation Draft February 2013), http://askwarks.files.wordpress.com/2013/02/2_sub_reg_gi_strategyconsultation.pdf. Accessed 11 November 2013.

distributor and local roads create high levels of noise and activity, which leads to a low level of tranquillity. Overall, the landscape condition is considered to be fair. There are no landscape related planning designations, but the area lies within green belt, and therefore, is considered to be regionally valued. Therefore, due to the fair condition of its key landscape components, low tranquillity and regional value, this area has a medium sensitivity to change.

Visual baseline

9.3.7 Descriptions of the identified representative viewpoints are provided in Volume 5: Appendix LV-001-020, 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, Map Book – Landscape and visual assessment, Maps LV-07-084b to LV-07-088a and LV-08-084b to LV-08-088a.

9.3.8 No protected views have been identified within the study area.

9.3.9 Residential receptors have a high sensitivity to change and are located on the edges of Middleton and Curdworth, in addition to isolated individual and small groups of properties throughout the study area. Views are typically rural across agricultural land with rooflines of buildings occasionally visible. Some views also include overhead power lines. Views available are often extensive, but in places successive belts of dense mature vegetation bordering fields limit the extent of these.

9.3.10 Recreational receptors, also with a high sensitivity to change, are located on PRoW throughout the study area, including the Heart of England Way and Centenary Way. The viewpoints are typically located in rural agricultural locations, with fields forming the foreground and wooded skylines or hedged field boundaries forming some degree of enclosure.

9.3.11 Viewpoints experienced by people travelling along roads such as A446 Lichfield Road, A4097 Kingsbury Road and a network of country lanes in the area have a medium sensitivity to change. People travelling on major roads (defined as motorways or trunk roads managed by the Highways Agency) have a low sensitivity to change. These views are characterised by elements in the view including the carriageway with adjoining farmland and wooded skylines.

Future baseline

9.3.12 A summary of the committed developments which are assumed to be mostly 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 on Volume 5: Appendix Cross topic maps, Maps CT-13-056 to -058.

Construction (2017)

9.3.13 The existing residential property at Cuttle Mill Fishery (Viewpoint 321.6.006) is assumed to change to employment use as a proposed office complex. Therefore, the sensitivity of the receptor would reduce from high to low.

Operation (year 1 – 2026)

9.3.14 Operation year 1 would be as per construction year 2017 as described above.

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 that 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, Construction of the Proposed Scheme). Overall, civil engineering works in this area will be undertaken between the start of 2017 and the end of 2022.

9.4.2 The A4097 Kingsbury Road overbridge main compound will be in place for approximately six years. Satellite construction compounds will be in place for between approximately one and five and a half years. The civil engineering works at most individual sites along the route in this area will occur for a period of between approximately six months and three years, with the exception of the, Faraday Avenue underbridge, Curdworth cutting and Kingsbury Road railhead, Trickley Coppice embankment (approximately nine years), and the Birmingham and Fazeley Canal viaducts (approximately five and a half 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.

9.4.3 The construction works that have been taken into account in determining the effects on landscape and visual receptors include, ordered from south to north:

- general clearance and earthworks along the route requiring vegetation removal, soil stripping and storage, demolition and clearance of existing structures and buildings, cut/fill and landform modification and the presence of machinery/vehicles, including movement of excavated materials along haul and construction routes;
- establishment of construction compounds and storage areas, including staff accommodation, lay down areas, fuel storage, temporary fencing and signage; A4097 Kingsbury Road overbridge main construction compound and the associated hard standings and lighting;
- construction and operation of Kingsbury Road railhead, materials handling yard and load transformer platforms, including permanent way (ballast and track) installation;
- installation of overhead line equipment, train control systems, signalling, telecommunication systems, and low voltage (LV) line side power;
- construction of Faraday Avenue, Cuttle Mill and Hunts Green underbridges;

viaducts located at Curdworth, the Birmingham and Fazeley Canal, and Langley Brook; and Drayton Bassett viaduct in the adjoining Drayton Bassett Hints and Weeford area (CFA21);

- construction of overbridges at the A4097 Kingsbury Road, Bodymoor Heath Lane, A4091 Tamworth Road, and Church Lane;
- infrastructure and utility diversions, including the fuel pipeline, high pressure gas mains and high voltage National Grid overhead power lines;
- stopping up of and/or realignment of roads, tracks, and PRoW, including erection of temporary structures such as scaffold bridges;
- realignments of watercourses; and
- permanent realignment or diversions of the A4097 Kingsbury Road, Bodymoor Heath Lane, A4091 Tamworth Road, Park Lane, Crowberry Lane and Church Lane.

Avoidance and mitigation measures

9.4.4 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include the following (see Volume 5: Appendix CT-003-000):

- 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); and
- 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).

9.4.5 These measures have been taken account of in the assessment of the construction effects below.

Assessment of temporary impacts and effects

9.4.6 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, hedges, woodland and agricultural land. Changes will be most notable in the vicinity of the Kingsbury Road railhead and the emerging construction of a series of viaducts at Curdworth, Birmingham and Fazeley Canal, Langley Brook and Drayton Bassett; a 'box structure' at the M42; and underbridges at Cuttle Mill, North Wood and Hunts Green. The height of the construction plant and viaducts and the close proximity of construction activities to viewpoints, coupled with the absence of intervening screening (apart

from the site hoardings) will result in significant visual effects during construction. The topography in certain locations and the retention of intervening hedgerows and trees will partially screen low level construction activity.

Landscape assessment

9.4.7 The following section describes the likely significant effects (major and moderate) on the LCA 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-001-020, Part 4.

Cole Valley LCA

9.4.8 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, predominantly in the Coleshill Junction area (CFA19), but partially within the Curdworth to Middleton area. 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.

9.4.9 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.

Middleton to Curdworth Tame Valley Farmland LCA

9.4.10 Construction activities will occur across a large part of this LCA including the establishment of the proposed railhead, traffic movements along haul roads, earthworks, construction compounds, lighting, fencing and the use of tall plant to construct major new structures. This will cause a noticeable increase in the scale of working activity and movement. These activities will also result in major alterations to existing landscape features, such as loss of hedgerows and part of North Wood, degrading the integrity of these key landscape elements.

9.4.11 Overall, the construction of the Proposed Scheme will be at considerable variance with the existing character. Therefore the magnitude of change is considered to be high.

9.4.12 The high magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a major adverse effect.

Visual assessment

9.4.13 The following section describes the likely significant effects (major and moderate) 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 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-001-020, Part 4.

9.4.14 The number identifies the viewpoint locations which are shown in Volume 5, Map Book – Landscape and visual assessment, Maps LV-07-084b to LV-07-088a. In each case, the middle number (xxx.X.xxx) identifies the type of receptor – 2: Residential, 3: Recreational, 4: Transport.

9.4.15 Where a viewpoint may represent multiple types of receptors, the assessment is based on the most sensitive receptor. Effects on other receptor types with a lower sensitivity may be lower than those reported.

Viewpoint 316.2.004: View west from Newlands Farm, off Faraday Avenue

9.4.16 Construction activity associated with the Proposed Scheme, including the Kingsbury Road railhead, will be visible within the foreground. Approximately 300m of the existing boundary vegetation, together with tree planting along Hams Lane and Birch Wood, will be removed to enable the construction of the new underbridge for Hams Hall Lane, link to the existing railway and the new farm access. At close distance to the west the activities associated with the construction of an embankment, track and overhead line equipment will be visible from side windows and from within the grounds. To the south, from the rear of the property, the Faraday Avenue underbridge construction compound and the Curdworth viaduct construction compound will both be visible in the foreground. Tall construction plant related with the construction of the Curdworth viaduct will also be visible in the middle ground, above the intervening vegetation. Whilst these activities will be viewed in the context of existing parked heavy goods vehicles and National Grid overhead power lines they will be visible in close proximity to the visual receptor. Therefore, the magnitude of change is considered to be high.

9.4.17 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoints 319.3.003, 319.3.009 and 319.3.010: Views east from the PRoW (M6/local cycle route), north-east and north from along/adjacent to the Birmingham and Fazeley Canal towpath

9.4.18 Construction activity, including Birmingham and Fazeley Canal construction compounds and the site access track will dominate the foreground of the view. Tall construction plant at the Birmingham and Fazeley Canal viaducts will also be visible in the foreground although in the context of existing overhead power lines. The construction of cuttings and embankments for the main line, Leeds spur and the Kingsbury Road railhead will all be highly visible in the foreground and middle ground. Therefore, the magnitude of change is considered to be high.

9.4.19 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 319.4.006: View east from A4097 Kingsbury Road, A4097 Kingsbury Road

9.4.20 There will be extensive views of construction activities in the foreground to the east of this viewpoint. The creation of the Curdworth cutting will be most prominent and will include the railway connection to the Kingsbury Road railhead and the bridging of this by the A4097 Kingsbury Road. Therefore, the magnitude of change is considered to be high.

9.4.21 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect.

Viewpoint 319.2.007: View east from Dunton Hall

9.4.22 The removal of field boundary vegetation and farm buildings in the immediate vicinity of the viewpoint will open up views of extensive construction activities across the foreground. The most dominant will be the construction of the Curdworth cutting to the east, which will also include the railway connection to the Kingsbury Road railhead site from the Birmingham and Derby railway line. In the middle and background the construction of cuttings and the Birmingham and Fazeley Canal viaducts will also be visible. In combination, these activities will be visible and incongruous with the existing view. Therefore, the magnitude of change is considered to be high.

9.4.23 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.24 At night, continuous lighting of the A4097 Kingsbury Road overbridge construction compound and temporary accommodation site will be visible in the middle ground of the view. Whilst this lighting will be visible in a previously unlit location, it will be viewed alongside other sources of light in the centre of the view. Therefore, the magnitude of change is considered to be high, giving rise to a major adverse effect.

Viewpoint 320.2.003: View west from Reindeer Park Lodge Caravan Park, off A4097 Kingsbury Road

9.4.25 Construction activity associated with the realignment of A4097 Kingsbury Road and the removal of mature vegetation in this location will be highly visible in close proximity to the north. Therefore, the magnitude of change is considered to be high.

9.4.26 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.27 At night, continuous lighting of the A4097 Kingsbury Road overbridge construction compound will be largely obscured by intervening vegetation in the foreground of the view. However, light spill will be apparent as sky glow in the middle ground of the view, set against an entirely unlit background. Therefore, the magnitude of change is considered to be medium, giving rise to a moderate adverse effect.

Viewpoints 320.2.008, 320.2.011 and 322.2.001: Views west from residence adjacent A4097 Kingsbury Road (Wheatley House), north and west from residences (Lea Marston Old School and School House) and west from residential properties and Marston Caravan and Camping Park in Marston, adjacent to the A4097 Kingsbury Road

9.4.28 Activities associated with the Kingsbury Road railhead, and for Viewpoint 322.2.001 the Leeds spur, will be partially screened by substantial mature deciduous vegetation in the foreground and middle ground from the rear of these properties. Tall construction plant, storage and lighting will also be visible. However, they will be viewed in the context of the existing National Grid overhead power lines. 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 receptors will result in a moderate adverse effect.

Viewpoints 320.2.009 and 320.3.005: Views to north and north-west from residences adjoining Mullensgrove Farm and west from Byway (M450) and Historic Green Lane, Marston Lane

9.4.30 There will be widespread visibility of the construction of the Proposed Scheme from these viewpoints, including in the foreground. The removal of several buildings within Mullensgrove Farm, agricultural land and vegetation within residential gardens together with the introduction of the A4097 Kingsbury Road overbridge construction compound will be visible.

9.4.31 The construction of deep cuttings and embankments will also be highly visible in the foreground and middle ground. The removal of young woodland off Marston Lane for the construction of the Leeds spur and Kingsbury Road railhead site in the middle ground will be visible. Tall construction plant at the Birmingham and Fazeley Canal viaducts will be highly visible in the background, although in the context of existing dominant vertical structures of the overhead power lines. Overall, the magnitude of change is considered to be high.

9.4.32 The high magnitude of change assessed alongside the high sensitivity of these receptors will result in major adverse effects.

9.4.33 At night, continuous lighting of the Kingsbury Road railhead will be visible in the foreground of the view. Whilst this lighting will be highly visible at close proximity in a previously unlit location, it will be viewed alongside other sources of light in the centre of the view. Therefore the magnitude of change is considered to be high, giving rise to a major adverse effect.

Viewpoints 320.4.012 and 322.3.002: View north and west from A4097 Kingsbury Road, west of Marston and view west from PRoW Bridleway (M23a), off Seeney Lane

9.4.34 Activities associated with the Kingsbury Road railhead will be visible in the foreground and middle ground of views from A4097 Kingsbury Road and Seeney Lane. However they will be viewed in the context of the existing National Grid overhead power lines. Therefore, the magnitude of change is considered to be medium.

9.4.35 The view of the Proposed Scheme from 322.3.002 during construction is illustrated on the photomontage shown in Volume 2: Map Book CFA20, LV01-205.

9.4.36 The medium magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 321.2.001: View south-east from Grange Farm Cottages, off the A4091 Tamworth Road

9.4.37 Construction activities will be visible in the middle and background. Tall construction plant at the Birmingham and Fazeley Canal viaduct will be visible, although in the context of the dominant vertical structures of the existing pylons. Construction activities associated with the North Wood embankment, balancing pond area and auto-transformer station and of A4097 Kingsbury Road overbridge and Birmingham and Fazeley Canal viaduct construction compounds will be partially visible behind undulating landform and vegetation in the middle ground. Overall, due to the openness of the view and the distance of construction activities from the viewpoint, the magnitude of change is considered to be medium.

9.4.38 The medium magnitude of change assessed against the high sensitivity of this receptor will result in a moderate adverse effect.

9.4.39 At night, continuous lighting of the Kingsbury Road railhead, construction compounds and temporary accommodation site will be visible in the middle ground of the view but will be partially obscured by intervening vegetation in the middle ground Therefore the magnitude of change is considered to be medium, giving rise to a moderate adverse effect.

Viewpoints 321.2.004 and 321.3.005: Views east from private residence within The Belfry golf club and from Historic Green Lane, Cuttle Mill Lane

9.4.40 Construction activities will be visible in the middle ground from these locations. Tall construction plant at the Cuttle Mill underbridge will be visible, although in the context of the dominant vertical structures of the existing pylons. It is likely that construction activities associated with North Wood embankment balancing pond area and auto-transformer station, including access track, will be visible from the second storey of this property. Tall construction plant at the Birmingham and Fazeley Canal viaducts will also be visible in the background. Therefore, the magnitude of change is considered to be high.

9.4.41 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 321.6.006 (future baseline): View north-east from Cuttle Mill Fishery and office

9.4.42 Views of construction activity will be extensive, including the Cuttle Mill underbridge construction compound and local worksite and site access track in the immediate foreground, which will be prominent in views. Tall construction plant related with the construction of the Cuttle Mill underbridge will also be visible and incongruent in the foreground. The loss of mature trees within North Wood will also be visible. Therefore, the magnitude of change is considered to be high.

9.4.43 The assessment above assumes the conversion of the existing residential use to office use. If the receptor remains residential its sensitivity will remain high resulting in a major adverse effect.

9.4.44 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 321.2.012 (assumed to be in residential use): View north-east from residence within Cuttle Mill Fishery

9.4.45 There will be extensive views of construction activity within the foreground. Large plant related with the construction of Cuttle Mill underbridge and North Wood embankment will also be noticeable but partially filtered by vegetation along the boundary of the property. Therefore, the magnitude of change is considered to be medium.

9.4.46 The medium magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a moderate adverse effect.

Viewpoints 322.2.003 and 324.3.001: Views west from residence adjacent to Bodymoor Heath Lane and from PRoW (Footpath T26) and Bodymoor Heath Lane

9.4.47 Activities associated with the Kingsbury Road railhead and Leeds spur will be visible in the middle ground. These new elements will be incongruous with the existing character of the view and viewed on a ridgeline. Therefore, the magnitude of change is considered to be high.

9.4.48 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in a major adverse effect.

Viewpoints 322.3.005 and 324.3.007: Views west from Seeney Lane Bridleway (T154), as it crosses the M42 and south-east from PRoW Footpath (T26), near to Marston Farm Hotel, south of Bodymoor Heath

9.4.49 Construction activity associated with the Proposed Scheme will be visible in the middle ground. Activities associated with the Kingsbury Road railhead will be partially visible through intervening vegetation in the middle ground. However, tall construction plant at the Cuttle Mill underbridge will be visible. The removal of part of North Wood will also alter a key characteristic of the existing view. Therefore, the magnitude of change is considered to be medium.

9.4.50 The medium magnitude of change assessed alongside the high sensitivity of the receptors will result in moderate adverse effects.

Viewpoints 322.3.006 and 324.3.006: Views west from junction of PRoW Footpath (T18) and Bridleway (T154) to the east of North Wood and from the Birmingham and Fazeley Canal towpath near to Cheatle's Farm Bridge

9.4.51 The Cuttle Mill underbridge construction compound and local worksite and site access track will be visible in the foreground. Tall construction plant at Cuttle Mill, Hunts Green and North Wood underbridges will also be visible, together with the demolition of Middleton House Farm and loss of mature trees at North Wood. There will also be

views of the formation of North Wood embankment in the middle ground. Due to the open views from these viewpoints, the magnitude of change is considered to be high.

9.4.52 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 322.2.009: View north-east from the residential property at Dunton Stables, off Marston Lane

9.4.53 Construction activity including tall construction plant at North Wood embankment will be visible within the foreground to the north, above the mature boundary vegetation located within the grounds of the property. It is also likely that tall construction plant related to the construction of the Birmingham and Fazeley Canal viaduct will be visible to the west and south.

9.4.54 The construction of Cuttle Mill underbridge, Dunton Wood embankment and Curdworth cutting and the location of Cuttle Mill underbridge construction compound and the Birmingham and Fazeley Canal viaduct construction compound will also be visible in the middle ground, to the north and south, beyond the activity in the foreground. It is likely that due to the close proximity of the receptor to the construction activities, these will be continuously highly visible and incongruous within the existing view. Therefore, the magnitude of change is considered to be high.

9.4.55 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

9.4.56 At night, continuous lighting of the construction compounds will be visible in the foreground of the view but be partially obscured by intervening vegetation. Therefore the magnitude of change is considered to be medium, giving rise to a moderate adverse effect.

Viewpoint 322.3.010: View south-west along the Birmingham and Fazeley Canal (local cycle route 017)

9.4.57 Construction activity, including Birmingham and Fazeley Canal satellite compound (north) and the site access track will dominate the foreground of the view. Tall construction plant at the Birmingham and Fazeley Canal viaduct will also be visible in the foreground although in the context of existing overhead power lines. The construction of cuttings and embankments for the main line, Leeds spur and the Kingsbury Road railhead will all be visible in the foreground and middle ground. Therefore, the magnitude of change is considered to be high.

9.4.58 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects.

Viewpoint 323.3.001: View east across The Belfry golf course from Wishaw Lane

9.4.59 Construction activities associated with the Bodymoor Heath Lane diversion and the Hunts Green and North Wood underbridges including views of Bodymoor Heath Lane overbridge and Primrose culvert construction compounds and plant and material storage areas will be partially visible in the middle ground of the view. Therefore, the magnitude of change is considered to be medium.

9.4.60 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 323.2.002: View north-east from Maple Leaf Farm on the A4091 Tamworth Road

9.4.61 The removal of vegetation along the A4091 Tamworth Road and Bodymoor Heath Lane will open up views of construction activity in the foreground and middle ground. There will be oblique views of the Bodymoor Heath Lane overbridge construction compound in the foreground. There will also be views of the construction of Bodymoor Heath Lane overbridge and Hunts Green underbridge; the demolition of part of Middleton House Farm and the formation of North Wood embankment and the construction of a new auto-transformer station within the property boundary. Given that views of construction activity in close proximity will be open the magnitude of change is considered to be high.

9.4.62 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

Viewpoint 323.2.004: Views north, south and east from The Bungalow and Middleton House Farm

9.4.63 The removal of vegetation along the A4091 Tamworth Road and Bodymoor Heath Lane will open up views of construction activity in the vicinity. The use of A4091 Tamworth Road as a construction route will increase views of heavy goods vehicles (HGVs). The construction of the Bodymoor Heath Lane overbridge, the Hunts Green underbridge and the North Wood underbridge including tall construction plant will be visible in the foreground. There will also be views of the works associated with the demolition of part of Middleton House Farm including Primrose culvert construction compound in the foreground. Given the substantial amount of construction activity within close proximity to the receptors the magnitude of change is considered to be high.

9.4.64 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

9.4.65 At night, continuous lighting of the construction compound will be highly visible in the foreground of the view. Therefore the magnitude of change is considered to be high, giving rise to a major adverse effect.

Viewpoint 324.3.002: View south and west from the public cycleway on the Birmingham and Fazeley Canal towpath. This view is also likely to be similar to the view from the grounds of the Brook Marston Farm Hotel

9.4.66 Construction activities associated with the North Wood embankment and Hunts Green underbridge as well as the demolition of part of Middle House Farm will be partially visible, through intervening vegetation, in the middle ground. Therefore the magnitude of change is considered to be medium.

9.4.67 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 324.2.004 and 324.3.003: Views west from residences around Bodymoor Heath Lane and from PRoW Footpath (T18) near Homestead Farm, off Bodymoor Heath Lane

9.4.68 Extensive areas of vegetation will be removed over a large part of the view including along Bodymoor Heath Lane and hedgerows opening up views across the flat floodplain to construction activity in the vicinity. There will be views of the construction of Bodymoor Heath Lane overbridge, Hunts Green underbridge and longer distance views to the construction of the North Wood underbridge. There will also be views of the demolition of part of Middleton House Farm and the formation of the North Wood embankment and Bodymoor Heath Lane embankments. Overall this will result in a high magnitude of change.

9.4.69 The high magnitude of change, assessed alongside the high sensitivity of the receptors, will result in major adverse effect.

Viewpoints 325.2.005 and 325.3.007: Views east from rear of properties on Wishaw Lane, Hunts Green Farm and from PRoW Footpath (T17) near Hunts Green Farm

9.4.70 Construction activities associated with the Bodymoor Heath Lane overbridge and the associated construction compound will be highly visible in the middle ground situated beside Park Lane to the rear of the properties. Therefore, the magnitude of change is considered to be high.

9.4.71 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effect.

Viewpoint 325.2.006: View south and east from Pool House Farm on the corner of Brick Kiln Lane and the A4091 Tamworth Road

9.4.72 The removal of vegetation along the A4091 Tamworth Road and Bodymoor Heath Lane will open up views to construction activity in the vicinity. Use of A4091 Tamworth Road as a construction route will increase views of large vehicles. There will be views of the construction of Bodymoor Heath Lane overbridge, Hunts Green underbridge and North Wood underbridge, including the presence and operation of tall plant, in the foreground. There will also be views of the demolition of part of Middleton House Farm and the Bodymoor Heath Lane overbridge construction compound in the foreground. Given the substantial amount of construction activity visible within close proximity to the receptors the magnitude of change is considered to be high.

9.4.73 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

Viewpoint 326.3.003: View west from PRoW Footpath (T17) adjacent to Bodymoor Heath Training Grounds

9.4.74 The removal of trees along part of the boundary with Bodymoor Heath Training Ground and along the A4091 Tamworth Road will be noticeable, opening up views of construction activity around Bodymoor Heath Lane and to the Proposed Scheme. Considering the context of the existing highly disturbed landscape, the magnitude of change is considered to be medium.

9.4.75 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 326.7.004: View south-west from Bodymoor Heath Training Grounds

9.4.76 The extensive removal of boundary tree screening will open up views of construction activity adjacent to the A4091 Tamworth Road and around Bodymoor Heath Lane in the foreground. Tall construction plant will also be visible at Bodymoor Heath Lane overbridge and Hunts Green underbridge, and earthworks construction activities at North Wood embankment in the foreground. Given the extent and proximity of construction activity the magnitude of change is considered to be high.

9.4.77 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 326.2.006 and 326.3.002: Views west and south-west from Primrose Cottage, Bodymoor Heath Lane and west from PRoW Bridleway (T21) near Lower Farm

9.4.78 Due to the flat terrain and the extensive clearance of vegetation, views will be opened up across the surrounding landscape. Construction activities associated with the realigned A4091 Tamworth Road and diverted Bodymoor Heath Lane and overbridges and the Hunts Green and North Wood underbridges and the demolition of part of Middleton House Farm all within close proximity of the property will result in a high magnitude of change.

9.4.79 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 327.2.001: View north-east from properties on the corner of Church Lane and Crowberry Lane, Middleton

9.4.80 There will be an extensive loss of mature vegetation in the foreground and middle ground. This will include hedgerows and trees along both sides of Church Lane and to the front of the properties and a portion of Walker's Spinney adjacent to Church Lane. There will be views of construction and construction traffic relating to the Church Lane overbridge in the foreground. Given the amount of construction in close proximity the magnitude of change is considered to be high.

9.4.81 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect.

9.4.82 At night, continuous lighting of the Church Lane overbridge construction compound will be visible in oblique views from the rear of the property, in a currently unlit location. Therefore the magnitude of change is considered to be medium, giving rise to a moderate adverse effect.

Viewpoint 327.4.002: View east from Park Lane, near Middleton

9.4.83 The realignment of the A4091 Tamworth Road and new overbridge, the diversion of Park Lane and the junction with Crowberry Lane will be visible in the foreground. Therefore, the magnitude of change is considered to be high.

9.4.84 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a moderate adverse effect.

Viewpoints 327.3.003 and 327.3.004: Views east from PRoW Footpath (T15) between Roger's Coppice and Park Lane and from PRoW Footpaths (T15 andT6) near Roger's Coppice

9.4.85 Activities associated with the construction of Langley Brook viaduct will be visible in the middle ground. From Viewpoint 327.3.003 there will be open views across the flat landscape towards the Crowberry Lane diversion. Views will include the A4091 Tamworth Road overbridge construction compound which will be visible in the middle ground. Therefore, the magnitude of change is considered to be high.

9.4.86 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 328.3.001: View west from Middleton Hall

9.4.87 Clearance of vegetation will open up views to the construction of the A4091 Tamworth Road overbridge and Middleton Pool cutting. Given the degree of change in the view and the proximity of construction activity, the magnitude of change is considered to be high.

9.4.88 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 328.3.002: View south-west from PRoW Footpath (T22) on the grounds of Middleton Hall

9.4.89 The removal of some trees along the A4091 Tamworth Road will partially open up views to the construction of Langley Brook viaduct and traffic on the A4091 Tamworth Road. Use of the A4091 Tamworth Road and Church Lane as construction routes will increase views of HGVs along the parkland perimeter. Therefore, the magnitude of change is considered to be medium.

9.4.90 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect.

Viewpoint 328.4.006: View west from Church Lane, Middleton

9.4.91 There will be a noticeable loss of mature vegetation including trees along Langley Brook and nearby hedgerows. This will open up views of the construction of Church Lane embankment and the Footpath (T15) accommodation overbridge as well as views of construction of extensive earthworks at Coppice Lane cutting and Trickley Coppice embankment. Therefore, the magnitude of change is considered to be high.

9.4.92 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect.

Viewpoints 328.2.008 and 329.2.001: Views west from Park Gate House and Park Gate Farm on the corner of Church Lane and the A4091 Tamworth Road and north-east from properties on the north-eastern edge of Middleton

9.4.93 The extensive removal of hedgerows in the middle ground close to Gallows Brook and along Church Lane will be visible from some properties. HGV movement will be visible from some properties along Coppice Lane in the middle ground. There will also be views of the construction of Church Lane overbridge, the Footpath (T15) accommodation overbridge and the culverting of Gallows Brook in the middle ground. There will be views of extensive earthworks associated with the formation of Trickley Coppice embankment and false cuttings as far as the Drayton Basset viaduct (in the Drayton Bassett, Hints and Weeford area (CFA21)). There will be views of the construction of noise fence barriers between Church Lane and Gallows Brook in the middle ground. Given the extent and proximity of these activities the magnitude of change is considered to be high.

9.4.94 The high magnitude of change assessed against the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 328.3.009: View south from PRoW Footpath (T15) looking toward Church Lane, Middleton

9.4.95 There will be a noticeable loss of trees around Walker's Spinney, hedgerows along Church Lane and in fields around Gallows Brook with close views of the construction of Church Lane overbridge. There will also be views of the construction of earthworks at Coppice Lane cutting and Trickley Coppice embankment as far as the Drayton Basset viaduct (in the Drayton Bassett, Hints and Weeford area (CFA21). Therefore, the magnitude of change is considered to be high.

9.4.96 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Cumulative effects

9.4.97 Volume 5: Appendix CT-004-000 and Volume 5: Map CT-13-056 to CT-13-058 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.

9.4.98 There are no committed developments which are known 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

9.4.99 To further reduce the significant effects described above, consideration of where planting can be established early in the construction programme will be given during the detail 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

9.4.100 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 that have been taken into account in determining permanent effects on landscape and visual receptors include, ordered from south to north:

- Faraday Avenue embankment and Faraday Avenue underbridge;
- Curdworth cutting and retaining wall; A4097 Kingsbury Road overbridge; and Footpath M16 accommodation overbridge;
- Leeds spur;
- Dunton Wood embankment and the viaduct crossing of the Birmingham and Fazeley Canal;
- accommodation tracks to balancing ponds and auto-transformer station near to Middleton House Farm;
- Cuttle Mill underbridge and North Wood embankment and underbridge, together with the loss of part of the North Wood ancient woodland;
- Hunts Green underbridge and Bodymoor Heath Lane overbridge, including the diversion and an overbridge for Bodymoor Heath Lane;
- realignment of the A4091 Tamworth Road, including a new overbridge;
- realignment and overbridge for Church Lane, to the north of Middleton;
- permanent realignment of Seeney Lane and new overbridge;
- Coppice Lane cutting, Footpath (T15) accommodation overbridge, Trickley Coppice embankment including acoustic and landscape mitigation mounds, and the Drayton Bassett viaduct (in the Drayton Bassett, Hints and Weeford area (CFA21));
- overhead line equipment, trains and security fencing; and
- general modifications of landform including cutting and embankment, landform modifications of the railhead site, land profiling for acoustic mitigation, areas of new planting and ecological compensation, footpath diversions, balancing ponds and access tracks, and noise fence barriers.

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 design of the landscape environment around the Proposed Scheme will ensure the creation of a well-connected landscape that helps to alleviate flooding, benefits biodiversity and recreation and is robust and has the capacity to adapt to climate change impacts;
- reflecting the sensitivity of this area, viaducts have been specifically designed to reduce the vertical alignment and reduce visual intrusion;
- embankments and cuttings both for the route of the Proposed Scheme and highway realignments have been shaped so as to integrate the Proposed Scheme into the character of the surrounding landscape;
- where it is considered that a noise fence barrier would create a visual impact on neighbouring residential properties a landscape bund will be provided where reasonably practicable;
- balancing ponds will be integrated into the landscape to alleviate flooding and also provide opportunities for biodiversity; and
- planting, including native broad-leaved woodland, shrub and hedgerows, will be implemented along various sections of the Proposed Scheme to screen the Proposed Scheme from neighbouring residential properties and users of adjacent PRoW and to aid integration of the Proposed Scheme into the landscape. Selection of species will reflect local vegetation and will 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 These measures have been taken account of in the assessment of the operational effects.

Assessment of impacts and effects

9.5.4 The likely significant effects on the landscape character and viewpoints in operation will arise from new engineered landforms cutting across the existing landscape; the introduction of new viaducts with associated infrastructure; the introduction of noise fence barriers that will create a manmade 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 obscured by the rising landform, retention of intervening hedgerows and trees and the routing of the Proposed Scheme within a cutting. Furthermore, effects will reduce over time as planting established as part of the Proposed Scheme matures.

Landscape assessment

9.5.5 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-001-020, Part 4.

9.5.6 The assessment of effects in year 15 assumes proposed planting has grown by approximately 450mm a year (i.e. trees would be 7-7.5m high). The assessment of effects in year 60 assumes all planting has reached its fully mature height.

Cole Valley LCA

9.5.7 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, predominantly within the Coleshill Junction area (CFA19), but also partially within the Curdworth to Middleton area (CFA20). 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 which 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 which are all footpaths including PRoW M77, M54, M43 and M60, which are a minor alteration to the existing PRoW network.

9.5.8 Given the context of existing major infrastructure, the operation of the Proposed Scheme through this LCA will not noticeably alter tranquillity.

9.5.9 Therefore, due to the Proposed Scheme introducing prominent elements that are either largely characteristic of the existing infrastructure setting or that will result in a

partial loss to the landscape character, the magnitude of change is considered to be medium in year 1 of operation.

9.5.10 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.

9.5.11 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-001-020, Part 4.

Middleton to Curdworth Tame Valley Farmlands LCA

9.5.12 The route of the Proposed Scheme will pass through a large section of this LCA.

9.5.13 Landscape impacts of the proposed scheme will include the introduction of steep sided embankments and cuttings, for both the siting of the track bed and sound abatement. New built components such as viaducts, overhead line equipment, overbridges and noise fence barriers will be prominent new elements at variance to the existing character of this generally flat landscape.

9.5.14 The inclusion of scheme planting to replace that lost during the construction phase will not be apparent in year 1. The introduction of built components, such as viaducts, and overbridges will be new elements within the LCA which will be prominent but largely characteristic with other existing features, such as roads, motorways and National Grid overhead power lines, which are already present within this character area.

9.5.15 Therefore, overall the magnitude of change on this LCA is considered to be medium in year 1 of operation.

9.5.16 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.

9.5.17 The operational effects for this character area will remain unchanged in year 15 compared to year 1 because of the limited additional change in character and setting arising from the maturity of planting.

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 15 of operation.

9.5.19 By year 60 of operation, the maturity of planting will further integrate the Proposed Scheme into the landscape resulting in effects becoming non-significant. This is reported in Volume 5: Appendix LV-001-020, Part 3.

9.5.20 Given the context of existing major infrastructure, the operation of the Proposed Scheme through this LCA will not noticeably alter tranquillity.

9.5.21 The Proposed Scheme will introduce prominent elements that are either largely characteristic of the existing infrastructure setting or that will result in a partial loss of characteristic landscape components. Overall, the magnitude of change is considered to be medium in year 1 of operation.

9.5.22 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.

9.5.23 By years 15 and 60 of operation, planting will have established and matured, aiding in the integration of the embankments and further reflecting the existing landscape character. This will reduce the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Visual assessment

9.5.24 This section describes the significant effects (major and moderate) 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-001-020, Part 4.

9.5.25 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.

9.5.26 Where significant effects have been identified, an assessment of effects at night time arising from additional lighting has also been undertaken.

9.5.27 The number identifies the viewpoint locations which are shown in Volume 5, Map Book – Landscape and visual assessment, Map Book LV-08-084b to LV-08-088a. In each case, the middle number (xxx.X.xxx) identifies the type of receptor – 2: Residential, 3: Recreational, 4: Transport.

9.5.28 Where a viewpoint may represent multiple types of receptors, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

9.5.29 The view of the Proposed Scheme from viewpoint 322.3.002 (illustrated in the photomontage shown in Figure LV-01-133) (Volume 2, CFA# Map Book)) would not be significantly affected during operational period due to the removal of the Kingsbury Road railhead.

Viewpoint 316.2.004: View west from Newlands Farm, off Faraday Avenue

9.5.30 Visible elements of the Proposed Scheme will include overhead line equipment, multiple tracks, train traffic and the proposed cutting for the underbridge at Faraday Avenue. These elements will be located in the foreground of the view (north to west) and viewed at close proximity in the direct frame of the view. It is likely that the passing trains, overhead line equipment and noise fence barrier on the Curdworth viaduct will be visible from the upper storeys of the rear of this property. Therefore, the magnitude of change is considered to be high in year 1 of operation.

9.5.31 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 of operation.

9.5.32 In summer of year 1 of operation, there will be no change to the effects as upper elements of the scheme will remain clearly visible.

9.5.33 By year 15 of operation, although proposed planting on the adjacent embankments and cuttings will provide some screening, the upper elements of the Proposed Scheme, including the overhead line equipment, will remain clearly visible beyond. Therefore effects will be unchanged from major adverse.

9.5.34 By year 60 of operation there will be no change to the effects from major adverse.

Viewpoints 319.3.003 and 319.3.009: Views east from the PRoW (M6/local cycle route) adjacent to the Birmingham and Fazeley Canal and north-east and south-east adjacent to the Birmingham and Fazeley Canal towpath

9.5.35 The Proposed Scheme will be visible as will the Birmingham and Fazeley Canal viaducts. The overhead line equipment and trains on Dunton Wood embankment will also be visible in the foreground. There will also be an extensive change in landform at the Curdworth cutting visible in the middle ground. Overall, the introduction of these new elements will result in major alterations to the existing view. Whilst these elements will be viewed in the context of the M42 and National Grid overhead power lines, they will be viewed in close proximity. Therefore, the magnitude of change is considered to be high.

9.5.36 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 of operation.

9.5.37 In summer of year 1 of operation the screening provided by the canalside vegetation will reduce visibility of the overhead line equipment, trains on the Birmingham north chord at Dunton Wood embankment and the Birmingham and Fazeley Canal viaducts. Therefore the effects will reduce to moderate adverse.

9.5.38 By year 15 of operation, planting will begin to restrict views of passing trains. However the overhead line equipment on Dunton Wood embankment and passing trains and overhead line equipment on the Birmingham and Fazeley Canal viaducts will still be visible. The effects will therefore remain unchanged at moderate adverse.

9.5.39 By year 60 of operation, the proposed planting will screen views of the passing trains and overhead line equipment in the foreground and middle ground. It is also likely that the planting will largely filter views of the trains and lower limits of the overhead line equipment over the Birmingham and Fazeley Canal viaducts, reducing the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 319.4.006: View east from A4097 Kingsbury Road, A4097 Kingsbury Road

9.5.40 The foreground will be dominated by views of the cuttings and retaining wall associated with the Curdworth cutting. Views of the overhead line equipment and passing trains will be partially screened by the Curdworth cutting. The loss of woodland off Marston Lane, in the middle ground, to accommodate the Leeds spur, will be visible. The Birmingham and Fazeley Canal viaducts, passing trains and overhead line equipment in the middle ground will be visible. There will be extensive views of new elements and changes to landform in the foreground and middle ground. Whilst these elements will be set in the context of the M42 and existing

National Grid overhead power line, they will be still be visible. Therefore, the magnitude of change is considered to be high.

9.5.41 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.42 In summer of year 1 of operation, the openness of the view will remain and effects will be unchanged at major adverse.

9.5.43 By year 15 of operation, planting will have not matured sufficiently to reduce effects from major adverse.

9.5.44 By year 60 of operation, proposed planting will have integrated the extensive landform changes and will partially restrict views of passing trains and overhead line equipment. It is also likely that planting will filter views of the trains and the lower parts of the overhead line equipment over the Birmingham and Fazeley Canal viaducts. However, planting will not provide any screening from the A4097 Kingsbury Road overbridge. Therefore effects will reduce to moderate adverse.

Viewpoint 319.2.007: View east from Dunton Hall

9.5.45 The cuttings, retaining wall and tunnel for the Proposed Scheme will be below the existing ground level in order to accommodate the multiple tracks of the mainline and Leeds spur, these elements will be visible to the south-east of this viewpoint. From upper storeys it is likely that the overhead line equipment and passing trains will also be visible in the foreground along with the diverted A4097 Kingsbury Road, which will run parallel to the east of the main line. In the middle ground, the proposed bund with planting will be visible to the south. Longer views to the north-east will be maintained, although elements such as the Birmingham and Fazeley Canal viaducts and noise fence barrier will be visible in this direction. Overall, the magnitude of the change is considered to be high.

9.5.46 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 of operation.

9.5.47 In summer of year 1 of operation, the openness of the view will remain, as per the winter view. The magnitude of change is considered to remain high meaning the overall effect will be unchanged.

9.5.48 By year 15 of operation, proposed planting will have established to provide some screening and will reduce the magnitude of change to medium. The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect by year 15 of operation.

9.5.49 By year 60 of operation, the planting established will have grown to a sufficient height to reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 319.3.010: View north from the towpath adjacent to Birmingham and Fazeley Canal

9.5.50 The Proposed Scheme will be visible in the foreground at the Birmingham and Fazeley Canal viaducts. In the middle ground the North Wood embankment and the

accommodation access track for the canalside properties will be visible and changes to the foreground views will therefore be substantial. Therefore the magnitude of change is considered to be high.

9.5.51 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 of operation.

9.5.52 In summer of year 1 of operation, effects will be unchanged due to the proximity of the Proposed Scheme and lack of intervening vegetation.

9.5.53 By year 15 and beyond to year 60 of operation, the proximity of the Proposed Scheme and lack of intervening vegetation means effects will remain at major adverse.

Viewpoint 320.2.003: View west from Reindeer Park Lodge Caravan Park, off A4097 Kingsbury Road

9.5.54 Elements of the Proposed Scheme will be visible in the foreground including the realigned access road to the caravan park. It is not anticipated that the tracks will be visible due to the substantial cutting (Curdworth cutting) at this point. Intervening landform and vegetation means that there will be partial views of the A4097 Kingsbury Road overbridge in the middle ground. Therefore the magnitude of change is considered to be medium.

9.5.55 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.

9.5.56 In summer of year 1 of operation, effects will be unchanged due to the proximity of the Proposed Scheme and lack of intervening planting.

9.5.57 By year 15 and beyond to year 60 of operation, the proposed planting will have matured sufficiently to reduce effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoints 320.2.009 and 320.3.005: Views from Mullensgrove Farm and adjoining residences and north and west from Byway (M450) and Historic Green Lane, Marston Lane

9.5.58 It is likely that the foreground of these views will be dominated by the modified landform of the cuttings associated with the Leeds spur and mainline and associated A4097 Kingsbury Road overbridge. The magnitude of change is considered to be high.

9.5.59 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 of operation.

9.5.60 In summer of year 1 of operation the openness of the view will remain as per the winter view. The magnitude of change is considered to remain high meaning the overall effect will be unchanged.

9.5.61 After 15 years, fencing and planting will be visible in the foreground, with the route on embankment and the viaduct visible in the middle ground. Growth of the scheme planting adjacent to the property boundaries and on the upper cutting slopes will begin to screen views of passing trains. This will reduce the magnitude of change to low. The low magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect by year 15 of operation.

9.5.62 The view of the Proposed Scheme from 320.3.005 during Year 1 and Year 15 is illustrated on the photomontages shown in LV01-131 and LV01-251. (CFA20 Map Book).

9.5.63 By year 60 of operation, the planting established will have grown to a sufficient height to reduce effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoints 321.2.004 and 321.3.005: Views east from private residence within The Belfry golf club and from Historic Green Lane, Cuttle Mill Lane

9.5.64 The Cuttle Mill underbridge and the North Wood embankment will be visible from second storey windows. These elements will appear distant and set within the context of existing vegetation, the M42 and overhead power lines. Therefore, the magnitude of change is considered to be medium in year 1 of operation.

9.5.65 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.

9.5.66 In summer of year 1 of operation the openness of the views will remain as per the winter view. The magnitude of change will remain medium meaning the overall effect will be unchanged.

9.5.67 By year 15 of operation, growth of the planting will begin to screen the views of passing trains. The overhead line equipment will remain visible. The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect by year 15 of operation.

9.5.68 By year 60 of operation the scheme planting will almost restrict views of the passing trains and overhead line equipment meaning effects on these viewpoints will be non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 321.6.006: View north-east from Cuttle Mill Fishery and office complex (future baseline)

9.5.69 As set out in Section 9.3.12, this development is assumed to be mostly built and occupied in advance of year 1 of operation of the Proposed Scheme. There are limited opportunities to provide screen planting adjacent to the route at this location, where Cuttle Mill underbridge is located. The underbridge, noise fence barrier, overhead line equipment and passing trains will be highly visible in close proximity. Therefore, the magnitude of the change is considered to be high.

9.5.70 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 of operation.

9.5.71 In summer of year 1 of operation, it is considered that there will be no change to the assessment as the openness of the view will remain as per the winter view.

9.5.72 By year 15 of operation it is considered that effects will remain as moderate adverse.

9.5.73 By year 60 of operation, the proposed planting will have grown to a sufficient height to reduce effects to being non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 321.2.012: View north-east from residential property within Cuttle Mill Fishery

9.5.74 Views of Cuttle Mill underbridge, overhead line equipment and passing trains will be partially visible through intervening vegetation located within the property's grounds. Therefore, the magnitude of the change is considered to be medium.

9.5.75 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.

9.5.76 In summer of year 1 of operation and continuing to year 15 and year 60 of operation, existing established vegetation located within and adjacent to the property's boundary will provide additional screening reducing the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 322.3.005: View west from Byway/Bridleway (T154), as it crosses the M42

9.5.77 The Proposed Scheme, including overhead line equipment and passing trains, will be visible in the middle ground on Cuttle Mill underbridge. The partial loss of North Wood will open up views of the Proposed Scheme which will be highly visible. Therefore, the magnitude of change is considered to be medium.

9.5.78 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.

9.5.79 In summer of year 1 of operation the openness of the views will remain as per the winter view meaning the overall effect will be unchanged.

9.5.80 By year 15 of operation, screen planting will yet to have matured and the Cuttle Mill underbridge together with the overhead line equipment and passing trains will remain visible, meaning the overall effect will remain unchanged from year 1.

9.5.81 By year 60 of operation, matured planting will almost entirely obscure views of the North Wood embankment and the overhead line equipment and passing trains meaning effects on this viewpoint will be non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoints 322.3.006 and 324.3.006: Views west from PRoW Footpath (T18) to the east of North Wood and from Birmingham and Fazeley Canal and traffic-free cycle route, near to Cheatle's Farm Bridge

9.5.82 The Proposed Scheme will be visible in the foreground and middle ground on the Cuttle Mill underbridge and a section of the North Wood underbridge with overhead line equipment and passing trains will also be visible. The North Wood embankment will be visible crossing the floodplain in the middle ground. The gently graded embankments of the North Wood embankment and the partial loss of North Wood will be a noticeable change and together with the many visible new elements the magnitude of change is considered to be high.

9.5.83 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 of operation.

9.5.84 In summer of year 1 of operation the openness of the views will remain so the effect will continue as major adverse.

9.5.85 By year 15 of operation the openness of the views will remain and planting will not have matured sufficiently to reduce impacts so the effect will remain as major adverse.

9.5.86 By year 60 of operation the mature growth of the scheme planting will restrict views of North Wood embankment, overhead line equipment and passing trains, reducing the effects from the viewpoints to moderate adverse. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 322.2.009: View north-west from the residence at Dunton Stables, off Marston Lane

9.5.87 The Proposed Scheme will be partially visible on North Wood embankment in the foreground, through mature vegetation. This view will include the Birmingham and Fazeley Canal viaduct, overhead line equipment and passing trains. The Leeds spur and the loss of woodland at Marston Lane/Barn Covert will also be visible in the context of the M42 where the route will pass over the motorway. Views will be partially filtered by intervening vegetation. Therefore, the magnitude of change is considered to be medium.

9.5.88 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.

9.5.89 In summer of year 1 operation, vegetation in the foreground will further screen views but will not provide total screening. The magnitude of change is therefore considered to remain at medium.

9.5.90 By year 15 and beyond to year 60 of operation, although vegetation in the foreground will have matured, the Birmingham and Fazeley Canal viaduct, overhead line equipment and passing trains will remain clearly visible. The effect will therefore remain unchanged at moderate adverse.

9.5.91 The view of the Proposed Scheme from this location during year 1 and year 15 is illustrated on the photomontages shown in Volume 2: Map Book CFA20, LV01-132 and LV01-252. Due to restricted access to the property, this view was taken from the nearest available position located on the adjacent towpath and therefore does not fully represent the intervening vegetation from viewpoint 322.2.009 which will filter views.

Viewpoint 322.3.010: View south-west from PRoW (local cycle route 017) along the Birmingham and Fazeley Canal

9.5.92 The Proposed Scheme will be highly visible in the foreground. The view will include the North Wood embankment, the Birmingham and Fazeley Canal viaduct, the overhead line equipment and passing trains. The creation of a new byway adjacent to the canal will also be visible in the foreground. Therefore, the magnitude of change is considered to be high in the winter of year 1 of operation.

9.5.93 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 of operation.

9.5.94 In summer of year 1 of operation due to the prominence of the viaducts in the view, the effects will be unchanged at major adverse.

9.5.95 By year 15 and beyond to year 60 of operation it is considered that the Proposed Scheme will remain highly visible and thus the effects will remain as major adverse.

Viewpoint 323.3.001: View east across The Belfry golf course from Wishaw Lane

9.5.96 The Proposed Scheme will be partly visible in the middle ground from higher ground within the golf course. The Bodymoor Heath Lane overbridge and false cuttings will be visible in front of Bodymoor Heath Training Grounds and the Bodymoor Heath Lane diversion and overbridge will be evident from certain points on the golf course. The Hunts Green underbridge and the North Wood embankment are also likely to be visible. Vegetation loss will be apparent in the vicinity of Middleton Pool. The vegetation within the golf course will provide considerable screening at different locations. However in certain places around the golf course the change will be noticeable as there will be prominent new features including embankments and underbridges in the view. The magnitude of change is therefore considered to be medium.

9.5.97 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.

9.5.98 In summer of year 1 of operation effects will be unchanged despite some screening from planting within and around the golf course.

9.5.99 By year 15 and beyond to year 60 of operation, proposed planting will have matured reducing the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 323.2.002: View north-east from Maple Leaf Farm on the A4091 Tamworth Road

9.5.100 The Proposed Scheme will be visible crossing the floodplain on embankment with oblique, close range views of the Hunts Green underbridge, and Bodymoor Heath Lane overbridge. The diverted Bodymoor Heath Lane will be partially screened by boundary hedgerows. Trains and overhead line equipment will also be visible. Views of these elements of the Proposed Scheme will be partially filtered by intervening vegetation. Therefore the magnitude of change is considered to be medium.

9.5.101 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.

9.5.102 In summer of year 1 of operation, while the existing intervening hedgerow will provide some additional screening, the magnitude of change is considered to remain at medium meaning the overall effect will be unchanged.

9.5.103 By year 15 and beyond to year 60 of operation, planting established on the Proposed Scheme embankments will have matured, providing additional screening to the elements of the Proposed Scheme. This will reduce the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoints 323.2.004 and 325.2.006: Views north, south and east from The Bungalow and Middleton House Farm and east and south from Pool House Farm on the corner of Brick Kiln Lane and the A4091 Tamworth Road

9.5.104 The Proposed Scheme including the Hunts Green underbridge, and North Wood embankment, together with passing trains and overhead line equipment will be visible in the foreground. The embankment and overbridge of the realigned Bodymoor Heath Lane will also be in the direct field of the view from the rear of these properties. A large balancing pond will also be clearly visible in close range views. These are considered to be substantial changes in close proximity and therefore the magnitude of change is considered to be high.

9.5.105 The high magnitude of change assessed alongside the high sensitivity of the receptors will result in major adverse effects in the winter of year 1 of operation.

9.5.106 In summer of year 1 operation, effects will be unchanged at major adverse due to the proximity of the proposals.

9.5.107 By year 15 and beyond to year 60 of operation, planting on Bodymoor Heath Lane overbridge will be sufficiently mature to restrict views of the carriageway. However given the height of the overbridge it is likely that oblique close range views from upper floor windows will persist of other parts of the Proposed Scheme and therefore the effects will remain as major adverse.

Viewpoint 324.3.002: View south and west from the public cycleway on the Birmingham and Fazeley Canal towpath. This view is also likely to be similar to the view from the grounds of the Brook Marston Farm Hotel

9.5.108 The Proposed Scheme will be visible in the middle ground crossing the floodplain on the North Wood embankment continuing in front of North Wood. Views of trains and overhead line equipment will be discernible although filtered by hedgerows and canalside vegetation in the foreground. Views will be in the context of existing close views of the Birmingham and Fazeley Canal viaduct and National Grid overhead power lines. Overall, the magnitude of change is considered to be medium.

9.5.109 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.

9.5.110 In summer of year 1 of operation although there will be some greater screening from foreground vegetation this will be insufficient to reduce the effects from moderate adverse.

9.5.111 By year 15 and beyond to year 60 of operation, although proposed planting will have matured, providing some screening, the elements of the Proposed Scheme will remain clearly visible beyond. Therefore effects will remain as moderate adverse.

Viewpoint 324.3.003: View west from PRoW Footpath (T18), near Homestead Farm

9.5.112 Although views of the Proposed Scheme will be partially screened by vegetation in the foreground, there will be a substantial alteration to a large part of the view. The Proposed Scheme on embankment, the Hunts Green underbridge, trains and overhead line equipment will be visible in the middle ground. Bodymoor Heath Lane

overbridge will also be visible. North Wood embankment and a section of North Wood underbridge will be partially visible, where they are not obscured by woodland. North Wood embankment will be evident in the middle ground. Therefore, the magnitude of change is considered to be high.

9.5.113 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 of operation.

9.5.114 In summer of year 1 of operation, there will be greater screening from foreground vegetation and hedgerows however this will not be sufficient to reduce the effect, which will remain as major adverse.

9.5.115 By year 15 and beyond to year 60 of operation, although proposed planting will have matured, providing some screening, the elements of the Proposed Scheme will remain clearly visible. Therefore effects will remain as major adverse.

Viewpoint 324.2.004: View west from properties around Bodymoor Heath

9.5.116 The Proposed Scheme on embankment, including overhead line equipment and trains, and the overbridge associated with the Bodymoor Heath Lane diversion will be visible in the middle ground. North Wood embankment will be partially screened by intervening vegetation and the Bodymoor Heath Training Ground buildings in the middle ground. These elements will be visible but at a distance, therefore the magnitude of change is considered to be medium.

9.5.117 The view of the Proposed Scheme from this location during year 1 is illustrated on the photomontage shown in Volume 2: Map Book CFA20, LV01-134.

9.5.118 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.

9.5.119 In summer of year 1 of operation vegetation and hedgerows in the foreground will further screen views. However, this will not be sufficient to reduce the effect which will remain as moderate adverse.

9.5.120 By year 15 and beyond to year 60 of operation, although proposed planting will have matured, providing some screening, the elements of the Proposed Scheme will remain clearly visible beyond. Therefore effects will remain as moderate adverse.

Viewpoint 325.3.007: View east from PRoW Footpath (T17) near Hunts Green Farm

9.5.121 The Proposed Scheme will be visible in the foreground on Bodymoor Heath Lane overbridge entering Middleton Pool cutting. The tops of trains and overhead line equipment will be visible over the false cutting where the track is on embankment. The mature planting removed during construction will also reveal views of embankments, the A4091 Tamworth Road overbridge, trains and overhead line equipment in the middle ground. This represents a high magnitude of change in the view.

9.5.122 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 of operation.

9.5.123 In summer of year 1 of operation, screening from adjoining hedgerows and associated trees will partially filter views, however this will not be sufficient to reduce the effect, which will remain as major adverse.

9.5.124 By year 15 of operation, proposed planting along the Bodymoor Heath Lane overbridge will be established but trains and overhead line equipment will remain visible in the view, reducing the effects to moderate adverse.

9.5.125 By year 60 of operation, the further growth and maturity of the proposed planting to the Bodymoor Heath Lane overbridge will provide sufficient screening to reduce the effects to non-significant. This is reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 326.3.002: View to the west from the PRoW Bridleway/Footpath (T21) near Lower Farm

9.5.126 The Proposed Scheme will be visible in the middle ground at Middleton House Farm. Bodymoor Heath Lane embankment and overbridge will be prominent features in the view. Hedgerows and trees along Bodymoor Heath Lane removed during construction will result in open views and trains. Given the extent of new and incongruous features, combined with the proximity of the view the magnitude of change is considered to be high.

9.5.127 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 of operation.

9.5.128 In summer of year 1 of operation, there will be improved screening however the elevated landform and structures will still be visible and the effect will remain as major adverse.

9.5.129 By year 15 of operation, although trains and overhead line equipment will remain visible in the view, planting on the Bodymoor Heath Lane overbridge will be established, reducing the effects to moderate adverse.

9.5.130 By year 60 of operation, proposed planting on the Bodymoor Heath Lane overbridge will have matured, obscuring views, reducing the effects to non-significant. This is reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 326.3.003: View west from public Footpath (T17) adjoining Bodymoor Heath Training Grounds

9.5.131 The Proposed Scheme will be visible on embankment in the middle ground as it crosses the edge of the gravel pit before it is screened by the tree belt along the boundary of the training ground. The Bodymoor Heath Lane overbridge will be partially visible in longer distance views through the trees. In the context of the existing disturbed and man-made landscape the operation of the Proposed Scheme will result in a medium magnitude of change.

9.5.132 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.

9.5.133 In summer of year 1 of operation, the trees along the training ground will provide partial screening. However there will still be close range views through the trees, therefore the moderate adverse effect will continue.

9.5.134 By year 15 and beyond to year 60 of operation, views of Bodymoor Heath Lane overbridge will be almost entirely restricted by planting meaning effects on this viewpoint will be non-significant. This is reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 326.7.004: View south-west from Bodymoor Heath Training Grounds

9.5.135 The Proposed Scheme will cross the foreground on the Bodymoor Heath Lane overbridge. Bodymoor Heath Lane will be diverted to cross the Proposed Scheme and the A4091 Tamworth Road adjacent to the training ground. The associated embankments and bridges will form prominent features in the view. Existing perimeter trees will have been removed. There will be close-range clear views of trains, overhead line equipment, rail and highway embankments and bridges. Therefore, the magnitude of change is considered to be high.

9.5.136 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 of operation.

9.5.137 In summer of year 1 of operation, the removal of the existing vegetation will mean the overall effect will be unchanged at moderate adverse.

9.5.138 By year 15 and beyond to year 60 of operation, although proposed planting will have matured to provide some screening, elements of the Proposed Scheme including upper sections of new vertical elements such as the overhead line equipment will remain clearly visible beyond. Therefore effects will remain as moderate adverse.

Viewpoint 326.2.006: View to the west and south-west from Primrose Cottage, Bodymoor Heath Lane

9.5.139 The Proposed Scheme will pass directly in front of this property, on the Bodymoor Heath Lane embankment and overbridge before continuing onto the North Wood embankment. These elements together with the overhead line equipment and passing trains will be conspicuous. The diverted Bodymoor Heath Lane will also be prominent in the foreground. These elements will block the longer distance views currently available from the property. The loss of existing view and the close proximity of the Proposed Scheme will give rise to a high magnitude of change.

9.5.140 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 of operation.

9.5.141 In summer of year 1 of operation, effects will remain as major adverse due to the lack of intervening planting.

9.5.142 By year 15 and beyond to year 60 of operation, the lack of intervening planting means effects will remain as major adverse.

Viewpoint 327.2.001: View north-east from properties on the corner of Church Lane and Crowberry Lane, Middleton

9.5.143 The false cuttings along the Coppice Lane cutting and Church Lane overbridge will be visible in the foreground. Ground levels in the vicinity will be raised, restricting longer distance views across the rural landscape to the north-east. The loss of mature hedgerows along Church Lane will open up views from the properties to the Proposed

Scheme including the overhead line equipment and noise fence barrier. The loss of views in close proximity of the Proposed Scheme will give rise to a high magnitude of change.

9.5.144 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 of operation.

9.5.145 In summer of year 1 of operation Walker's Spinney will provide some denser screening to the Church Lane overbridge, but not sufficient to alter the effect from major adverse.

9.5.146 By year 15 and beyond to year 60 of operation proposed planting behind Walker's Spinney will be sufficiently dense to prevent views of the Proposed Scheme. Planting along the embankments either side of Church Lane will help integrate the bridge and new road into the local landscape reducing the effects to moderate adverse.

Viewpoint 327.4.002: View east from Park Lane, near Middleton

9.5.147 The Proposed Scheme will be visible in the foreground where the realigned A4091 Tamworth Road will cross the Middleton Pool cutting on overbridge. The junction of Crowberry Lane with Park Lane will be reconfigured. The loss of hedgerows and mature hedgerow trees along Crowberry Lane and Park Lane will open up views to the A4091 Tamworth Road realignment and to the overbridge. The highway embankments along Crowberry Lane will also be visible along with the false cuttings adjacent to Middleton Pool cutting to the north of the overbridge where the prominent junctions of both lanes will be raised above existing levels. Given the degree of change and the close proximity of the views the magnitude of change is considered to be high.

9.5.148 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.149 In summer of year 1 of operation, the loss of vegetation means effects will continue as major adverse.

9.5.150 By year 15 and beyond to year 60 of operation the proposed planting along the false cutting adjacent to Middleton Pool cutting will create a wooded backdrop to views along Park Lane. New hedgerows will be well developed, however the A4091 Tamworth Road overbridge will still be visible, reducing the overall effects to moderate adverse.

Viewpoint 327.3.003: View east from PRoW Footpath (T15) between Roger's Coppice and Park Lane

9.5.151 A section of Langley Brook viaduct will be visible in the background at a distance of approximately 500m to the north-east of Roger's Coppice. Hedgerow trees along Crowberry Lane will filter views to the southern approach embankment after which the Proposed Scheme will enter Middleton Pool cutting and will not be visible. The northern embankment of the realigned A4091 Tamworth Road as it approaches the overbridge to cross the Proposed Scheme will be partially visible in the background, above hedgerow and field boundaries. Views of the overbridge and southern embankment will be filtered by field boundary vegetation around Hunts Green.

Roger's Coppice, dense hedgerows with mature trees along Crowberry Lane and Park Lane, will limit views of a large section of the Proposed Scheme. However a broad swath of trees in the middle ground will have been removed allowing views of the viaduct and realigned A4091 Tamworth Road. Given the degree of change the magnitude of change is considered to be high.

9.5.152 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 of operation.

9.5.153 In summer of year 1 of operation, the effect will be unchanged at major adverse.

9.5.154 By year 15 of operation the proposed planting will be of a sufficient height to partially screen the southern approach embankment to Langley Brook viaduct and the associated A4091 Tamworth Road overbridge and Middleton Pool embankment. Elsewhere replacement planting will restore the wooded backdrop. Therefore, the effects will be reduced to moderate adverse.

9.5.155 By year 60 of operation the effects will remain at moderate adverse.

Viewpoint 327.3.004: View east from the PRoW Footpaths (T15 and T6) near Roger's Coppice

9.5.156 The Langley Brook viaduct noise fence barriers will be visible in close proximity and the realigned A4091 Tamworth Road will be visible on higher ground. The loss of mature trees which currently screen the existing A4091 Tamworth Road and create an attractive backdrop to the view will open up views. Mature vegetation along Langley Brook and at Walker's Spinney will screen Church Lane embankment, although removal of mature planting along Langley Brook during construction will broaden visibility in this location. Roger's Coppice will screen the southern length of the Middleton Pool embankment. The Langley Brook viaduct, overhead line equipment and trains will be clearly visible as the central focus in direct views from the footpath, framed by woodland and mature trees. Traffic on the realigned A4091 Tamworth Road will also be noticeable. Given the degree of change combined with the proximity of the receptor the magnitude of change is considered to be high.

9.5.157 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 of operation.

9.5.158 During summer of year 1 of operation, screening from trees along Langley Brook and adjoining woodlands will reduce the length of viaduct and A4091 Tamworth Road that is visible. The magnitude of change will therefore be medium and will result in a moderate adverse effect.

9.5.159 By year 15 and beyond to year 60 of operation, screening from trees along Langley Brook and adjoining woodlands will continue to the same degree and thus effects will remain as moderate adverse.

Viewpoint 328.3.001: View west from the grounds of Middleton Hall

9.5.160 The Proposed Scheme will be partly visible in the middle ground with views of trains and overhead line equipment largely screened by existing mature trees and the false cutting. The route will emerge from this cutting on the approach to Langley Brook viaduct. The loss of some existing boundary trees will foreshorten existing views.

Given the degree of change caused by vegetation loss, the introduction of new elements including train movements and the proximity of the receptor, the magnitude of change is considered to be high.

9.5.161 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 of operation.

9.5.162 In summer of year 1 of operation, effects will be reduced as the woodland which frames this view together with the ornamental tree groups in the foreground will improve screening and reduce the breadth of view resulting in a medium magnitude of change and moderate adverse effect.

9.5.163 By year 15 and beyond to year 60 of operation, proposed planting will have matured reducing the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 328.3.002: View south-west from the PROW Footpath (T22) near Middleton Hall

9.5.164 The Proposed Scheme will be visible in the background on embankment in front of Walker's Spinney before crossing Langley Brook on viaduct. There will be partial views of Langley Brook viaduct, approach embankments, noise fence barrier and trains in the middle ground. These views will be filtered by planting along the park perimeter and avenue trees along the entrance drive. Although dense planting within the grounds of Middleton Hall will filter views of the viaduct, it will result in a noticeable deterioration in the quality of the view across scenic parkland. Overall, the magnitude of change is therefore considered to be medium.

9.5.165 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.

9.5.166 In summer of year 1 of operation, impacts will be reduced as the woodland which frames this view, together with the ornamental tree groups in the foreground will enhance screening, resulting in a moderate adverse effect.

9.5.167 By year 15 and beyond to year 60 of operation, the maturing of trees in the parkland will reduce the effects to non-significant. These are reported in Volume 5: Appendix LV-001-020, Part 4.

Viewpoint 328.4.006: View west from Church Lane, Middleton

9.5.168 The Proposed Scheme will be visible in the middle ground crossing the valley to the north of Middleton on Trickley Coppice embankment as far as the Drayton Basset viaduct (located in the Drayton Bassett, Hints and Weeford area (CFA21)). The wide sweeping views towards Middleton will be interrupted by embankments, false cuttings, a footbridge, noise fence barrier and overhead line equipment. The loss of hedgerows along Church Lane will open up views from the road and the raised embankments and the overbridge will appear as incongruous elements within the flat landscape. There will be close range views to the Langley Brook viaduct and the Church Lane embankment with the balancing pond and access track in the foreground to the south. Given the loss of attractive views combined with the close proximity to the receptor the magnitude of change is considered to be high.

9.5.169 The high magnitude of change assessed alongside the medium sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.170 In summer of year 1 of operation the effects will remain as major adverse.

9.5.171 By year 15 and beyond to year 60 of operation, although proposed planting will have matured, providing some screening, elements of the Proposed Scheme will remain clearly visible beyond resulting in a reduction of effects to moderate adverse.

Viewpoint 328.2.008: View west from Park Gate House and Park Gate Farm on the corner of Church Lane and the A4091 Tamworth Road

9.5.172 The Proposed Scheme will be visible on embankment (but set in a false cutting) in the middle ground with overhead line equipment, passing trains, and PRoW Footpath (T15) accommodation overbridge visible from the rear of both properties. The realignment of Church Lane and introduction of an overbridge will also be visible in the foreground. Views towards Langley Brook viaduct will generally be screened by intervening vegetation. Given the partially filtered views within close proximity, the magnitude of change is considered to be medium.

9.5.173 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.

9.5.174 In summer of year 1 of operation, effects will be unchanged at moderate adverse.

9.5.175 By year 15 and beyond to year 60 of operation, proposed woodland and hedgerow planting along Church Lane will screen the overbridge and highway embankments and will help to assimilate the new road into the landscape. However the false cuttings along Trickley Coppice embankment and footbridge will remain visible. The noise fence barrier and overhead line equipment will also remain visible. Therefore the overall effects will remain moderate adverse.

Viewpoint 328.3.009: View south from PRoW Footpath (T15) looking towards Church Lane, Middleton

9.5.176 The Proposed Scheme will be located in the foreground, crossing the flat valley floor on Trickley Coppice embankment. The wide, sweeping views across an attractive, gently sloping rural landscape will be replaced with close up views of the false cutting over which the noise fence barrier and overhead line equipment will be visible. A footbridge providing a crossing point for the PRoW will dominate the foreground of the view. There will be oblique views of the realigned Church Lane where it crosses the Proposed Scheme in the middle ground. The footbridge will be prominent in the foreground and the loss of hedgerows and trees along Church Lane will be noticeable. Given the substantial alteration to key characteristics of this view and the introduction of new, visible features within close proximity to the receptor, the magnitude of change is considered to be high.

9.5.177 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 of operation.

9.5.178 In summer of year 1 of operation, effects will be unchanged at major adverse.

9.5.179 By year 15 and beyond to year 60 of operation, effects will remain as major adverse due to the close proximity of the new features and the substantial change to key characteristics of this view.

Viewpoint 329.2.001: View north-east from properties on the north-eastern edge of Middleton

9.5.180 The Proposed Scheme will be visible in the middle ground and background including Church Lane overbridge and Coppice Lane cutting. Buildings at Highfields Farm will screen views although there are likely to be views of the Trickley Coppice embankment in the middle ground from some upper storey windows. Upper floor windows of properties at the end of Coppice Lane will look down over the Footpath (T15) accommodation overbridge and onto false cuttings with views of the noise fence barrier and overhead line equipment. There will also be views from properties along Church Lane north along the valley toward Drayton Basset viaduct (located in the Drayton Bassett, Hints and Weeford area (CFA21)) in the background. These major alterations to key characteristics of the view and the introduction of new features that will be highly visible and incongruous will result in a high magnitude of change.

9.5.181 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 of operation.

9.5.182 In summer of year 1 of operation, effects will be unchanged due to the limited intervening vegetation.

9.5.183 By year 15 and beyond to year 60 of operation proposed woodland planting on Trickley Coppice embankment and by Gallows Brook culvert will be sufficiently mature to screen some views. It is likely that the Drayton Basset viaduct (located in the Drayton Bassett, Hints and Weeford area (CFA21)) and Trickley Coppice embankment will be screened by adjacent planting on the false cuttings. The alteration to the landform and introduction of woodland blocks into the agricultural landscape will remain a substantial visual change. Therefore the overall effects will reduce to moderate adverse.

9.5.184 The view of the Proposed Scheme from this location during year 1 and year 15, is illustrated on the photomontages shown in Volume 2: CFA20 Map Book, Map LV01-135 and LV01-253 (CFA20 Map Book).

Cumulative effects

9.5.185 There are no known developments which are assumed to be under construction at the same time that the Proposed Scheme is operational, and therefore there are no cumulative effects on the LCAs and viewpoints.

Other mitigation measures

9.5.186 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, which will be considered during the detail design stage. This would provide additional screening and greater integration of the Proposed Scheme into the landscape. However, no other mitigation measures are

considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

Summary of likely residual significant effects

9.5.187 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 character of Middleton to Curdworth Tame Valley Farmland LCA due to the influence that the engineered landforms and viaducts will have on the rural landscape. These effects will reduce by year 60 of operation, once the proposed planting has become fully established;
- adverse effects on views from residences at or adjacent to Newlands Farm (316.2.004), Dunton Hall and Farm (319.2.007), Dunton Stables (322.2.009), Mullensgrove Farm (320.2.009), Cuttle Mill Farm (321.6.006, 321.2.012), Middleton House Farm (323.2.004), Pool House Farm (352.2.006) and Park Gate Farm (328.2.008) and a number of other scattered properties within the study area;
- adverse effects on views from residences at Bodymoor Heath and on the edge of Middleton including properties on Church Lane and Crowberry Lane (e.g. 327.2.001);
- adverse effects on users of PRoW across parts of the study area, arising from visibility of different elements of the Proposed Scheme including trains, noise fence barriers and overhead line equipment; and
- adverse effects on people travelling along Park Lane (e.g. 327.4.002) and Church Lane (e.g. 328.4.006) in Middleton, and on the A4097 Kingsbury Road (e.g. 319.4.006, 320.4.012), arising from the visibility of different elements of the Proposed Scheme including trains, noise fence barriers and overhead line equipment.

10 Socio-economics

10.1 Introduction

10.1.1 The section reports the 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:

- 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 operation of the Proposed Scheme will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

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 8.8 of 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.

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 Curdworth to Middleton 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[46].

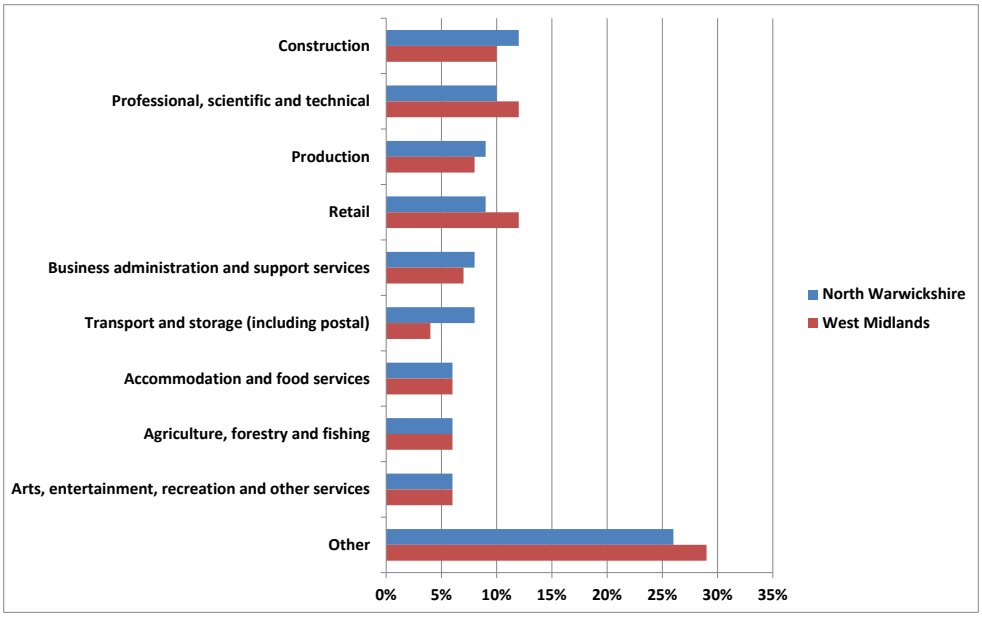
10.3.2 The Curdworth and Middleton area lies wholly within the area covered by NWBC.

10.3.3 Where possible, baseline data has been gathered on demographic character areas (DCA)[47] to provide a profile of local communities. This area contains one DCA – Middleton, Marston and Curdworth DCA which contains the settlements of Middleton, Curdworth, Lea Marston and Marston (Volume 5: Map SE-002-105 shows the location of the DCA).

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%). 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%) in NWBC than the West Midlands region (12%) and England (14%)[48]. This is shown in Figure 6.

Figure 6: Business sector composition in NWBC and West Midlands[49] [50]

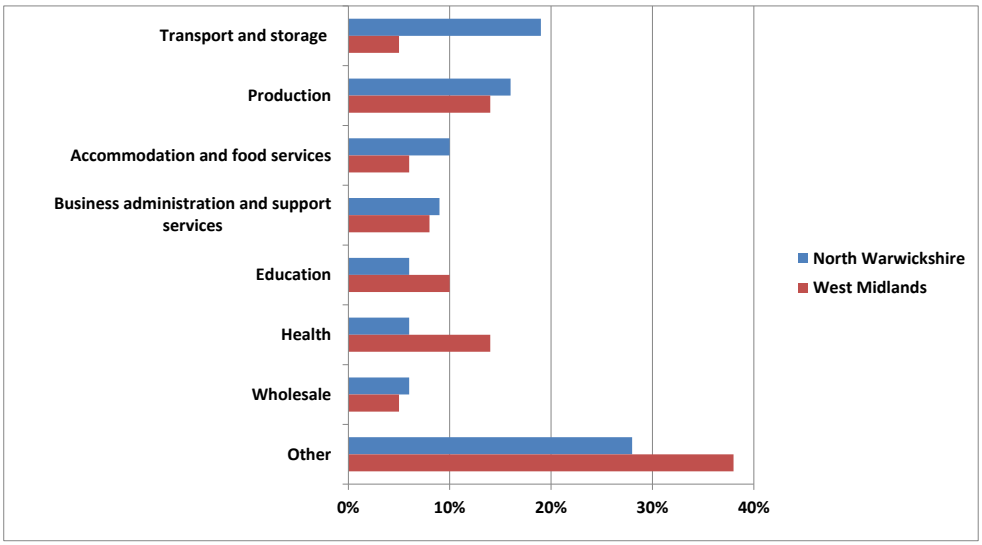


[46] Further information on the socio-economics baseline, with regard to business and labour market profile, within the area is contained in the Volume 5: Appendix SE-001-000.
[47] DCA have been determined through an understanding of local context and aim to be aligned as closely as possible to groups of lower super output areas (LSOAs).
[48] Office for National Statistics (ONS) (2012), *UK Business: Activity, Size and Location 2011.* Please note 2011 data has been used to provide an appropriate comparison with 2011 Census data.
[49] 'Other' includes motor trades; wholesale; finance and insurance; property; public administration and defence; and education.
[50] ONS (2012), *UK Business: Activity, Size and Location 2011*, ONS, London.

10.3.5 Approximately 39,000 people worked in NWBC in 2011, and 7,600 people worked within the Middleton, Marston and Curdworth DCA[51].

10.3.6 The sector with the highest proportion of employment in NWBC is transport and storage (19%), which is higher than the West Midlands average and England (both 5%). Production[52] also makes up 16% of the district employment, 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%). This is shown in Figure 7. In the Middleton, Marston and Curdworth DCA the key employment sector in terms of employment was transport and storage (36%) with other major employment sectors including accommodation and food services (14%), production (14%) and business administration and support services (11%).

Figure 7: Proportion of employment by industry in NWBC and West Midlands[53] [54]



10.3.7 According to the 2011 Census[55], the employment rate[56] within NWBC was 68% (31,000 people) which is higher than that recorded for both the West Midlands (62%) and England (65%). The employment rate in the Middleton, Marston and Curdworth DCA was 70%. The unemployment in NWBC was 6% which was lower than the rate for the West Midlands (9%) and the average for England (7%). In the Middleton, Marston and Curdworth DCA the unemployment rate was 4%.

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%)

[51] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.
[52] Production, as per ONS definition, is comprised of the mining, quarrying and utilities, and manufacturing sectors.
[53] Other' includes agriculture, forestry and fishing; motor trades; information and communication; finance and insurance; property; public administration and defence; and arts, entertainment, recreation and other services.
[54] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.
[55] ONS (2012), *Census 2011*, ONS, London.
[56] The proportion of working age (16-74 years) residents who are in employment. Employment comprises the proportion of the total resident population who are 'in employment' and includes full-time students who are employed.

and England (23%). In the Middleton, Marston and Curdworth DCA, 26% of residents aged 16 and over were qualified to NVQ4 and above while 22% had no qualifications.

10.3.9 The Middleton, Marston and Curdworth DCA is characterised by a heavy focus on the transport sector with an employment rate above the district, regional and national 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[57]. Overall, this suggests a reasonable availability of alternative accommodation.

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 will result in approximately 200 additional jobs[58] 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 significant additional 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 Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-003-000) 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);

[57] 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).
[58] 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.

- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (draft CoCP Section 13);
- requiring contractors 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).

Assessment of impacts and effects

Temporary effects

Change in business amenity value

10.4.3 No non-agricultural businesses[59] 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 Curdworth to Middleton area off A4097 Kingsbury Road and 14 civil engineering satellite compounds and two railway installation satellite compounds to support construction activity. The use of these sites could result in the creation of up to 3,100 person years of construction employment opportunities[60], or approximately 310 full-time equivalent jobs[61], 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 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 developments have been identified that are considered to interact with the Proposed Scheme.

[59] Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.
[60] 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.
[61] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

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 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 building may have more than one occupier or that similar businesses/resources are clustered together.

10.4.10 In all, 17 business accommodation units within the Curdworth to Middleton area will be directly impacted upon by the Proposed Scheme. These together form the defined resources and include businesses on Mullensgrove Farm, Middleton Farm and a business off the A4097 Kingsbury Road. From an employment perspective, no significant direct effects on non-agricultural employment have been identified within this area.

10.4.11 It is estimated that land required for the Proposed Scheme will result in the displacement or possible loss of approximately 80 jobs[62] 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 developments 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 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.

[62] 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.

10.4.16 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 identified in this assessment that will arise during construction.

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 Curdworth to Middleton 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[63]; 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'[64].

11.1.2 The assessment of likely significant effects from noise and vibration on agricultural, community, cultural heritage or ecological receptors and the assessment of tranquillity are presented in Sections 3, Agriculture, forestry and soils; 5, Community; 6, Cultural heritage; 7, Ecology; and 9, Landscape and visual assessment 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 the scope and methodology are defined in the following documents:

- Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1); and
- SMR addendum (Volume 5: Appendix CT-001-000/2).

[63] '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.

[64] 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 Volume 5: Appendix SV-001-000).

11.1.7 More detailed information and mapping regarding the sound, noise and vibration assessment for Curdworth to Middleton is available in the relevant appendices in Volume 5:

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000);
- sound, noise and vibration baseline (Appendix SV-002-020);
- sound, noise and vibration construction assessment (Appendix SV-003-020);
- sound, noise and vibration operation assessment (Appendix SV-004-020); and
- Volume 5: Map Book – Sound, noise and vibration, Map Series SV-01, SV-02, SV-03 and SV-04.

11.2 Environmental baseline

Existing baseline

11.2.1 The existing baseline sound environment for this area is varied, but may broadly be split between the north and the south, reflecting the local land uses. The southern part of the area is predominantly urban and is characterised by industrial development and infrastructure, including the Hams Hall Distribution Park, the M42 and M6 Toll interchange, the Coleshill Sewage Treatment Works and electricity substation, and an aggregate processing site. Further north, the area becomes increasingly rural in nature interspersed with areas of mineral workings.

11.2.2 In the southern part of this area, the major transportation sound sources in the area are busy roads and motorways including the M42, the M6 Toll, the A446 Lichfield Road and the A4091 Tamworth Road and aircraft flying to/from Birmingham Airport. The sounds of aircraft are notable over much of the area, although rarely the dominant source of existing sound levels. Close to the main roads, daytime sound levels of around 60 to 65dB[65] are typical. Night-time sound levels in the vicinity of the M42 and M6 Toll do not reduce appreciably and are typically between 55 and 60dB[66]. In areas further from these busy roads, lower sound levels are experienced of generally around 55dB during the day and 50dB at night. The sound environment in such areas is dominated by distant road traffic with contributions from natural sound sources.

11.2.3 In the residential area of Curdworth, which lies to the west of the M42 and M6 Toll in the southern part of the study area, the soundscape is dominated by distant road traffic on the M6 Toll and M42, together with local road traffic and community activity. Typical sound levels here are generally around 60dB during the daytime and 55 to 60dB at night-time.

11.2.4 The village of Middleton is a small rural community located in the north of the study area which extends to within 300m of the centre line of the Proposed Scheme. The sound environment is characterised by natural sounds, distant road traffic (on the

[65] Quoted dB values at residential areas refer to the free-field 16-hour daytime (07:00 to 23:00) equivalent continuous sound pressure level, $L_{pAeq,16hr}$.
[66] Night-time sound levels refer to the free-field 8-hour night-time (23:00 to 07:00) equivalent continuous sound pressure level, $L_{pAeq,8hr}$.

A4091 Tamworth Road) and the passage of local road traffic. The existing sound levels in this area are generally 45 to 55dB during the day and around 45dB at night.

11.2.5 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in Volume 5: Appendix SV-002-020.

11.2.6 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration[67]. 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

11.2.7 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[68], tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Construction (2017)

11.2.8 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 Section 12, Traffic and transport.

Operation (2026)

11.2.9 The assessment is based upon the predicted change in sound levels that results from the Proposed Scheme. The assessment initially considered a worst case analysis (that would overestimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2012/2013. 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

Local assumptions

11.3.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3, Construction of the Proposed Scheme.

[67] Further information is available in the Volume 5: Appendix SV-001-000, the SMR and its Addendum.
[68] Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph.

11.3.2 A construction railhead will be located in the vicinity of the A4097 Kingsbury Road. This facility will be established and operated during the construction phase of the Proposed Scheme for the movement of construction material deliveries and as an access point for ballast and track-laying activities.

11.3.3 The Kingsbury Road railhead will be connected to the classic rail network so that the movements of materials both into and out of the railhead can be made by trains during the construction period. The movement of trains into and out of the railhead to the classic rail network will utilise available train paths during the day and night.

11.3.4 Additionally, it is anticipated that there may be some short term night-time working during road and rail possession periods. It is expected that any noise effects will be limited in duration and hence are not considered to be significant.

11.3.5 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

Local limitations

11.3.6 In this area, there are a number of locations where the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient information has been obtained to undertake the assessment. Further information is provided in Volume 5: Appendix SV-002-020.

Avoidance and mitigation measures

11.3.7 The assessment assumes the implementation of the principles and management processes set out in the draft Code of Construction Process (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[69]; 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's noise insulation and temporary re-housing policy;

[69] Warning signals that consist of bursts of noise.

- 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 CoCP and appropriate action will be taken by the Nominated Undertaker as required to ensure compliance.

11.3.8 In addition to this mitigation, taller screening as described in the draft CoCP[70] has been assumed along the edge of the construction site boundary adjacent to the residential communities at: A4097 Kingsbury Road in the Dunton Wood area; Lock House Lane to the east of Curdworth; Dunton Hall; the southern edge of the A446 Lichfield Road; Bodymoor Heath Lane; south east of Middleton; and the Church Lane/Crowberry Road area in eastern Middleton. Taller screening is also assumed adjacent to the industrial areas at Edison Road (Hams Hall area) and Cuttle Mill Fishery.

11.3.9 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP's noise insulation and temporary re-housing policy. Noise insulation or ultimately temporary re-housing will avoid residents being significantly affected[71] by levels of construction noise inside their dwellings. The assessment reported in this section provides an estimate of the buildings that are likely to qualify for such measures.

11.3.10 Qualification for noise insulation and temporary re-housing will be identified as part of seeking prior consent from the local authorities under Section 61 of the Control of Pollution Act. Qualifying buildings will be identified early enough so that noise insulation can be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria. Noise insulation, where required, will be installed as early as possible to reduce internal sound levels from construction activities and also when the Proposed Scheme comes into operation.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

11.3.11 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, four residential buildings (two dwellings adjacent to Faraday Avenue, two dwellings (Dunton Hall and Dunton Stables off Kingsbury Road) are forecast to

[70] 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.
[71] Information is provided in the emerging National Planning Practice Guidance – Noise http://planningguidance.planningportal.gov.uk. Accessed 11 November 2013.

experience noise levels higher than the noise insulation trigger levels as defined in the draft CoCP. For daytime construction the trigger level is an equivalent continuous noise level of 75dB[72] measured outdoors.

11.3.12 The mitigation measures, including noise insulation, will reduce noise inside all dwellings such that it does not reach a level where it would significantly affect[71] residents.

Residential receptors: direct effects – communities

11.3.13 The avoidance and mitigation measures in this area will avoid airborne construction noise adverse effects[71] on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this section.

11.3.14 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

11.3.15 In locations with lower existing sound levels[73], construction noise effects[71] 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[74], as identified in Table 19.

Table 19: 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-003-020)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed approximate duration of impact and details
CSV20-C01	Construction airborne noise	Day	Middleton. Approximately five dwellings on Church Lane.	Roadworks associated with the construction of Church Lane overbridge, with typical and highest monthly noise levels of around 60dB[75] and 70dB.	2 months

Residential receptors: indirect effects

11.3.16 Significant noise effects on residential receptors arising from construction traffic are unlikely to occur in this area.

Non-residential receptors: direct effects

11.3.17 Significant construction noise effects have been identified on a worst case basis on the commercial properties (related to a veterinary practice) located at Dunton Hall, Curdworth (CSV20-N01). The noise effects[76] have been identified during the daytime with noise levels rising at times to around 80dB[75] over a period of approximately three years and two months, commencing 2019 during the construction of the Curdworth cutting.

[72] $L_{pAeq,0800-1800}$ measured at the facade.
[73] Further information is provided in Volume 5: Appendix SV-001-000.
[74] Further information is provided in SV-001-000 and SV-003-020.
[75] Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.
[76] Activity disturbance, especially for activities that require good conditions for verbal communication.

Non-residential receptors: indirect effects

11.3.18 Significant noise effects on non-residential receptors arising from construction traffic are unlikely to occur in this area.

Cumulative effects from the Proposed Scheme and other committed development

11.3.19 This assessment has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments[77]. In this area, no developments 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

11.3.20 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[71] residents.

11.3.21 The measures reduce any adverse effects from construction noise outdoors on the majority of residential communities such that they are not considered significant except at the residential community along Church Lane, Middleton that are closest to the works.

11.3.22 On a worst case basis, noise from specific construction activities has been identified as resulting in residual significant temporary effects on commercial properties located at Dunton Hall.

11.3.23 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

11.4 Effects arising during operation

Local assumptions and limitations

Local assumptions – service pattern

11.4.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based on the highest likely train flows, including 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.

11.4.2 The expected passenger service frequency for both Phase One and Phase One with Phase Two services is described in Volume 1[78]. As a reasonable worst case, this assessment is based upon the service pattern for Monday to Saturday including Phase 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

[77] Refer to Volume 5: Appendix CT-004-000.
[78] The change in noise and vibration effects between the different passenger services is assessed in Volume 1.

direction on the main lines set out in Table 20. 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 20.

Table 20: 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
Phase One main line to Leeds spur	07:00 – 21:00	22 (8)	330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services
Phase One main line north of Leeds spur	07:00 – 21:00	12 (8)	330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services
Phase Two main line north of Leeds spur	07:00 – 21:00	10 (0)	270kph around the spur rising to 330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services

Avoidance and mitigation measures

11.4.3 The development of the Proposed Scheme has, as far as reasonably practicable, kept the alignment away from main communities. This has protected many communities from likely significant noise or vibration effects.

Airborne noise

11.4.4 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 (185mph) 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.

11.4.5 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 underbridges and viaducts. Noise barrier locations are shown on Volume 2: Map Book – Sound, noise and vibration, Map series SV-05.

11.4.6 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.

11.4.7 The Proposed Scheme incorporates 'low-level' noise barriers into the design of underbridges and 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.

11.4.8 The Proposed Scheme also includes taller earthworks and a taller 3m above rail parapet noise barrier on the Langley Brook viaduct to further reduce adverse noise effects at Middleton.

11.4.9 Noise effects are reduced in other locations along the Proposed Scheme by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise barriers are not required). The location of these barriers is shown on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05.

11.4.10 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 (Volume 5: Appendix SV-001-000).

11.4.11 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[79] (the Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Regulations. Qualification for noise insulation under the Regulations will be identified and noise insulation offered at the time that the Proposed Scheme becomes operational.

11.4.12 Where required, as well as improvements to noise insulation of windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.

11.4.13 Following Government's emerging National Planning Practice Guidance[80], 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 hybrid 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 passes exceeds the criterion[82], noise insulation will be offered for these additional buildings.

[79] Her Majesty's Stationery Office (1996), *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations*, London.
[80] National Planning Practice Guidance – Noise http://planningguidance.planningportal.gov.uk.
[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.

Ground-borne noise and vibration

11.4.14 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

11.4.15 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified a number of residential dwellings, close to the Proposed Scheme, where noise would exceed the daytime trigger threshold set forth in the Regulations. It is therefore estimated that these buildings are likely to qualify for noise insulation under the Regulations. These dwellings include the following and are indicated on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05:

- Orchard Bungalow and Newlands Farm, Newlands Lane, Curdworth; and
- The Bungalow, Middleton Farm, Tamworth Road, Middleton.

11.4.16 The assessment has identified three additional residential buildings close to the Proposed Scheme, Dunton Hall and Dunton Stables off the A4097 Kingsbury Road, Curdworth, and 254 Lock House Lane, Curdworth; where the daytime forecast noise level does not exceed the threshold set in the Regulations but the forecast night-time noise level would exceed the World Health Organization's Interim Target of 55dB[81], or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion[82]. It is estimated that these buildings will also be offered noise insulation as described previously in the Avoidance and mitigation measures section. These are also identified as being likely to qualify for noise insulation as a consequence of construction noise as described earlier in this section. These buildings are indicated on Volume 5: Map Book – Sound, noise and vibration, Map series SV-05.

11.4.17 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.

Residential receptors: direct effects – communities

11.4.18 Mitigation measures in this area will avoid airborne noise adverse effects on the majority of receptors, and at the following residential communities:

- Middleton;
- Hunts Green; and
- Curdworth.

11.4.19 Taking account of the envisaged mitigation, Volume 2: CFA20 Map Book, Map Series SV-05 shows the long term 40dB[84] night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level

[84] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$).

contour is equivalent to, or slightly larger than, the 50dB daytime contour[85]. In general, below these levels adverse effects are not expected.

11.4.20 Above 40dB during the night and 50dB during the day the effect of noise is dependent on the baseline sound levels and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the Proposed Scheme are presented on Volume 2: CFA20 Map Book, Map Series SV-05.

11.4.21 The changes in noise levels are likely to affect the acoustic character of the area such that there is a perceived change in the quality of life and can be considered to be significant when assessed on a community basis[86] taking account of the local context[87]. However, as a result of the avoidance and mitigation measures included within the Proposed Scheme, the assessment has not identified any adverse effects that are considered to be significant on a community basis in this area.

Residential receptors: indirect effects

11.4.22 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

11.4.23 The assessment of operational noise and vibration indicates that significant effects are likely on the non-residential receptors identified in Table 21.

11.4.24 The assessment of direct effects on non-residential receptors has been undertaken on a reasonable worst case basis taking account of publicly available information about each receptor. Further information can be found in Volume 5: Appendix SV-004-020.

Table 21: 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
OSV20-N01	Adverse effect on the acoustic character around the buildings and on a worst case basis there is a risk of disturbing activities inside the buildings due to the operation of train services.	Daytime	Commercial buildings (related to a veterinary practice) located at Dunton Hall, Curdworth
OSV20-N02	Adverse effect on the acoustic character around the buildings and on a worst case basis there is a risk of disturbing activities inside the buildings due to the operation of train services.	Daytime and night time	Middleton House Farm bed and breakfast

Non-residential receptors: indirect effects

11.4.25 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

[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.
[86] Further information is contained in Volume 1.
[87] Further information is provided in Volume 5: Appendices SV-001-000 and SV-004-020.

Summary of likely residual significant effects

11.4.26 The mitigation measures reduce noise inside all dwellings such that it does not reach a level where it would significantly affect[71] residents.

11.4.27 The mitigation measures in this area will avoid noise and vibration adverse effects[71] on the residential communities including their shared open areas.

11.4.28 On a reasonable worst case basis a significant noise effect has been identified on the commercial buildings associated with the veterinary clinic at Dunton Hall, Curdworth, and on the Middleton House Farm bed and breakfast, Tamworth.

11.4.29 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the 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 Curdworth to Middleton area.

12.1.2 With regard to traffic and transport, the main issues are increased traffic as a result of construction 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 traffic projection scenarios.

12.1.4 A detailed report on traffic and transport and surveys undertaken within this area is contained in 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.

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 (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.

12.2.2 The study area includes the M42, the A446 Lichfield Road, Faraday Avenue, the A4097 Kingsbury Road, the A4091 Tamworth Road, Bodymoor Heath Lane, Park Lane and Church Lane.

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 forecasting of 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 and information on public transport, PRoW and accident data.

12.3.2 Traffic surveys of roads crossing the route or potentially affected roads 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. This was 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, based on the above data, 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 equestrians (non-motorised users). The surveys included PRoW and roads that will cross the route of the Proposed Scheme and additional PRoW and roads that will be affected by the Proposed Scheme. The Proposed Scheme affects ten PRoW within the Curdworth to Middleton area and crosses each of these. Six of these PRoW were used by less than ten people a day. The routes with the greatest usage were Footpath T15 with 25 users and Byway M450 (Marston Lane) with 15 users per day. The Proposed Scheme crosses one road with footways.

12.3.4 There are three strategic routes that pass through the area. The M42 travels in a broadly south to north-east direction and is accessed in the area at Junction 9, via a six-arm signal-controlled roundabout with the A446 Lichfield Road and the A4097 Kingsbury Road roundabout. The M6 Toll diverges from the M42 at junction T1, just to the south of M42 junction 9, to head broadly north-west. There is a northbound slip onto the M6 Toll from a roundabout on the A4097 Kingsbury Road, just to the west of the M42 junction 9 roundabout. There is a southbound slip road off the M6 Toll at junction T2 to a roundabout with the A446 Lichfield Road and the A4091 Tamworth Road. The A38 runs past Sutton Coldfield to the west of the area and provides access to and from the M6 Toll at junction T3, about 2.5km west of Middleton.

12.3.5 The main local roads that will be affected by the Proposed Scheme, from south to north, are: the A446 Lichfield Road, which runs broadly south to north-west through the area; Faraday Avenue, which runs east from a roundabout with the A446 Lichfield Road to a roundabout with Fishery Lane in the Hams Hall Distribution Park; the A4097 Kingsbury Road, which runs east from the M42 junction 9 roundabout to a roundabout with the A51 and B4098 Coventry Road outside Kingsbury, and also runs west from the M42 junction 9 roundabout through Curdworth to a roundabout with the A38 at Minworth; the A4091 Tamworth Road, which runs broadly in a south/north direction and starts at the roundabout with the A446 Lichfield Road and M6 Toll slip road and runs northwards past Middleton to Fazeley and Tamworth; Bodymoor Heath Lane, which runs east from the A4091 Tamworth Road to A4097 Kingsbury Road; Park Lane, which runs west from the A4091 Tamworth Road to connect to Crowberry Lane and Wishaw Lane; and Church Lane, which runs west from the A4091 Tamworth Road and through the village of Middleton to connect to Coppice Lane, which continues west to the A446 London Road. In total, the Proposed Scheme will cross roads in seven locations in the Curdworth to Middleton area.

12.3.6 Safety and accident data has been obtained from WCC for the three year period up to 2012. Analysis of the data over a three year period has shown that two junctions within the area experienced a significant concentration of accidents:

- A446 Lichfield Road/Faraday Avenue junction with ten accidents over the three year period; and

- M42 junction 9 roundabout with the A446 Lichfield Road and A4097 Kingsbury Road with 14 accidents.

12.3.7 There are five public bus services that pass through the Curdworth to Middleton area. These services provide a maximum combined service frequency of six buses per hour between Monday and Friday. The destinations and communities served by these bus services are:

- bus number 90 – Birmingham, Solihull and Chelmsley Wood, serving Water Orton and Coleshill Industrial Estate;
- bus number 115 – Birmingham, Birmingham International station and Tamworth serving Curdworth and Marston;
- bus number 116 – Birmingham, Birmingham International station and Tamworth serving Curdworth, Marston and Kingsbury;
- bus number 216 – Tamworth, Whiteacre and Lea Marston; and
- bus number 223 – Solihull, Coleshill, Curdworth, Lea Marston and Kingsbury.

12.3.8 Between Water Orton and Wilnecote, just south of Faraday Avenue, the Proposed Scheme will cross the existing Birmingham and Derby Line (via Tamworth) rail services, currently operated by CrossCountry, with an average off peak frequency of two to three services per hour.

12.3.9 There is one navigable waterway within the Curdworth to Middleton area, the Birmingham and Fazeley Canal. The usage of the canal by two boats per hour has been identified during a survey undertaken.

Future baseline

12.3.10 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

12.3.11 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 12% by 2021 compared to 2012.

Operation (2026)

12.3.12 Future baseline traffic volumes in the peak hours are forecast to grow by around 20% by 2026 compared to 2012.

Operation (2041)

12.3.13 Future baseline traffic volumes in the peak hours are forecast to grow by around 41% by 2041 compared to 2012.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The following measures (as described in Section 2.3, Construction of the Proposed Scheme) have been included as part of the engineering design of the Proposed Scheme in the Curdworth to Middleton area and will avoid or reduce effects on transport users:

- construction materials and equipment will be transported along haul roads adjacent to the Proposed Scheme alignment 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;
- the Proposed Scheme includes permanent realignments or diversions of ten PRoW and temporary diversions where reasonably practicable to reduce loss of amenity;
- road closures will be limited to overnight and/or weekends where reasonably practicable;
- restricted access and traffic management arrangements will be in place on the M42 to avoid day time closure;
- heavy goods vehicles (HGV) routeing will be along the strategic road network and use designated routes for access as shown in Volume 5: Map Book – Traffic and transport, Map TR-03-105;
- materials will be transported by rail where reasonably practicable to reduce the potential number of HGV trips that would otherwise be made on the highway network; and
- provision of on-site accommodation and welfare facilities to reduce daily travel by site workers.

12.4.2 The draft Code of Construction Practice (CoCP) (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[88] 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

[88] 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.

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 a rural context, this will encourage the use of sustainable modes of transport.

12.4.4 The measures in the draft 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 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 and where possible only partial closure of the line will be required, therefore maintaining passenger services. 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 the Curdworth to Middleton area will be:

- construction vehicle movements to/from the main construction compound and satellite/railhead construction compounds;
- movement of material between road heads and construction sidings;
- import of material by rail;
- road realignments and associated overnight and/or weekend diversions; and
- traffic management arrangements on the M42.

12.4.9 Construction vehicle movements required to construct the Proposed Scheme 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 2.3, Construction of the Proposed Scheme. Some compounds only have traffic movements to other locations within the construction area. The duration of when there will be busy transport activity at each site is shown in Table 22. 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 of the range shows the peak month flows. The assessment has assumed the peak month for the combination of activities, i.e. not necessarily the peak activity at each individual site.

Table 22: 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
Satellite	Curdworth viaduct (south)	Track/haul route via Water Orton Viaducts 1 & 3 (North) satellite compound (CFA19)	2019	2.5	-	Few external movements	
Satellite	Curdworth viaduct (central)	Edison Road/Faraday Avenue/A446 Lichfield Road	2019	2.5	8	120-140	70-85
Satellite	Curdworth viaduct (north)	Faraday Avenue/A446 Lichfield Road	2019	2.5	-	Few external movements	
Satellite	Faraday Avenue underbridge	Faraday Avenue/A446 Lichfield Road	2018	1.5	-	70-80	30-60
Satellite	Faraday Avenue Package Substation	Faraday Avenue/A446 Lichfield Road	2022	<1	1	Few external movements	
Main	A4097 Kingsbury Road overbridge	A4097 Kingsbury Road	2018	5	19	225-260	125-165
Satellite	A4097 Kingsbury Road overbridge	Track/haul route via A4097 Kingsbury Road main compound	2018	1.5	-	Few external movements	
Railhead/main compound	Kingsbury Road railhead	A4097 Kingsbury Road	2023	4	5	400/465	10
Satellite	Seeney Lane overbridge compound	Track/haul route via A4097 Kingsbury Road main compound	2018	1	-	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
Satellite	Birmingham & Fazeley Canal viaduct (south)	Track/haul route via A4097 Kingsbury Road main compound	2018	3	-	Few external movements	
Satellite	Birmingham & Fazeley Canal viaduct (central)	Track/haul route to A446 Lichfield Road	2018	3	-	Few external movements	
Satellite	Birmingham & Fazeley Canal Viaduct (North)	Track/haul route to Cuttle Mill underbridge satellite compound	2018	3	-	Few external movements	
Satellite	Cuttle Mill mid-point auto-transformer station (MPATS)	Track/haul route to Cuttle Mill Lane/A4091 Tamworth Road/A446 Lichfield Road	2022	1.5	1	<10	<5
Satellite	Cuttle Mill underbridge	A4091 Tamworth Road	2018	3	11	65-75	50-70
Satellite	Primrose culvert	Track/haul route to Cuttle Mill underbridge satellite compound	2019	1	-	Few external movements	
Satellite	Bodymoor Heath Lane overbridge	Brick Kiln Lane/A4091 Tamworth Road/A446 Lichfield Road	2018	4	10	55-75	45-65
Satellite	A4091 Tamworth Road overbridge	Park Lane	2017	3	-	45-50	25-50
Satellite	Church Lane overbridge	Church Lane	2018	4.5	11	70-85	55-70
Road head	Faraday Avenue	Faraday Avenue/A446 Lichfield Road	2019	4.5	54	-	1170

12.4.11 Details of construction phasing are provided in Section 2.3, Construction of the Proposed Scheme. The assessment of construction traffic has considered the traffic and transport impacts and effects in three peak periods of construction activity, based on the proposed phasing of the works. The peak periods have been identified as months 27 to 35 (2018 Quarter 3 to 2019 Quarter 1), months 36 to 42 (2019 Quarter 2 to 2019 Quarter 4) and months 43 to 59 (2019 Quarter 4 to 2021 Quarter 1). In months 27 to 35 and 43 to 59 there will be five of the worksites that also provide access for

other compounds operational and in months 36 to 42 there will be six that will be in operation. Where impacts are significant in any of these periods they are identified, together with the effects of other significant changes.

12.4.12 It is envisaged that the M42, M6 Toll and A446 Lichfield Road will provide the primary HGV access and egress routes for construction traffic.

12.4.13 Highway realignments in this area will not result in changes in journey length of more than 500m. The effects of this will not be significant.

12.4.14 There will be a restricted access arrangements and overnight and/or weekend closures on Faraday Avenue, the A4097 Kingsbury Road, Bodymoor Heath Lane, the A4091 Tamworth Road, Crowberry Lane, Park Lane and Church Lane. The effect of these off peak closures on traffic flows and traffic delays, in terms of the diversions and traffic congestion[89], will not be significant. Liaison will be undertaken with businesses in the Hams Hall Distribution Centre during detailed design to understand what provisions need to be made to mitigate the impact on these 24 hour businesses.

12.4.15 The works will involve restrictions and closures of sections of the M42. These are described in Section 2.3. During the construction of the M42 Marston box structure, the number of lanes on the M42 will be maintained with the exception of a small number of overnight carriageway closures which include five night-time closures of the southbound carriageway for installation of the deck over that carriageway; and four night-time closures of the northbound carriageway for installation of the deck over that carriageway.

12.4.16 These closures will be of a short duration and are considered to not have significant effects.

12.4.17 Construction of the Proposed Scheme will result in changes in traffic flows from workers and construction vehicles accessing compounds, and also as a result of temporary road closures and diversions.

12.4.18 Changes in traffic flows will lead to a significant increase in delay and congestion to vehicle users in the following junctions:

- A446 Lichfield Road/Faraday Avenue/Marsh Lane (minor adverse effect); and
- A4091 Tamworth Road/A446 Lichfield Road (minor adverse effect).

12.4.19 These junctions are predicted to be over capacity in the future baseline scenario on the basis of the background traffic growth forecast. The addition of construction traffic will increase congestion.

12.4.20 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) that will cause a

[89] 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.

significant increase in traffic-related severance[90] for non-motorised users, making it more difficult to cross the roads in the following locations:

- Church Lane between Crowberry Lane and the A4091 Tamworth Road (moderate adverse effect due to increase in HGV traffic);
- A446 Lichfield Road, between Faraday Avenue and the A4091 Tamworth Road (moderate adverse effect due to increase in HGV traffic);
- A446 Lichfield Road, between B4117 Watton Lane and Faraday Avenue (major adverse effect due to increase in HGV traffic);
- A446 Lichfield Road/Faraday Avenue (moderate adverse effect due to increase in HGV traffic);
- A446 Lichfield Road/A4097 Kingsbury Road (minor adverse effect due to increase in HGV traffic);
- A4091 Tamworth Road/Park Lane (minor adverse effect due to increase in HGV traffic); and
- A4091 Tamworth Road/A446 Lichfield Road (minor adverse effect due to increase in HGV traffic).

12.4.21 Utility works (including diversions) have been assessed in detail only where they are major works and where the traffic and transport impacts from the works separately, or in combination with other works, is greater than other construction activities arising from such works within the area. More minor utilities works are expected to result in only localised traffic and pedestrian diversions that will be of short term duration. No additional significant effects are expected.

12.4.22 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 total traffic during construction.

12.4.23 It is not expected that the construction of the Proposed Scheme will require any bus route diversions, as road closures will generally only be overnight when bus services will not be operational.

12.4.24 Construction of the Proposed Scheme is not expected to result in any temporary loss of pedestrian links to or between public transport services. There are no stations or interchanges affected by the Proposed Scheme in this area.

12.4.25 Civil engineering works to construct the Curdworth viaducts over the Birmingham and Derby Line will necessitate temporary rail possessions affecting rail users passing through the Curdworth to Middleton area. Track possessions will be limited to a small number of weekend and 24 hour possessions. Additional rail possessions will be needed to accommodate the interface with Network Rail associated with the Kingsbury Road railhead to be used for systems works. These will similarly involve

[90] 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.

limited possessions including mid-week night time and weekend possessions. The impact of these works on rail passengers will not be significant. Rail replacement services will be provided, if necessary, when rail possessions are in place.

12.4.26 The Birmingham and Derby Line will be used to supply materials to the Kingsbury Road railhead. These train movements will use available train paths and will have no effect on existing services.

12.4.27 During the construction phase there will be five minor adverse effects in journey ambience on users of PRoW within the Curdworth to Middleton area. These include five PRoW (footpaths, bridleways and byways T17, T179, M16, M22 and M23a), where construction vehicles will operate alongside or across the PRoW. Footpaths M450, M13 and M23 will be closed for a period of nine years during the construction and operation of the Kingsbury Road railhead. Currently they pass across the proposed site of the railhead.

12.4.28 There will be minor adverse effects on non-motorised users due to increased travel distances for three PRoW (footpaths T15, T17 and M23a), each of which will be diverted by up to 100m. Effects of permanent PRoW realignments are reported in the operation section.

12.4.29 The effects of construction of the permanent works over the Birmingham and Fazeley canal and will not be significant, as any stoppage of the waterway, if required, would only be overnight.

Cumulative effects

12.4.30 The assessment includes cumulative effects of planned development during construction by taking this into account within the background traffic growth.

12.4.31 The assessment also includes in-combination effects by taking into account traffic and transport impacts of works being undertaken in the neighbouring areas. The assessment for this area has therefore included inbound construction traffic flows of 150 cars/light goods vehicles (LGV) and 1430 HGV per day and outbound construction traffic flows of 175 cars/LGV and 1430 HGV per day, as generated from the Coleshill Junction area (CFA19); also inbound construction traffic flows of 90 cars/light goods vehicles (LGV) and 300 HGV per day and outbound construction traffic flows of 105 cars/LGV and 300 HGV per day, as generated from the Drayton Bassett, Hints and Weeford area (CFA21).

12.4.32 The traffic management required to construct the M42 Marston box structure will be coordinated with the works to cross the motorway network in the Coleshill Junction area (CFA19). The combined effect of these works is considered in Volume 2 of CFA19.

Permanent effects

12.4.33 Any permanent effects of construction have been considered in the operations assessment for traffic and transport. This is because the impacts and effects of the forecast increases in travel demand and the wider impacts of operations need to be considered together.

Other mitigation measures

12.4.34 The implementation of the draft CoCP (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. These reductions in effects arising from the travel plan measures have not been included in the assessment, which will mean the effects may be over-stated.

12.4.35 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

12.4.36 The most intensive peak periods of construction will cause increases in traffic that will affect pedestrians, cyclists and equestrians crossing and using Church Lane between Crowberry Lane and the A4091 Tamworth Road, the A446 Lichfield Road, between Faraday Avenue and the A4091 Tamworth Road, the A446 Lichfield Road, between B4117 Watton Lane and Faraday Avenue, the A446 Lichfield Road/Faraday Avenue junction, the A446 Lichfield Road/A4097 Kingsbury Road junction, the A4091 Tamworth Road/Park Lane junction, and the A4091 Tamworth Road/A446 Lichfield Road junction.

12.4.37 Similarly, increased traffic will cause additional congestion, increasing delays for road users on theA446 Lichfield Road/Faraday Avenue/Marsh Lane junction and A4091 Tamworth Road/A446 Lichfield Road junction.

12.4.38 There will be minor adverse effects on non-motorised users due to increased travel distances for three PRoW (footpaths T15, T17 and M23a), each of which will be diverted by up to 100m. Permanent PRoW diversions will also occur and are reported in Section 12.5.

12.4.39 Three PRoW (footpaths M450, M13 and M23) will be closed for a period of nine years during the construction and operation of the Kingsbury Road railhead.

12.4.40 The significant effects that result from construction of the Proposed Scheme are shown on Map TR-03-105 (Volume 5, Map Book, Traffic and Transport).

12.4.41 The journey ambience of five PRoW (footpaths T17, T179, M16, M22, and M23a) will be temporarily affected due to construction vehicles operating alongside or across the PRoW.

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; 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).

12.5.3 The operational traffic and transport impacts within this area will include:

- permanent road realignments and diversions;
- permanent PRoW realignments and diversions; and
- traffic accessing the areas of the Proposed Scheme for maintenance purposes.

12.5.4 In 2041, traffic flows with the Proposed Scheme 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 vehicle movements are expected to be infrequent and will have no significant effect, including no effects on travel times or non-motorised users.

12.5.5 The effect on accident and safety risks will not be significant as there are no substantial increases in traffic due to the operation of the Proposed Scheme.

12.5.6 The Proposed Scheme will have no effect on the five bus services that will intersect with the alignment of the Proposed Scheme. There will be no significant effects on public transport delays within this area.

12.5.7 Ten PRoW will be realigned or diverted within this area. Of these, three will be realigned by less than 100m. The maximum realignment will be approximately 2.5km (M450); however this will mainly impact on non-pedestrian by-way users (pedestrians will still be able to cross the road). Footpath T17 will be realigned by 835m. A further four PRoW will be realigned up to 320m (M16, M14, M23 and M23a).

Cumulative effects

12.5.8 The assessment includes the cumulative effects of planned development during operation, by taking this into account within the background traffic growth.

12.5.9 The assessment also considers in-combination effects by taking into account traffic and transport movements from nearby areas. However, there are no in-combination impacts for this area.

Other mitigation measures

12.5.10 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

12.5.11 Six PRoW (footpaths, byways and bridleways T17, M450, M16, M14, M23 and M23a) will be realigned with significant increases in journey times for pedestrians, cyclists and equestrians.

12.5.12 The significant effects that will result from the Proposed Scheme are shown in Volume 5: Map Book – Traffic and transport, Map TR-04-105.

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 Curdworth to Middleton area (CFA20) include:

- the River Tame and Langley Brook both classified as main rivers, that are crossed by the Proposed Scheme, as do their tributaries, including Gallows Brook, which are classified as ordinary watercourses;
- the Birmingham and Fazeley Canal that will be crossed by the Proposed Scheme;
- a number of Secondary aquifers;
- the Middleton Pool SSSI;
- numerous minor springs present within the study area; and
- a licensed groundwater abstraction at Bodymoor Heath Training Ground; and five other licensed groundwater abstractions.

13.1.3 Key environmental issues relating to water resources and flood risk include the potential impacts of:

- culverting a section of Gallows Brook east of Upper House Farm (part of the Langley Brook water body) and two tributaries of Langley Brook at Middleton House Farm and Primrose Cottage;
- extending an existing bridge on Langley Brook under the A4091 Tamworth Road;
- the viaduct crossings over the watercourses in this study area, specifically the Curdworth viaducts, Birmingham and Fazeley Canal viaducts, Langley Brook viaduct, and Drayton Bassett viaduct (located in the Drayton Bassett, Hints and Weeford area (CFA21));
- constructing a bridge over a tributary of Langley Brook at Cuttle Mill Fishery;
- groundwater flows with respect to the construction of the M42 Marston box structure and the potential need for dewatering during construction of the Proposed Scheme; and
- alteration of groundwater flow to issues, springs and on groundwater dependent ecological receptors.

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)[91] compliance assessment; and
- a route-wide Flood Risk Assessment (FRA).

13.1.5 Detailed reports on water resources and flood risk within this area are also contained in the Volume 5 appendices. These include:

- Appendix WR-002-020: Water Resources Assessment report;
- Appendix WR-003-020: Flood Risk Assessment; and
- Appendix WR-004-013: Curdworth to Middleton River Modelling Report.

13.1.6 Volume 5: Map series WR-01 to WR-03, WR-05 and WR-06 showing details referred to in this report.

13.1.7 Discussions have been held with the Environment Agency, Warwickshire County Council (WCC) 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 Volume 5: WR-002-020 and Volume 5: WR-003-020. 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 Kingsbury Road railhead, professional judgement has been used in selecting the appropriate limit to the extension in spatial scope required. For the purposes of this assessment, this 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 and which may therefore

[91] Directive 200/60/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.

be potentially affected by the Proposed Scheme have been detailed in the baseline in this assessment.

13.2.4 Site visits were undertaken in June 2013 with the Environment Agency and WCC for the following locations along the route: River Tame downstream of Curdworth Bridge; tributary of Langley Brook at Primrose Cottage; Langley Brook crossing at Middleton Pool, Walkers Spinney; and tributary of Langley Brook at Trickley Coppice.

13.2.5 Water Framework Directive 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 RBMP, these are referred to as 'not assessed by the Environment Agency' in the summary of geology and hydrogeology in Table 24.

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 Volume 5: Appendix WR-003-020.

13.3 Environmental baseline

Existing baseline – surface water resources

Surface water features

13.3.1 All water bodies within the study area, with the exception of the Birmingham and Fazeley Canal upper section, fall within the Tame Anker and Mease catchment that includes the River Tame, Langley Brook and Gallows Brook. This catchment falls within the Humber River Basin District (RBD) as set out within the RBMP[92]. The Birmingham and Fazeley Canal upper section is not assigned to a catchment but is within the Humber RBD.

13.3.2 The current surface water baseline is shown in Volume 5: Maps WR-01-033 and WR-01-034) and all surface water features within the study area are assessed within Volume 5: Appendix WR-002-020. Table 23 includes features potentially affected by the Proposed Scheme.

[92] Environment Agency (2009), *River Basin Management Plan: Humber River Basin District.*

Table 23: Surface water features potentially affected by the Proposed Scheme

Water feature	**Location description (map reference)**[93]	**Watercourse classification**[94]	**WFD water body name and number and current overall status**	**WFD objective status (by 2027*) as per Humber RBMP unless stated**	**Receptor value**[95]
River Tame	Downstream of Curdworth Bridge Map WR-01-033 (SWC-CFA20-001)	Main river	River Tame from confluence of the two arms to River Blythe (GB104028046840) – Moderate Potential	Good Potential	Very High
Tributary of River Tame	South-east of Spring Farm and the M42 Map WR-01-033 (SWC-CFA20-002)	Ordinary watercourse			Moderate
Tributary of River Tame	West of Edison Road Map WR-01-033 (SWC-CFA20-003)	Ordinary watercourse			Moderate
Tributary of River Tame	On Newlands Farm Map WR-01-033 (SWC-CFA20-004)	Ordinary watercourse			Moderate
Drain	At Faraday Avenue Map WR-01-033 (SWC-CFA20-005)	Ordinary watercourse			Moderate
Birmingham and Fazeley Canal	At White Bridge/Lower Mill Plantation Map WR-01-033 (SWC-CFA20-006)	Artificial watercourse	Birmingham and Fazeley Canal upper section (GB70410515) – Moderate Potential	Good Potential	Moderate
Pond	Pond No.1 at Cuttle Mill Fishery Map WR-01-033 (SWC-CFA20-007)	Not applicable			Low

[93] Volume 5: Map Book – Water resources, Maps WR-01-033 and WR-01-034.
[94] 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 Department for Environment, Food and Rural Affairs (Defra) on the main river map and are regulated by the Environment Agency.
[95] For examples of receptor value see Table 43 in the SMR addendum Volume 5 Appendix CT-001-000/2.

Water feature	Location description (map reference)[93]	Watercourse classification[94]	WFD water body name and number and current overall status	WFD objective status (by 2027*) as per Humber RBMP unless stated	Receptor value[95]
Pond	Pond No.2 at Cuttle Mill Fishery Map WR-01-033 (SWC-CFA20-008)	Not applicable			Refer to Section 7, Ecology
Tributary of Langley Brook	At Cuttle Mill Fishery Map WR-01-033 (SWC-CFA20-009)	Ordinary watercourse	Middleton Hall catchment – tributary of Langley Brook (GB104028046850) – Moderate Potential	Good Potential (by 2015)	Moderate
Tributary of Langley Brook	At Middleton House Farm Map WR-01-034 (SWC-CFA20-010)	Ordinary watercourse			Moderate
Tributary of Langley Brook	At Primrose Cottage Map WR-01-034 (SWC-CFA20-011)	Ordinary watercourse			Moderate
Drain feeder to Langley Brook	At Brick Kiln Lane Map WR-01-034 (SWC-CFA20-012)	Ordinary watercourse			Moderate
Langley Brook	At Middleton Pool, Walkers Spinney Map WR-01-034 (SWC-CFA20-013)	Main river	Langley Brook from Source to Middleton Hall Catchment (GB104028046890) – Poor Status	Good Status	Moderate
Gallows Brook	East of Upper House Farm Map WR-01-034 (SWC-CFA20-014)	Ordinary watercourse			Moderate
Tributary of River Tame	At Trickley Coppice Map WR-01-034 (SWC-CFA20-015)	Ordinary watercourse			Moderate
5 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 status of both the River Tame and the Birmingham and Fazeley Canal is Moderate Potential. The overall WFD classification of Langley Brook is Poor Status. The WFD objective for all water bodies is Good by 2027.

13.3.4 The WFD status and objectives of water bodies that are not crossed by the route are shown in Volume 5: Appendix WR-002-020.

Abstractions and permitted discharges

13.3.5 There are 11 locations where surface water is abstracted within 1km of the Proposed Scheme in this area, according to data from the Environment Agency[96] (details in Volume 5: Appendix WR-002-020).

13.3.6 Information from North Warwickshire Borough Council (NWBC) indicates that there are no unlicensed abstractions from surface water used for potable supply in their records.

13.3.7 There is potential for further unlicensed abstractions to exist as a licence is not required for abstraction volumes below 20 cubic metres per day.

13.3.8 Envirocheck data indicates that there are 43 current permitted surface water discharges within 1km of the Proposed Scheme in this study area (details in Volume 5: Appendix WR-002-020).

Existing baseline – groundwater resources

Geology and hydrogeology

13.3.9 The location of abstractions and geological formations are shown in Volume 5: Map Book Map WR-02-020.

13.3.10 A summary of the superficial and bedrock geology and hydrogeology is presented in Table 24. Unless otherwise stated, the geological groups listed are all crossed by the Proposed Scheme.

[96] Surface water abstractions for public supply are not included.

Table 24: Summary of geology and hydrogeology in CFA20

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	Broadly constrained to valleys within the eastern half of the study area	Clay, silt, sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River Terrace Deposits	Broadly constrained to valleys within the eastern half of the study area	Sand and Gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial Deposits	Isolated areas in the south of the study area, in the vicinity of the M42/M6 toll (junction 9)	Sand and Gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciolacustrine Deposits	Broad area in the south of the study area, in the vicinity of the M42/M6 toll (junction 9)	Clay and Silt	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Head Deposits	Isolated patches throughout study area	Clay, Silt, Sand and Gravel.	Secondary (Undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Mercia Mudstone Group	Underlies entire study area	Mudstones and subordinate siltstones.	Secondary B aquifer	Tame Anker Mease – Secondary Combined Poor status	Good Status	Moderate

* Year may vary in different RBMPs.

Superficial deposits

13.3.11 Superficial geological deposits are located across the majority of the route and consist of glacial deposits, river terrace deposits and localised alluvium associated with watercourses such as the River Tame.

13.3.12 The groundwater vulnerability of the alluvium and river terrace deposits is generally high, however the vulnerability of the groundwater within the alluvium associated with the ponds at The Belfry is low.

Bedrock aquifers

13.3.13 The Mercia Mudstone Group is classified as a Secondary B aquifer.

Water Framework Directive status

13.3.14 No WFD classification has been given by the Environment Agency to the superficial deposits.

13.3.15 The current overall WFD status of groundwater in the bedrock in the study area is summarised in Table 24. Groundwater in this study area is classified as at risk, with overall Poor Status.

13.3.16 The reason for the poor status is given in the RBMP for the Humber River Basin District, which 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

13.3.17 The locations of licensed abstractions within the study area are shown in Volume 5: Appendix WR-002-020, Table 4. The locations are shown in Volume 5: Map WR-02-020.

13.3.18 The Environment Agency reports that there are six licensed groundwater abstractions within the study area (further details are provided in Volume 5: Appendix WR-002-020).

13.3.19 There are no groundwater Source Protection Zones (SPZs) located within the study area.

13.3.20 One unlicensed potable supply (Volume 5: Map WR-02-020, CFA20-GWA1) has been identified by NWBC within the study area at Cuttle Mill Farm (Volume 5: Map WR-02-020, F5).

13.3.21 There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20 cubic metres per day.

13.3.22 Envirocheck data indicates that there are 14 permitted discharges to groundwater within the study area.

Surface water/groundwater interaction

13.3.23 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-002-020, Table 6.

13.3.24 Ponds which may potentially be affected by the Proposed Scheme are summarised in Table 23 and listed in full in Table 6 of Volume 5: Appendix WR-002-020. 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

13.3.25 Middleton Hall and Middleton Pool SSSI (Volume 5: Map Book – Ecology, Map EC-01-058) is situated upon groundwater bearing superficial deposits and contains fen and swamp habitat and partially fed by the Langley Brook.

13.3.26 There are a number of potentially water dependent ecological sites within the Curdworth to Middleton area which are locally designated. These are detailed in Table 7 of Volume 5: Appendix WR-002-020 and include:

- Lea Marston Old Quarry local wildlife site (LWS);
- Lea Marston Lake (LWS);
- Mill Plantation and Lower Mill Plantation and surrounding fishing lakes at Cuttle Mill Fishery;
- Middleton Hall Farm Quarry; and
- Coneybury Wood (LWS) and ancient replanted woodland).

13.3.27 Further information on the ecological receptors is given in Section 7, Ecology.

Existing baseline – flood risk

River flooding

13.3.28 The agreed data set for river flooding is the Environment Agency Flood Zone Mapping[97]. This mapping has been supplemented with the use of site-specific hydraulic modelling at all locations where the Proposed Scheme will cross watercourses as shown on OS mapping.

13.3.29 At the southern extent of the Curdworth to Middleton area, the route will be on a viaduct that will cross the River Tame. The catchment area draining to this location is in excess of 400km^2.The course of the River Tame has historically been altered due to development requirements in this and upstream areas. Site-specific hydraulic modelling shows that flood flows will inundate the land on the northern bank during the 1 in 100 (1%) annual probability event, allowing for climate change, at the location of the Proposed Scheme, and in more extreme events be hydraulically connected to the drains to the north. The width of the 1 in 100 (1%) allowing for climate change, floodplain at this location is 494m. There are no residential properties within the floodplain near to the Proposed Scheme, the land use within the floodplain is the Coleshill Sewage Treatment Works and therefore less vulnerable (moderate value receptor).

13.3.30 A tributary of Langley Brook flows north-east from the outfall of the impounded water bodies at the Cuttle Mill Fishery. The catchment area draining to this location is 3km^2; however, the flow at the Proposed Scheme is likely to be dependent on the operation of the upstream water bodies, rather than a natural flow regime. The width of the 1 in 100 (1%) allowing for climate change, floodplain at the proposed crossing is 40m. There is a residential property at Cuttle Mill Fishery within the floodplain near to the

[97] 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.

Proposed Scheme; the land use is which is categorised as more vulnerable (high value receptor).

13.3.31 In the vicinity of Middleton House Farm, two tributaries of Langley Brook flow from west to east. The catchment areas of these tributaries, at the location of the Proposed Scheme, are 5.5km^2 and 2.3km^2. The width of the 1 in 100 (1%) allowing for climate change, floodplain to be crossed by the Proposed Scheme at this location is 347m. There are no residential properties within the floodplain near to Proposed Scheme, the land use within the floodplain is agricultural and therefore less vulnerable (moderate value receptor).

13.3.32 Towards the northern extent of the Curdworth to Middleton area, Langley Brook flows from west to east. The catchment area draining to this location is 16.5km^2 and the width of the 1 in 100 (1%) allowing for climate change, floodplain at the proposed crossing is 167m. There are no residential properties within the floodplain near to the Proposed Scheme; the land use within the floodplain is a sewage treatment works and equine facilities, which is categorised as less vulnerable (moderate value receptor).

13.3.33 There are no residential properties located within the modelled 1 in 100 (1%) plus climate change flood plain, which would be impacted as a result of the Proposed Scheme. The Flood risk assessment (FRA) in Volume 5: Appendix WR-003-020 provides further details of receptors within the Flood Zones and their vulnerability.

13.3.34 The Environment Agency Mapping and Warwickshire SFRA[98] indicate that there have been no incidents of historical river flooding either at or within 1km of the route. However, the Warwickshire PFRA[99] indicates that historical events have occurred along Langley Brook in the vicinity of the Proposed Scheme.

Surface water flooding

13.3.35 The agreed data set for surface water flooding is the Environment Agency Flood Map for Surface Water (FMfSW), as shown on Volume 5: Map Book Maps WR-01-033 and 034.

13.3.36 The areas susceptible to surface water flooding during the 1 in 200 (0.5%) annual probability event are shown on Volume 5: Map Book Maps WR-01-033 and 034.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 Curdworth to Middleton area.

13.3.37 Six areas identified to be at risk of surface water flooding are classed to be at a high risk and two locations have 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;

[98] Warwickshire County Council (2008), *Strategic Flood Risk Assessment. Volume 1* completed by Halcrow Group Ltd.
[99] Warwickshire County Council (2011), *Warwickshire Preliminary Flood Risk Assessment*. Completed by Royal Haskoning on behalf of Warwickshire County Council.

- overland flow paths; or
- isolated areas (e.g. low spots where water collects).

13.3.38 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.

13.3.39 In this study area there is one location where overland flow paths are evident on the Environment Agency FMfSW which do not follow a watercourse. This is to the north of the Birmingham and Fazeley Canal (Volume 5: Map Book Map WR-01-034).

13.3.40 The Environment Agency Mapping, Warwickshire SFRA and Warwickshire PFRA indicate that there have been no incidents of historical surface water flooding within the study area.

Sewer flooding

13.3.41 The agreed data sets for sewer flooding are the NWBC SFRA[100]. In this study area, Severn Trent Water asset mapping has also been used.

13.3.42 The Proposed Scheme will be in the vicinity of the sewer network in one location. However, the topography of the area indicates that there are no flow paths from surcharge points to the Proposed Scheme; therefore, the Proposed Scheme will not affect flooding from this source. It is concluded that there is a low risk of flooding from the sewer network.

13.3.43 The Environment Agency Mapping, Warwickshire SFRA and Warwickshire PFRA indicate that there have been no incidents of historical sewer water flooding within the study area.

Artificial water bodies

13.3.44 The agreed data set for reservoir flooding is the Environment Agency reservoir inundation map. OS mapping has been used to determine the location of canals within the study area.

13.3.45 Flooding from artificial systems may occur from failure of a retaining structure that impounds water. The following manmade features have been identified within the FRA (Volume 5: Appendix WR-003-20) as being a source of flood risk:

- the canal system; and
- reservoirs.

13.3.46 The Birmingham and Fazeley Canal (Volume 5: Map WR-01-033, SWC-CFA20-006) is the only canal that will be crossed in the study area (by the Birmingham and Fazeley Canal viaduct, to the south of Cuttle Mill Fishery). Topographic data indicates that the normal water level in the canal is not above surrounding ground level and hence there is no risk of structural breaching occurring. However, there is a small section of embankment on the left bank upstream of the lock at White Bridge that could be overtopped if water levels in the canal rise during a storm event. Water levels within

[100] North Warwickshire Borough Council (2008), *Level 1 Strategic Flood Risk Assessment for Local Development Framework*.

canals are maintained and if water levels do rise, the flow is likely to spill into the lower pond before spilling over the embankment; therefore it is unlikely that overtopping will occur. The flow route of any potential flooding form the canal at this location would be to the north east, which will not change as a result of the Proposed Scheme. The Proposed Scheme will not increase the risk of flooding from this source as no works that will affect the integrity of the canal are proposed. The risk from this source of flooding is low.

13.3.47 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. There are four water bodies that are listed in the Environment Agency reservoir inundation flood mapping as posing a potential flood risk to the Proposed Scheme. These reservoirs, Rotton Park (Edgbaston Reservoir), Bartley, Belfry, and Canwell, pose a risk at three locations described below. However, the data provided does not indicate flood depths, flow velocities or the time taken for onset of flooding after a breach takes place.

13.3.48 The mapping shows that flood extents associated with the Rotton Park (Edgbaston Reservoir) and Bartley reservoirs, would be less than the 1 in 100 (1%) annual probability of river flooding from the River Tame. The inundation extents for the Canwell Reservoir are similar to the river flooding extents of a tributary of the River Tame. The inundation extents for The Belfry Reservoir are similar to the river flooding extents of the Langley Brook where the route crosses the watercourse; however to the north of Bodymoor Heath Lane the reservoir inundation mapping covers a greater extent than the 1 in 100 (1%) annual probability of river flooding extent.

13.3.49 Due to the strict regulations and high level of maintenance associated with reservoirs, breaching is considered very unlikely, and the works associated with the Proposed Scheme will not increase the risk of failure. The Proposed Scheme will not increase the risk of flooding from this source as no works that will affect the integrity of the impounding structures are proposed. Therefore the risk from this source of flooding is categorised as low.

13.3.50 The Environment Agency Mapping, Warwickshire SFRA and Warwickshire PFRA indicate that there have been no historical incidents of reservoir or canal flooding within the study area.

Groundwater flooding

13.3.51 The agreed data set for groundwater flooding is the Warwickshire PFRA.

13.3.52 The Warwickshire PFRA does not report any significant groundwater flooding within the study area.

Future baseline

13.3.53 Section 2.1, Overview of the area and description of the Proposed Scheme 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 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)

13.3.54 All committed developments are required to comply with the NPPF[101], 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.

13.3.55 WFD future status objectives are set out in Table 23 and Table 24. This potential change in baseline is not considered to result in significant changes to the reported effects from the Proposed Scheme.

Operation (2026)

13.3.56 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

13.3.57 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 are not considered to result in the reported effects from the Proposed Scheme changing in significance.

13.3.58 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.

13.3.59 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.

13.3.60 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.

[101] Department for Communities and Local Government (2012), *National Planning Policy Framework.*

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 provided in Volume 5: Appendices WR-002-020 and WR-003-020.

13.4.3 It is proposed to culvert watercourses at the following locations:

- two sections of tributaries of Langley Brook. The first is at Middleton House Farm (Volume 5: Map WR-01-034, SWC-CFA20-010) and the second is at Primrose Cottage (Volume 5: Map WR-01-034, SWC-CFA20-011);
- a section of Gallows Brook, east of Upper House Farm (Volume 5: Map WR-01-034, SWC-CFA20-014); and
- it is also proposed to extend an existing culvert under A4091 Tamworth Road on Langley Brook at Middleton Pool, Walkers Spinney (Volume 5: Map WR-01-034, SWC-CFA20-013).

13.4.4 Culvert length will be minimised wherever possible and will be designed with invert levels below the firm bed of the watercourse to negate the impact on flows and sediment transfer. Consideration will be given to the detailed design to the objectives of the WFD as described in the RBMP. 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. 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)[102] 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.

13.4.5 Railway drainage will be managed using sustainable drainage techniques. In the study area surface water discharges are proposed to:

- the River Tame downstream of Curdworth Bridge (Volume 5: Map WR-01-033, SWC-CFA20-001);
- a tributary of the River Tame south-east of Spring Farm and the M42 (Volume 5: Map WR-01-033, SWC-CFA20-002);
- an unknown drain at Faraday Avenue (Volume 5: SWC-CFA20-005);
- the Birmingham and Fazeley Canal crossing at White Bridge/Lower Mill Plantation (Volume 5: Map WR-01-033, SWC-CFA20-006);
- a tributary of Langley Brook at Middleton House Farm (Volume 5: Map WR-01-034, SWC-CFA20-010); and
- Langley Brook at Middleton Pool, Walkers Spinney (Volume 5: Map WR-01-034, SWC-CFA20-013).

[102] Construction Industry Research and Information Association (2010), *C689 Culvert Design and Operation Guide C689.*

13.4.6 Drainage has been designed to reduce the rate and volume of run-off from the railway and to avoid an increase in flood risk. The balancing ponds will provide mitigation to ensure that rainfall run-off from the Proposed Scheme including. The balancing ponds, shown on Maps CT-06-112 to CT-06-116 (Volume 2, CFA20 Map Book), will be designed where practicable to discharge at existing run-off rates and will accommodate for events up and including the 1 in 100 annual probability (1%) including an allowance for climate change.

13.4.7 Realignments of three minor roads (Church Lane, Hams Lane and Bodymoor Heath Lane) and three major roads (Faraday Avenue, A4097 Kingsbury Road and the A4091 Tamworth Road) are required as part of the Proposed Scheme in this area. The receiving watercourses for road run-off are as follows:

- Langley Brook at Middleton Pool, Walkers Spinney (Volume 5: Map WR-01-034, SWC-CFA20-013) to which it is assumed that Church Lane and the A4091 Tamworth Road outfall;
- a tributary of Langley Brook at Primrose Cottage Spinney (Volume 5: Map WR-01-034, SWC-CFA20-011) to which it is assumed that Bodymoor Heath Lane outfalls;
- a drain at Faraday Avenue (Volume 5: Map WR-01-033, SWC-CFA20-005) to which it is assumed that Faraday Avenue and Hams Lane outfall; and
- the River Tame (Volume 5: Map WR-01-033, SWC-CFA20-001) to which it is assumed that the A4097 Kingsbury Road outfalls.

13.4.8 Appropriate sustainable drainage mitigation will be provided for minor roads 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)[103] and CIRIA[104] 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 WR-002-020.

13.4.9 The horizontal alignment of the route has been designed to limit the potential impact to the ecological sites at the Middleton Hall Farm Quarry (partially designated as an ancient woodland) and Coneybury Wood LWS. The dewatering of the ponds and superficial deposits in the vicinity of these receptors is no longer required, because the planned route has been moved further towards the west.

13.4.10 The Curdworth cutting retaining wall and the Leeds spur north-east retaining wall combined with Sustainable Drainage Systems (SuDS) on the eastern side of the structure will reduce the potential impact on two sets of issues (a type of spring) located between Lea Marston and Dunton Hall. The retaining walls will constrain the zone of influence in the glaciofluvial Secondary A aquifer, which feeds the issues, and SuDS will allow recharge to the Secondary A aquifer along the western side of the

[103] DMRB, Volume 4 Section 2.
[104] CIRIA (2006), *c648 Control of water pollution from linear construction projects*.

retaining wall. This will also reduce the potential impact from dewatering on the Secondary A aquifer within the glaciofluvial superficial deposits and to the Secondary B aquifer within the Mercia Mudstone Group bedrock.

13.4.11 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 discharged to the associated watercourse. This will allow the water to follow a similar path to the existing situation.

13.4.12 Sustainable drainage systems and infiltration trenches will be implemented to facilitate recharge to the groundwater to help maintain groundwater levels within the Secondary aquifers. These SuDS and infiltration trenches will be located in areas where gravity transfer is achievable, having due regard to Environment Agency guidelines[105].

13.4.13 Replacement floodplain storage will be provided to mitigate the impact of the Proposed Scheme on river flood risk. At the North Wood north culvert, the Hunts Green underbridge and the Langley Brook viaduct, modelling has indicated that replacement floodplain storage will be provided upstream of these structures to avoid an increase in flood risk.

13.4.14 Where the Proposed Scheme will interrupt surface water flow paths, the drainage will be designed to intercept and manage this water. This will be achieved through collecting water in the proposed drainage and/or balancing ponds prior to being discharged to the associated watercourse. This will allow the water to follow similar path to the existing situation.

13.4.15 Section 16 of the draft Code of Construction Practice (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.

13.4.16 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 also be provided where appropriate such as the one main compound and 14 satellite compounds, Kingsbury Road railhead and mid-point auto transformer station to reduce the risk of surface water or groundwater pollution;
- the use of oil interceptors, if required, at site offices and work compounds; and

[105] Environment Agency (2013), *Groundwater: Protection: Principles and practice*.

- appropriate measures such as use of bunds of non-erodible material or silt or sediment fences adjacent to watercourses such as the River Tame and also the Langley Brook recognising that it feeds a SSSI.

13.4.17 Measures defined in the draft CoCP, Section 16 will reduce the risk of the works causing an increase in river flood risk through constricting and altering flood flow paths.

13.4.18 Measures defined in the draft 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 and sewers in the surrounding receptors, principally the Severn Trent Water sewer network.

13.4.19 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.

13.4.20 The Kingsbury Road railhead will be located between Marston and the M42. The railhead will contain areas of rail track, loading bays, workshops, car parking, storage areas and fuel tanks. These elements could be a source of contamination to underlying aquifers, and may reduce infiltration to groundwater. The use of SuDS and measures set out in the draft CoCP will reduce the potential impact to the Secondary B aquifer within the Mercia Mudstone and the Secondary undifferentiated aquifer within the superficial head deposits.

Assessment of impacts and effects

13.4.21 This section describes the significant effects following the implementation of avoidance and mitigation measures.

13.4.22 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-002-020 and FRA in Volume 5: Appendix WR-003-020.

13.4.23 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).

13.4.24 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).

Temporary effects

Surface water

13.4.25 The assessment shows there will be no likely significant temporary adverse effects on surface water resources during the construction period.

13.4.26 As no temporary significant effects on surface water features have been identified in the assessment, no likely significant adverse effects on abstractions or discharges will arise.

Groundwater

13.4.27 The assessment shows that there will be no likely significant temporary adverse effects on groundwater, on licensed abstractions and permitted discharges, or on surface water/groundwater interaction.

13.4.28 The assessment shows that there will be no likely significant temporary adverse effects to water dependent habitats.

Flood risk

13.4.29 The assessment has identified no likely 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

13.4.30 No committed developments have been identified that will result in significant cumulative effects.

Permanent effects

Surface water

13.4.31 The assessment shows that there will be no likely permanent significant effects on surface water features from the Proposed Scheme in the construction period.

13.4.32 Further details of the assessment, including the determination of the potential impacts that will have effects which are not significant are provided in Volume 5: Appendix WR-002-020.

13.4.33 As no permanent significant effects on surface water features have been identified, no likely significant effects on abstractions or discharges will arise.

Groundwater

13.4.34 The assessment shows that there will be no likely significant effects on groundwater abstractions and permitted discharges or on surface water/groundwater interaction.

13.4.35 The assessment shows that there will be no likely permanent significant adverse effects on water dependent habitats.

Flood risk

13.4.36 The assessment shows that there will be no likely permanent adverse significant effects on flood risk as a result of the Proposed Scheme.

13.4.37 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-003-020.

Cumulative effects

13.4.38 No committed developments have been identified that will result in significant cumulative permanent effects.

Other mitigation measures

13.4.39 No other mitigation measures are envisaged for surface water, groundwater or flooding.

Summary of likely residual significant effects

13.4.40 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 SuDS used for drainage from the Proposed Scheme, such as balancing ponds, will 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 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 will reduce flood risk are described in Volume 1.

Assessment of impacts and effects

13.5.5 There are considered to be no likely significant 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 effects on surface water resources, groundwater resources or flood risk.

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