HS2

October 2018

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)

Working Draft Environmental Statement

Volume 2: Community Area report

LA04: Coleorton to Kegworth

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LA04: Coleorton to Kegworth

Department for Transport

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

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Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

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

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2.

Structure of the working draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown in Figure 1.

This working draft ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

The working draft ES comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of the following, identified at a stage in the ongoing design and environmental assessment:

- the Proposed Scheme and the reasonable alternatives studied;
- the likely significant beneficial and adverse effects of the Proposed Scheme;
- the means to avoid or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques, based on a stage in the ongoing design;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase, based on a stage in the ongoing design; and

- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied post July 2017 are reported in the relevant Volume 2: Community area reports.

Volume 2: Community area reports and map books

These cover the following community areas:

- western leg: MA01 Hough to Walley's Green; MA02 Wimboldsley to Lostock Gralam; MA03 Pickmere to Agden and Hulseheath; MA04 Broomedge to Glazebrook; MA05 Risley to Bamfurlong; MA06 Hulseheath to Manchester Airport; MA07 Davenport Green to Ardwick; MA08 Manchester Piccadilly Station; and
- eastern leg: LA01 Lea Marston to Tamworth; LA02 Birchmoor to Austrey; LA03 Appleby Parva to Ashby-de-la-Zouch; LA04 Coleorton to Kegworth; LA05 Ratcliffe-on-Soar to Long Eaton; LA06 Stapleford to Nuthall; LA07 Hucknall to Selston; LA08 Pinxton to Newton and Huthwaite; LA09 Stonebroom to Clay Cross; LA10 Tibshelf to Shuttlewood; LA11 Staveley to Aston; LA12 Ulley to Bramley; LA13 Ravenfield to Clayton; LA14 South Kirkby to Sharlston Common; LA15 Warmfield to Swillington and Woodlesford; LA16 Garforth and Church Fenton; LA17 Stourton to Hunslet; and LA18 Leeds Station.

The reports provide the following information for each area, as identified at a stage in the ongoing design and environmental assessment:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a summary of the local alternatives considered since the Government's announcement of the preferred route in July 2017;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- where possible, the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in a separate Volume 2: Community area map book. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-00, LV-02, LV-03, and LV-04, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: Community area reports), operational sound contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: Community area reports) and maps showing key surface water and groundwater features (Map Series WR-01 and WR-02, to be read in conjunction with Section 15, Water resources and flood risk of the Volume 2: Community area reports).

In addition to the community areas detailed above, reports are provided for community areas within which electrification of a section of the MML is proposed: MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station. These reports are provided at an earlier stage of the design and environmental assessment process, following the amendment of the route of the Proposed Scheme to include the electrification of a section of the MML between Clay Cross and Sheffield Midland Station. This would enable high speed trains to connect to Chesterfield and Sheffield as part of the Proposed Scheme. They include for each area:

- an overview of the area;
- a description of the proposed works within the area, based on a stage in the ongoing design;
- an outline of potential effects; and
- an overview of stakeholder engagement and consultation to be carried out as part of the EIA process.

Mitigation measures have not been identified at this stage of the design and environmental assessment process in relation to the likely effects arising from construction and operation of the Proposed Scheme for the MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station areas. Any required mitigation measures will be reported in the formal ES. In addition, any required environmental monitoring during operation of the Proposed Scheme will be reported in the formal ES.

Volume 3: Route-wide effects

This describes the effects that are likely to occur at a geographical scale greater than the community areas described in the Volume 2: Community area reports, based on a stage in the ongoing design and environmental assessment.

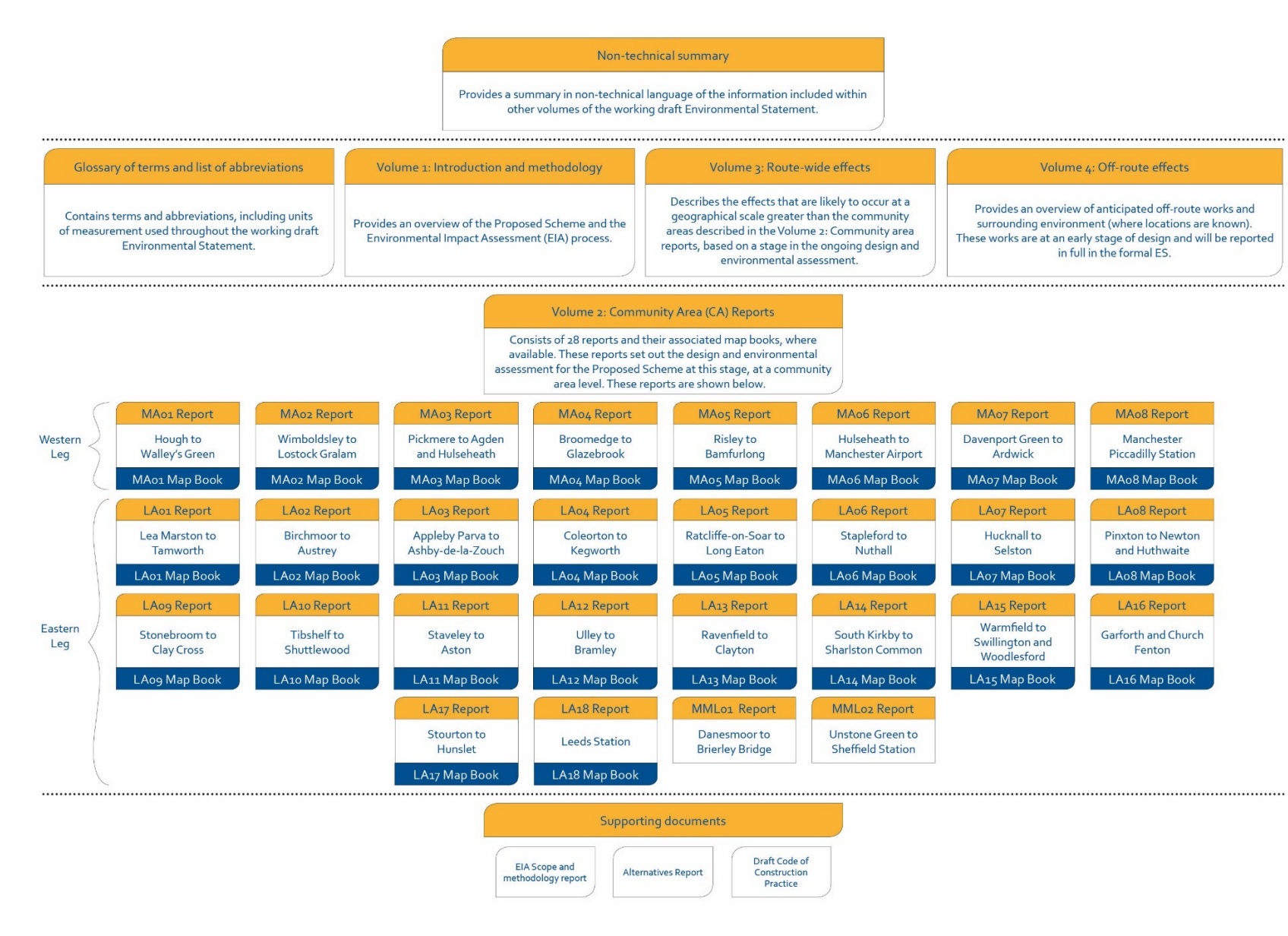
Volume 4: Off-route effects

This provides an overview of anticipated off-route works and surrounding environment (where locations are known). These works are at an early stage of design and will be reported in full in the formal ES.

Supporting documents

- EIA Scope and Methodology Report: this outlines the scope and methodology adopted for the EIA.HS2 Ltd consulted on a draft of the EIA Scope and Methodology Report (SMR) between July and September 2017. This updated version takes into consideration comments received, where appropriate, in addition to changes required as a result of updates to legislation or industry best practice guidance.
- Alternatives report: this describes the evolution of the Proposed Scheme and the reasonable alternatives considered at this stage of the design, at the strategic, route-wide, route corridor and local levels.
- Draft Code of Construction Practice (CoCP): this sets out measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Figure 1 Structure of the Working Draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

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

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London - West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.

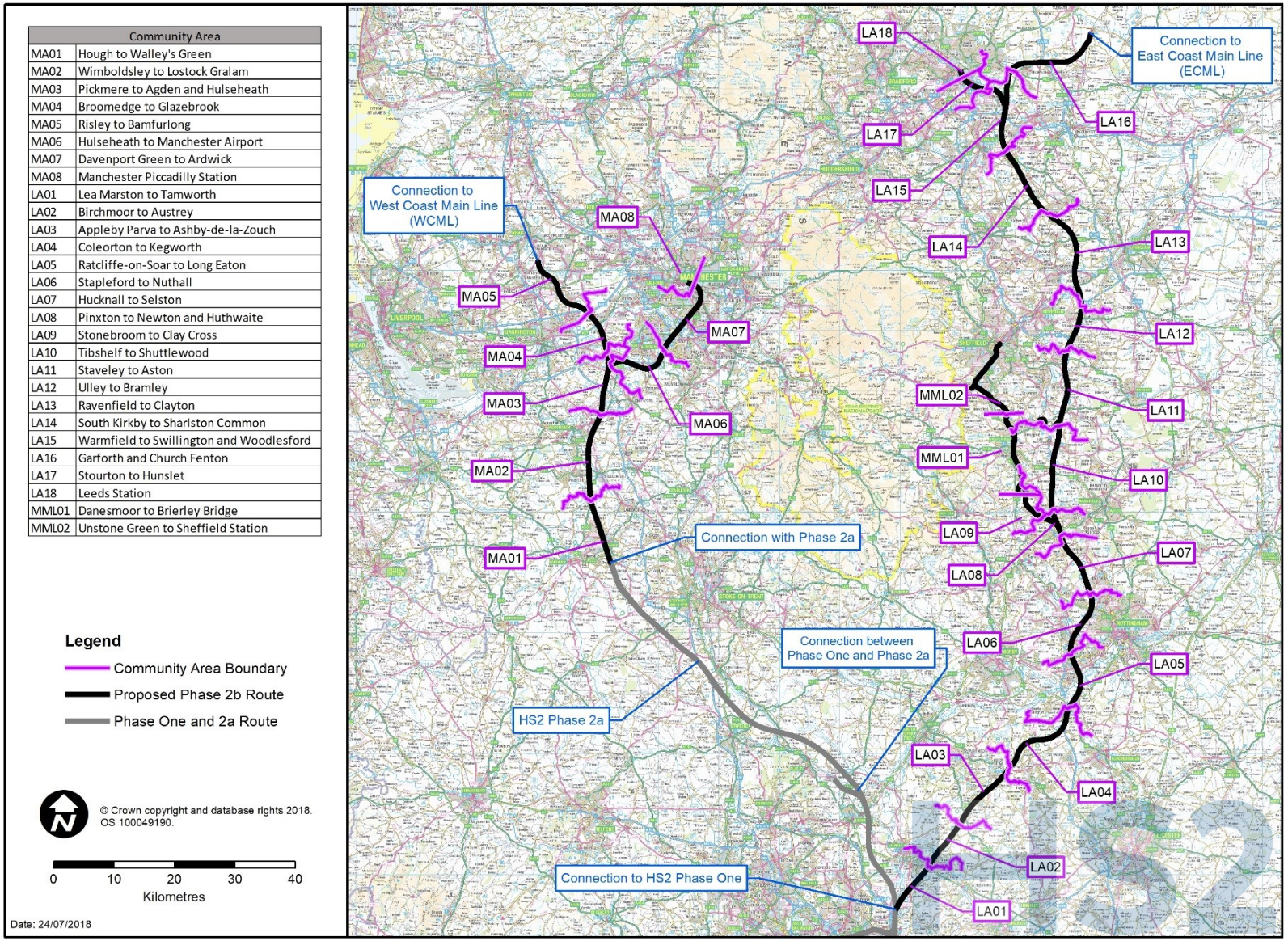
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the 'Y network'.

1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands - Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.

1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the 'western leg'), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as 'the eastern leg'). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Coleorton to Kegworth area (LA04) which is located on the eastern leg of the Proposed Scheme.

Figure 2: The HS2 Phase 2b route and community areas



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point-in-time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Coleorton to Kegworth area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.

1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.

1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)[1,2]. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.

1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;

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

- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

1.3.2 Each environmental topic section (Sections 4 to 15) comprises:

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

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Coleorton to Kegworth area are provided in a separate corresponding document entitled Volume 2: LA04 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: LA04 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

[3] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Coleorton to Kegworth area (LA04) covers an approximately 15.2km section of the Proposed Scheme, passing through the parishes of Coleorton, Staunton Harold, Worthington, Breedon on the Hill, Isley cum Langley, Belton, Long Whatton and Diseworth and Kegworth. This area lies within the local authority areas of North West Leicestershire District Council (NWLDC) and Leicestershire County Council (LeCC). The southern boundary of this section lies within the parish of Coleorton and the northern boundary lies within the parish of Kegworth.

2.1.2 As shown in Figure 3, the Appleby Parva to Ashby-de-la-Zouch area (LA03) lies to the south-west and the Ratcliffe-on-Soar to Long Eaton area (LA05) lies to the north.

Settlement, land use and topography

2.1.3 The Coleorton to Kegworth area is predominantly rural in character, with agriculture being the main land use, interspersed with woodland (including ancient woodland), villages and a scattering of isolated dwellings and farmsteads. The area is characterised by undulating low hills and woodland cover. River valley landscapes containing settlements and floodplain pasture at lower levels are present around Boden Brook and Diseworth Brook.

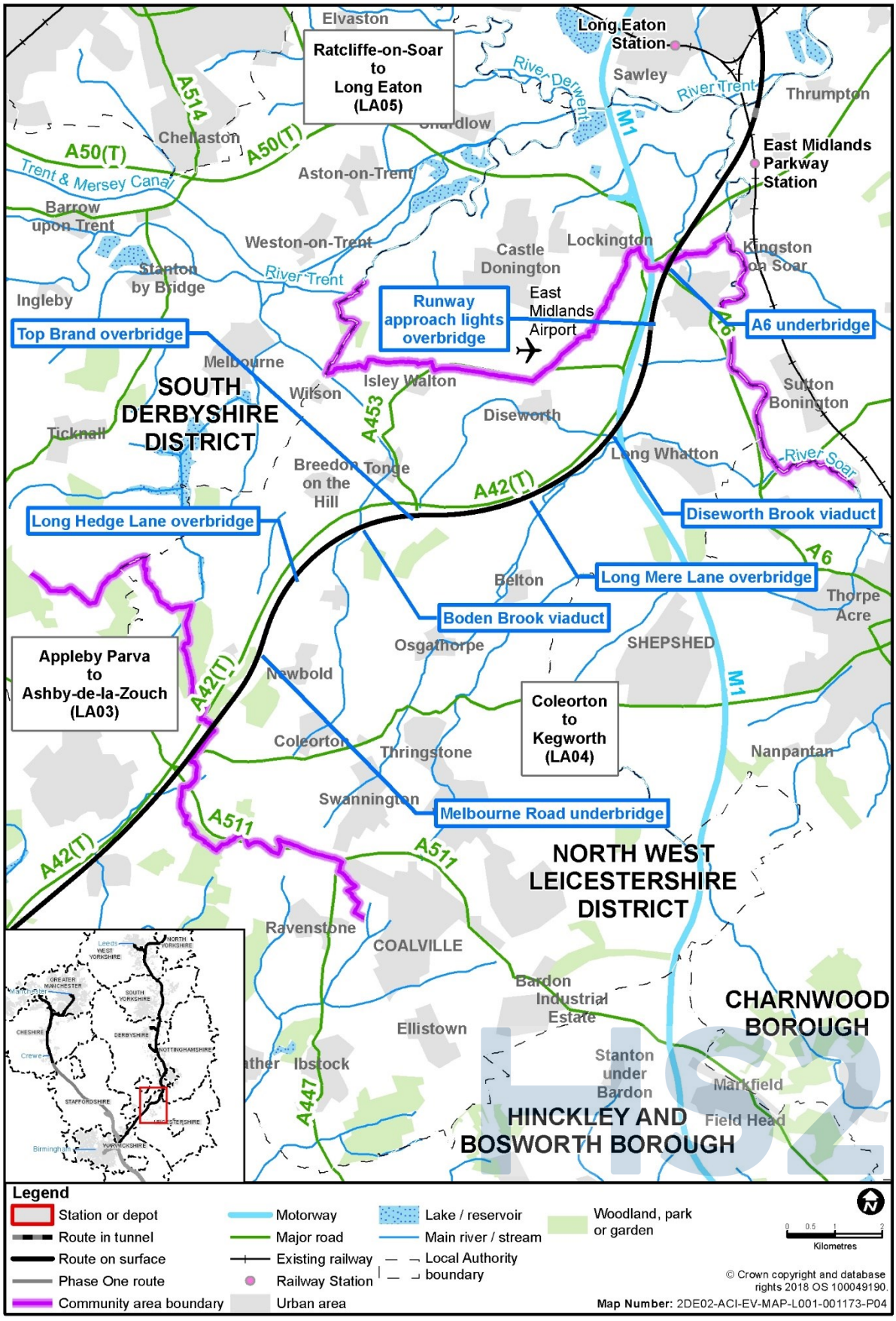
2.1.4 At the southern end of the Coleorton to Kegworth area are the settlements of Newbold (also referred to as Newbold Coleorton) and Lount. Between Lount and Newbold there are areas of woodland and open space including Rough Park and Birch Coppice (both of which contain areas of ancient woodland) and Lount Meadows Site of Special Scientific Interest (SSSI).

2.1.5 Further north are the settlements of Worthington, Breedon on the Hill and Tonge. Between the settlements of Worthington and Breedon on the Hill are Cloud Hill Quarry, Breedon Cloud Wood and Quarry SSSI and Breedon Cloud Wood Ancient Woodland. Pasture and Asplin Woods SSSI and Ancient Woodland and the Grade II listed Breedon Lodge Farmhouse and Cottage are located north-east of Worthington, south of Tonge.

2.1.6 At the northern end of the Coleorton to Kegworth area are the settlements of Diseworth, Long Whatton and Kegworth.

2.1.7 The southern end of the Coleorton to Kegworth area lies approximately 157m above Ordnance Datum (AOD), with a line of hills running south-east to the Charnwood Forest. Towards the north-east, the Coleorton to Kegworth area comprises undulating landscape running to the edge of the River Soar valley, where the land is up to approximately 34m AOD.

Figure 3: Community area context map



Key transport infrastructure

2.1.9 The M1 passes through the north of the Coleorton to Kegworth area. The A42 runs from the south-west to the north-east through the entire Coleorton to Kegworth area, and the route of the Proposed Scheme would closely follow the alignment of the A42. The boundary between the Coleorton to Kegworth area and the Appleby Parva to Ashby-de-la-Zouch area (LA03) is approximately 1km north of junction 13 of the A42. Other main transport routes in the area include the A453 Ashby Road, the A6 Derby Road and several secondary roads, including Stocking Lane, Top Brand, The Green and Ashby Road.

2.1.10 East Midlands Airport lies within the Coleorton to Kegworth area, to the west of Ashby Road and the M1.

2.1.11 The Proposed Scheme would cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide transport links between scattered dwellings and surrounding villages. A 56km long-distance walking route, the Ivanhoe Way, passes near Worthington. Two National Cycle Network (NCN) routes, NCN Route 6 (known locally as Cloud Trail) and NCN Route 15, which runs along Mill Lane, are located in this area.

Socio-economic profile

2.1.12 In the NWLDC area there is a variety of businesses reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (15%)[4], with construction as the second largest (11%), followed by business administration and support (9%).

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the NWLDC area was 77% (45,500 people) and unemployment[7] in the NWLDC area was 4.1%.

2.1.14 The survey also records that 39.8% of NWLDC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 4.9% of residents had no qualifications.

Notable community facilities

2.1.15 The settlements in the southern part of the Coleorton to Kegworth area, including Coleorton, Lount, Newbold (Newbold Coleorton), Worthington, Breedon on the Hill, Tonge, Diseworth and Long Whatton, provide few local services. Generally, these communities are served by the facilities located in the town of Ashby-de-la-Zouch, located in the Appleby Parva to Ashby-de-la-Zouch area (LA03) and described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch, and the village of Kegworth.

[4] Office for National Statistics; UK Business count – Local Units 2015. Available online at: https://www.nomisweb.co.uk
[5] Annual Population Survey, (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[6] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'
[7] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this Office for National Statistics has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.

2.1.16 Kegworth village is located north-east of East Midlands Airport, south-east of junction 24 of the M1. The village has a number of community facilities including Kegworth Museum, Orchard Surgery, Kegworth Primary School, Kegworth Village Hall Pre-School, Kegworth Parish Church St. Andrews, Kegworth Methodist Church and facilities at Kegworth Parish Council. Kegworth also has public houses, restaurants and sports facilities.

Recreation, leisure and open space

2.1.17 This is a predominantly rural area, comprising open space, woodland and farmland. New Lount Local Nature Reserve (LNR), which has picnic facilities and walking routes, forms part of The National Forest and is located south of Newbold Coleorton.

2.1.18 Recreational open spaces such as sports grounds and playing fields are located in the villages of Worthington, Breedon on the Hill, Long Whatton, Diseworth and Kegworth. These include Breedon Priory Golf Centre in Breedon on the Hill and Kegworth Tennis Club and Kegworth Town Cricket Club in Kegworth.

Policy and planning context

Planning framework

2.1.19 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

2.1.20 The following local policy documents have been considered and referred to where appropriate to the assessment:

- North West Leicestershire Local Plan 2011 to 2031 (November 2017)[8];
- Leicestershire Minerals Development Framework – Core Strategy and Development Control Policies up to 2021[9];
- Leicestershire Minerals Local Plan Review 1995 (saved policies)[10];
- Leicestershire and Leicester Waste Development Framework – Core Strategy and Development Control Policies up to 2021[11];
- Leicestershire, Leicester and Rutland Waste Local Plan 1995-2006 (saved policies)[12]; and
- Leicestershire Local Transport Plan 3 (2011-2026)[13].

[8] North West Leicestershire District Council (2017), *North West Leicestershire Local Plan*. Available online at: https://www.nwleics.gov.uk/files/documents/adopted_local_plan_2011_20312/Adopted%20Written%20Statement.pdf
[9] Leicestershire County Council (2016), *Leicestershire Minerals Development Framework.* Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/Minerals_core_strategy_development_control_policies.pdf
[10] Leicestershire County Council (1995), *Leicestershire Minerals Local Plan Review.* Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/3/Minerals_local_plan_0.pdf
[11] Leicestershire County Council (2016), *Leicestershire & Leicester Waste Development Framework*. Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/waste_core_strategy_development_control_policies.pdf
[12] Leicestershire County Council (2002), *Leicestershire, Leicester and Rutland Waste Local Plan 1995-2006.* Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/waste_local_plan.pdf
[13] Leicestershire County Council (2014), *Leicestershire Local Transport Plan 3.* Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2017/1/9/Local_transport_plan.pdf

2.1.21 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for examination.

2.1.22 The Leicestershire Minerals and Waste Local Plan (2016) was submitted to the Secretary of State for examination in February 2018[14].

Committed development

2.1.23 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme. Allocations in the submission draft of the Leicestershire Minerals and Waste Local Plan have also been included as committed development.

2.1.24 Where it is likely that committed developments will have been completed by 2023, these will be identified as 'future baseline' schemes and taken into account in the formal ES.

2.1.25 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.26 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

Ongoing design development

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

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, including access to balancing ponds;
- additional environmental measures required to mitigate likely significant

[14] Leicestershire County Council Minerals and Waste Local Plan (2016). Available online at: https://www.leicestershire.gov.uk/environment-and-planning/planning/minerals-and-waste-local-plan/submission

environmental effects;

- accommodation works and crossings of the Proposed Scheme for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station locations.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Coleorton to Kegworth area, including the proposed environmental mitigation measures that have been identified to date. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9.

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

Overview

2.2.3 The Proposed Scheme through the Coleorton to Kegworth area would be approximately 15.2km in length and would lie within the NWLDC and LeCC areas. The Proposed Scheme would extend from Coleorton in the south to Kegworth in the north.

2.2.4 This section of route is illustrated on maps CT-06-419b to CT-06-429a in the Volume 2: LA04 Map Book.

2.2.5 All dimensions in the sections below are approximate.

2.2.6 In the Coleorton to Kegworth area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 828m (Boden Brook and Diseworth Brook viaducts);
- cuttings for a total length of 6.8km (Ashby-de-la-Zouch No.2 continuing from the Appleby Parva to Ashby-de-la-Zouch area (LA03), Worthington, Gelscoe, Diseworth and Kegworth cuttings); and
- embankments for a total length of 7.6km (Lount, Cloud Hill Quarry No.1, Cloud Hill Quarry No.2, Diseworth south, Diseworth north, Kegworth and A6 Kegworth embankments).

2.2.7 Embankments and cuttings have been labelled according to their predominant physical characteristics. It is important to note that embankments and cuttings may vary as to their depth of cutting or height of embankment, as a result of the topography through which the railway passes. In the Coleorton to Kegworth area, there would be sections of embankment which would be located below ground level. This applies to the Cloud Hill Quarry embankment No.1, which would include a shallow cutting that is 60m in length and up to 3m below existing ground level.

2.2.8 The Proposed Scheme is described in four separate sections below.

2.2.9 In general, features are described along the route of the Proposed Scheme from south to north, and west to east as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA04 Map Book.

Ashby-de-la-Zouch cutting No.2 to Cloud Hill Quarry embankment No.1

2.2.10 The route of the Proposed Scheme would continue from the Appleby Parva to Ashby-de-la-Zouch area (LA03) north-east, passing to the east of Lount and to the west of Newbold Coleorton in Ashby-de-la-Zouch cutting No.2 and on Lount embankment. It would pass to the west of Worthington in Worthington cutting.

2.2.11 This section of route is illustrated on maps CT-06-419b to CT-06-422 in the Volume 2: LA04 Map Book.

2.2.12 Key features of this approximately 4.7km section would include:

- Ashby-de-la-Zouch cutting No.2, the first 1.5km of which would be located in the Appleby Parva to Ashby-de-la-Zouch area (LA03). The remaining 454m would be in the Coleorton to Kegworth area. This element of the Proposed Scheme is described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch (see Volume 2: Map CT-06-419b, H5 to J6);
- realignment of the A512 Ashby Road, the first 300m of which would be located in the Appleby Parva to Ashby-de-la-Zouch area (LA03). The remaining 800m would be in the Coleorton to Kegworth area. This element of the Proposed Scheme is described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch (see Volume 2: Maps CT-06-419b, B5 to F10, and CT-06-419b-R1, D1 to G5);
- an area of woodland habitat creation to the east of the Proposed Scheme, extending from the realigned A512 Ashby Road in the Appleby Parva to Ashby-de-la-Zouch area (LA03) to Melbourne Road. This area would provide replacement habitat and maintain ecological connectivity between areas of deciduous woodland, including woodland in Rough Park Ancient Woodland (see Volume 2: Maps CT-06-419b, C7 to F9 and to J6, and CT-06-420, A6 to H8);
- a balancing pond for highway drainage to the east of the route of the Proposed Scheme, 200m west of Flagstaff Farm, with access provided from the realigned A512 Ashby Road (see Volume 2: Map CT-06-419b, D7 to D8);
- realignment of Leicestershire Footpath M60/3. This footpath diversion would span the boundary between the Coleorton to Kegworth area and the Appleby Parva to Ashby-de-la-Zouch area and is described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch (see Volume 2: Map CT-06-419b, D7 to D8);
- accommodation access for Flagstaff Farm, located to the east of the Proposed Scheme, which would be provided from the realigned A512 Ashby Road (see Volume 2: Map CT-06-419b, E8 to E9);

- accommodation access for Hall Farm, located to the east of the Proposed Scheme, which would be provided from the realigned A512 Ashby Road (see Volume 2: Map CT-06-419b, E9 to F9);
- a balancing pond for land drainage on the east side of the Proposed Scheme, 350m north of Flagstaff Farm, with access provided from the accommodation access for Flagstaff Farm (see Volume 2: Map CT-06-419b, F7 to G7);
- diversion of Leicestershire Footpath M30/1. This footpath diversion would span the boundary between the Coleorton to Kegworth area and the Appleby Parva to Ashby-de-la-Zouch area and is described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch (see Volume 2: Map CT-06-419b, D10 to H6);
- Lount embankment, 1.9km in length and up to 18m in height, with landscape mitigation planting on the west side for the majority of its length and on both sides north of Melbourne Road to help integrate the Proposed Scheme into the surrounding landscape and provide visual screening for residents of Lount (see Volume 2: Maps CT-06-420, A5 to J6, and CT-06-421, A6 to C6);
- Birch Coppice auto-transformer station on the west side of the Proposed Scheme, 500m north of Hall Farm. Access would be provided from the realigned Melbourne Road (see Volume 2: Maps CT-06-419b, J5 and CT-06-420, B6 to D6;
- Lount south culvert, 1.2km south of Melbourne Road, for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-420, D6 to D7);
- Lount underbridge, 53m in length and 12m below track level, located 1km south of Melbourne Road, to provide drainage and to carry a realigned woodland access track under the route of the Proposed Scheme (see Volume 2: Map CT-06-420, D6 to D7);
- realignment of a woodland access track, located to the west of the Proposed Scheme, to the west of its existing alignment to cross the Proposed Scheme via Lount underbridge and maintain access within the Staunton Harold Estate (see Volume 2: Maps CT-06-420, D7 to J5 and CT-06-421, A5 and A6);
- realignment of a woodland access track, located to the east of the Proposed Scheme, to maintain access within the Staunton Harold Estate (see Volume 2: Map CT-06-420, D6 to J5);
- a balancing pond for railway drainage to the west of the Proposed Scheme, 175m south-west of Melbourne Road, with access provided from Melbourne Road (see Volume 2: Map CT-06-420, H5 to H6 and D6 to J5);
- realignment of Melbourne Road to the south-west of its existing alignment for 750m, crossing under the route of the Proposed Scheme via the Melbourne Road underbridge, which would be 67m in length, 9m below track level and 4m below existing ground level (see Volume 2: Map CT-06-420, H9 to J4);

- diversion of a depot access road on the east side of the Proposed Scheme, to the south of its existing alignment, to maintain access to a depot located west of the village of Newbold. The diversion would be 350m in length and would connect with the realigned Melbourne Road, south-east of the Melbourne Road underbridge (see Volume 2: Map CT-06-420, I7 to J9);
- an area of grassland habitat creation, to the east of the Melbourne Road realignment and to the south of the depot access road diversion, to provide replacement habitat (see Volume 2: Map CT-06-420, H8 to I7);
- an area of woodland habitat creation to the south of the depot access road diversion to provide replacement habitat (see Volume 2: Map CT-06-420, I7 to J9);
- diversion of Leicestershire Footpath M56/1 to the south of its existing alignment for 2.2km, to connect with the diverted depot access road. The footpath would cross under the route of the Proposed Scheme via the Melbourne Road underbridge and continue on the west side of the Proposed Scheme northwards to connect to the realigned Leicestershire Footpath M35/1 at Long Hedge Lane (see Volume 2: Maps CT-06-420, I8 to J4 and to J6, and CT-06-421, A8 to D6 and C5 to G4);
- a balancing pond for highway drainage to the west of the Proposed Scheme. It would have road access from Melbourne Road to allow for maintenance (see Volume 2: Map CT-06-421, B4 to B5);
- Lount north culvert, 300m north of Melbourne Road, for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-421, B6);
- Worthington cutting, 2.4km in length, up to 15m in depth and up to 111m in width, with intermittent landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Maps CT-06-421, C6 to J6, and CT-06-422, A6 to G5);
- Long Hedge Lane overbridge, 67m in length and up to 9m in height above track level, to carry Long Hedge Lane over the route of the Proposed Scheme on its existing alignment (see Volume 2: Map CT-06-421, G4 to G5);
- realignment of Leicestershire Footpath M35/1, to the south of its existing alignment for 670m, to connect with Long Hedge Lane and cross the route of the Proposed Scheme on the Long Hedge Lane overbridge (see Volume 2: Map CT-06-421, G3 to I6);
- a balancing pond for land drainage, to the west of the Proposed Scheme, 400m south-west of White House Fields Farm with access from Breedon Lane (see Volume 2: Map CT-06-422, B4 to E3);
- realignment of Breedon Lane to the south-west of its existing alignment for 228m. The realigned Breedon Lane would pass over the route of the Proposed Scheme on the Breedon Lane overbridge, which would be 76m in length and

11m above track level (see Volume 2: Map CT-06-422, D6 to E3);

- an area of grassland habitat creation, to the east of the Proposed Scheme extending from the Breedon Lane overbridge to the Boden Brook viaduct, to provide replacement habitat (see Volume 2: Map CT-06-422, E5 to F7 and to H5);
- diversion of Leicestershire Footpath M21/6 to the south of its existing alignment for 610m to connect with the realigned Breedon Lane and cross the route of the Proposed Scheme on Breedon Lane overbridge (see Volume 2: Map CT-06-422, E3 to E5 and D6 to F7); and
- a balancing pond for railway drainage on the east side of the Proposed Scheme near Boden Brook, with access via Breedon Lane (see Volume 2: Map CT-06-422, D6 to F6).

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

2.2.14 Construction of this section would be managed from the Junction 13 main compound, the Melbourne Road underbridge satellite compound, the Long Hedge Lane overbridge satellite compound, the Breedon Lane overbridge satellite compound and the Top Brand main compound, which are described in Section 2.3, and shown on maps CT-05-419b, CT-05-421, CT-05-422 and CT-05-423 in the Volume 2: LA04 Map Book.

Cloud Hill Quarry embankment No.1 to Diseworth south embankment

2.2.15 The route of the Proposed Scheme would continue north-east, passing south of Breedon on the Hill and north of Worthington on Cloud Hill Quarry embankment No.1, followed by Boden Brook viaduct and Cloud Hill Quarry embankment No.2. It would then continue east towards Diseworth in Gelscoe cutting.

2.2.16 This section of route is illustrated on maps CT-06-422 to CT-06-424 in the Volume 2: LA04 Map Book.

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

- Cloud Hill Quarry embankment No.1, 193m in length and up to 6m in height (see Volume 2: Map CT-06-422, G5);
- an area of wetland habitat creation on both sides of the Proposed Scheme along the banks of Boden Brook, to provide replacement habitat (see Volume 2: Map CT-06-422, F7 to J4, and CT-06-423, A5 to B3);
- areas of grassland habitat creation on both sides of the route of the Proposed Scheme on either side of the area of wetland habitat creation, to provide replacement habitat (see Volume 2: Maps CT-06-422, F8 to G7 and I5 to J3 and to J6, and CT-06-423, A5 to B3 and to C5);

- Cloud Hill Quarry culvert, 170m west of Boden Brook, for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-422, G5);
- Boden Brook viaduct, 174m in length and up to 12m in height above ground level. The viaduct would span over Boden Brook and its floodplain, Cloud Hill Quarry and NCN Route 6 (Cloud Trail) (see Volume 2: Map CT-06-422, G5 to H5);
- a replacement floodplain storage area to the east of the Proposed Scheme, adjacent to Boden Brook (see Volume 2: Maps CT-06-422, H5);
- Cloud Hill Quarry embankment No.2, 518m in length and up to 12m in height, with landscape mitigation planting on both sides of the embankment to provide visual screening for users of NCN Route 6 (see Volume 2: Maps CT-06-422, H5 to J7, and CT-06-423, A6 to C5);
- Boden Brook culvert, immediately south of Stocking Lane, to allow a tributary of Boden Brook to pass under the route of the Proposed Scheme (see Volume 2: Map CT-06-422, I5 to I6);
- Stocking Lane underbridge, 29m in length, 9m below track level and 1m above existing ground level, to carry Stocking Lane under the route of the Proposed Scheme on its existing alignment (see Volume 2: Map CT-06-422, I5 to I6);
- access for Cloud Hill Quarry, located to the east of the Proposed Scheme, which would be provided from Stocking Lane (see Volume 2: Map CT-06-422, I6);
- realignment of the accommodation access for Breedon Lodge Farm, located to the east of the Proposed Scheme, which would be provided from Stocking Lane (see Volume 2: Maps CT-06-422, I6 to J7, and CT-06-423, B6 to D5);
- a balancing pond for railway drainage to the west of the Proposed Scheme with access from Doctor's Lane (see Volume 2: Map CT-06-422, I3 to J3, and CT-06-423, A3 to C5);
- Boden Brook auto-transformer station on the west side of the Proposed Scheme, 400m west of Breedon Lodge Farm. Access would be provided from Doctor's Lane (see Volume 2: Map CT-06-422, I3 to J3, and Map CT-06-423, A3 to C5);
- Gelscoe cutting, 2.2km in length, up to 14m in depth and up to 108m in width. This cutting would have intermittent landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Maps CT-06-423, C5 to J6, and CT-06-424, A5 to F6);
- Top Brand overbridge, 56m in length and 13m above track level, to carry Top Brand on its existing alignment over the route of the Proposed Scheme (see Volume 2: Map CT-06-423, H4 to H5);

- diversion of Leicestershire Footpath M17/1 to the east of its existing alignment for 550m to connect with Top Brand and cross the route of the Proposed Scheme on Top Brand overbridge (see Volume 2: Map CT-06-423, F5 to H4);
- diversion of Mill Lane (western branch[15]) on the east side of the route of the Proposed Scheme, for 375m. Mill Lane (western branch) would be diverted to the west of its existing alignment to connect with Top Brand, south of Top Brand overbridge (see Volume 2: Map CT-06-423, G6 to J6);
- an area of landscape mitigation planting on the east side of the Proposed Scheme, to the south of Mill Lane (western branch), to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-423, G6 to J8);
- Gelscoe aqueduct, 55m in length and 8m above track level, to convey a tributary of Diseworth Brook over the route of the Proposed Scheme (see Volume 2: Map CT-06-423, I5);
- a balancing pond for highway drainage on the east side of the route of the Proposed Scheme, 250m east of Top Brand, with access from Mill Lane (western branch) (see Volume 2: Map CT-06-423, I6);
- diversion of Mill Lane (eastern branch[16]), including NCN Route 15, on both sides of the route of the Proposed Scheme, 240m to the west of its existing alignment, for 577m. Mill Lane (eastern branch) would cross over the route of the Proposed Scheme on the Mill Lane overbridge and connect to Gelscoe Lane at its northern extent (see Volume 2: Map CT-06-424, D5 to D9);
- Mill Lane overbridge, 60m in length and 9m above track level (see Volume 2: Map CT-06-424, D5 to D6);
- a balancing pond for highway drainage on the east side of the route of the Proposed Scheme, 300m south-east of Gelscoe Lodge Farm, with access from Mill Lane (eastern branch) (see Volume 2: Map CT-06-424, D8 to D10);
- an area of landscape mitigation planting on the east side of the Proposed Scheme, to the west of Mill Lane (eastern branch) to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-424, D6 to D9); and
- areas of woodland habitat creation on the east side of the Proposed Scheme, to provide replacement habitat (see Volume 2: Map CT-06-424, D6 to F8 and to D9).

2.2.18 This section of the route would include two maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be

[15] Mill Lane (western branch) is the branch of Mill Lane that runs westwards. The existing alignment of Mill Lane connects to Gelscoe Lane east of the junction with Top Brand and the A453. The proposed diversion would connect Mill Lane (western branch) to Top Brand, south of the junction with Gelscoe Lane.
[16] Mill Lane (eastern branch) is the branch of Mill Lane that runs northwards. The existing alignment of Mill Lane is joined by Gelscoe Lane and then crosses the A42. The proposed diversion would connect Mill Lane (eastern branch) to Gelscoe Lane to the west of its existing junction with Gelscoe Lane.

maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.19 Construction of this section would be managed from the Boden Brook viaduct south satellite compound, the Boden Brook viaduct north satellite compound, the Top Brand main compound and the Mill Lane overbridge satellite compound, which are described in Section 2.3, and shown on maps CT-05-422 and CT-05-423 in the Volume 2: LA04 Map Book.

Diseworth south embankment to Diseworth cutting

2.2.20 The route of the Proposed Scheme would continue north-east towards Diseworth on Diseworth south embankment. It would pass to the east of Diseworth and to the west of Long Whatton on Diseworth Brook viaduct and Diseworth north embankment.

2.2.21 This section of route is illustrated on maps CT-06-424 to CT-06-427 in the Volume 2: LA04 Map Book.

2.2.22 Key features of this approximately 4.1km section would include:

- Diseworth south embankment, 3.1km in length and up to 14m in height with landscape mitigation planting on both sides of the embankment for some of its length. These features would help integrate the route of the Proposed Scheme into the surrounding landscape and provide visual screening for residents of local farmsteads and scattered dwellings. (see Volume 2: Maps CT-06-424, F6 to J5, CT-06-425, A5 to J6, and CT-06-426, A5 to E7);
- Diseworth south culvert No.1, 240m east of the existing alignment of Mill Lane (eastern branch), to allow tributary one of Westmeadow Brook to pass under the route of the Proposed Scheme (see Volume 2: Map CT-06-424, F6);
- Diseworth south culvert No.2, 840m east of the existing alignment of Mill Lane (eastern branch), to allow tributary two of Westmeadow Brook to pass under the route of the Proposed Scheme (see Volume 2: Map CT-06-424, I5 to I6);
- realignment of Long Mere Lane, including Leicestershire Bridleway L31/1, up to 75m to the north-west of its existing alignment. The realignment would be 675m in length and would cross the route of the Proposed Scheme on Long Mere Lane overbridge and maintain access to Long Mere Farm (see Volume 2: Map CT-06-424, J5 to J6, and CT-06-425, B7 to E6);
- Long Mere Lane overbridge, 64m in length and 10m above track level (see Volume 2: Map CT-06-425, B6 to C6);
- diversion of Leicestershire Footpath L32/1 to the south-west of its existing alignment for 1.3km to connect with Long Mere Lane and cross the route of the Proposed Scheme on Long Mere Lane overbridge (see Volume 2: Map CT-06-425, E6 to E7);
- realignment of Leicestershire Footpath L50/4 to the north-east of its existing alignment for 750m from the diverted Leicestershire Footpath L32/1 to

connect with Long Mere Lane and cross the route of the Proposed Scheme on Long Mere Lane overbridge (see Volume 2: Map CT-06-425, E6 to H7);

- areas of wetland habitat creation and areas of grassland habitat creation on the east side of the Proposed Scheme along Westmeadow Brook and on both sides of the Proposed Scheme along Diseworth Brook, to provide replacement habitat (see Volume 2: Maps CT-06-425, B6 to J6, and CT-06-426, A6 to H7);
- a balancing pond for railway drainage to the east of the Proposed Scheme with access from the west via Long Mere Lane (see Volume 2: Map CT-06-425, B7 to E7);
- Diseworth south culvert No.3, 260m east of where Long Mere Lane crosses over the A42, to allow tributary two of Westmeadow Brook to pass under the route of the Proposed Scheme (see Volume 2: Map CT-06-425, F6);
- three replacement floodplain storage areas to the east of the Proposed Scheme, adjacent to Westmeadow Brook, with sides graded back to ground level (see Volume 2: Maps CT-06-425, F8 to J6, and CT-06-426, F7 to H7);
- a balancing pond for railway drainage to the west of the Proposed Scheme, 400m south of Wood Nook Farm. Access would be provided via The Green to allow for maintenance (see Volume 2: Maps CT-06-425, J5 to J6 and CT-06-426, A5 to E6);
- Diseworth auto-transformer station, on the west side of the Proposed Scheme, 350m south of Wood Nook Farm. Access would be provided via The Green (see Volume 2: Map CT-06-426, B6 to E6);
- a replacement floodplain storage area on the east side of the Proposed Scheme, adjacent to Westmeadow Brook, with sides graded back to existing ground level (see Volume 2: Map CT-06-426, D7 to E8);
- Diseworth Brook viaduct, 654m in length and up to 19m in height above ground level. The viaduct would span over The Green, the M1, Diseworth Brook and its floodplain, and the floodplain of Westmeadow Brook (see Volume 2: Map CT-06-426, E6 to H6);
- areas of landscape mitigation planting to the west of the Proposed Scheme between the A42 and the Proposed Scheme, on both sides of The Green (see Volume 2: Map CT-06-426, A6 to F6);
- a balancing pond for railway drainage, east of the Proposed Scheme, 80m east of the M1 with access via a track parallel to the M1 off West End (see Volume 2: Map CT-06-426, F9 to I7); and
- Diseworth north embankment, 408m in length and up to 10m in height, with landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-426, H6 to J5, and CT-06-427, A5 to A6).

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

2.2.24 Construction of this section would be managed from Top Brand main compound, Long Mere Lane overbridge satellite compound, The Green south satellite compound, The Green north satellite compound and Ashby Road main compound, which are described in Section 2.3, and shown on map CT-05-423, map CT-05-426 and map CT-05-428a in the Volume 2: LA04 Map Book.

Diseworth cutting to Ratcliffe-on-Soar viaduct

2.2.25 The route of the Proposed Scheme would continue north towards Kegworth, passing to the east of East Midlands Airport in Diseworth cutting, on Kegworth embankment and in Kegworth cutting. It would then pass to the west of Kegworth on the A6 Kegworth embankment and onto the Ratcliffe-on-Soar viaduct at the boundary between the Coleorton to Kegworth area and the Ratcliffe-on-Soar to Long Eaton area (LA05).

2.2.26 This section of route is illustrated on maps CT-06-427 to CT-06-429a in the Volume 2: LA04 Map Book.

2.2.27 Key features of this approximately 3.3km section would include:

- Diseworth cutting, 467m in length, up to 34m in width and up to 4m in depth. There would be landscape mitigation planting on both sides of the cutting for some of its length to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-427, B6 to D7);
- Kegworth embankment, 668m in length and up to 12m in height, with landscape earthworks on the east side and landscape mitigation planting on both sides of the embankment. The earthworks and planting would help to integrate the Proposed Scheme into the surrounding landscape and would provide visual screening for residents of Kegworth (see Volume 2: Map CT-06-427, D6 to G7);
- Kegworth culvert, 320m south-west of Springhouse Farm, for land drainage and to allow a tributary of the River Soar to pass under the route of the Proposed Scheme (see Volume 2: Map CT-06-427, F6 to F7);
- Kegworth cutting, 1.3km in length, up to 100m in width and up to 14m in depth with landscape mitigation planting on the west side and landscape earthworks on the east side to help integrate the Proposed Scheme into the surrounding landscape. This cutting would include the Runway Approach Lights overbridge (see Volume 2: Map CT-06-427, G6 to J5, and CT-06-428a, A6 to F5);
- Runway Approach Lights overbridge, 99m in length, which would allow the route of the Proposed Scheme to pass under East Midlands Airport runway approach lights, 14m below ground level (see Volume 2: Maps CT-06-427, J5 to J6, and CT-06-428a, A5 to B6);

- A6 Kegworth Bypass overbridge, 67m in length and 11m above track level, to carry the A6 Kegworth Bypass over the route of the Proposed Scheme on its existing alignment (see Volume 2: Map CT-06-428a, B4 to B7);
- realignment of accommodation access for Mole Hill Farm, located to the west of the Proposed Scheme, which would be provided from the A6 Kegworth Bypass (see Volume 2: Map CT-06-427, I4 to J5 and CT-06-428a, A4 to B5);
- realignment of Leicestershire Footpath L45a/1 to the north of its existing alignment for 380m to cross the Proposed Scheme on the A6 Kegworth Bypass overbridge (see Volume 2: Map CT-06-428a, B5 to C7);
- a link road to connect the A6 Kegworth Bypass and Ashby Road, on the west side of the Proposed Scheme (see Volume 2: Map CT-06-428a, B5 to C5);
- Ashby Road north overbridge, 105m in length and 13m above track level, to carry Ashby Road over the route of the Proposed Scheme on its existing alignment (see Volume 2: Map CT-06-428a, C5 to D6);
- landscape earthworks, with associated landscape mitigation planting, on the east side of the Proposed Scheme, 670m in length and 6m in height above track level, extending between Ashby Road and the A6 Derby Road to provide acoustic and visual screening for properties in Kegworth (see Volume 2: Map CT-06-428a, D5 to H5);
- A6 Kegworth embankment, 823m in length and up to 12m in height, with landscape mitigation planting on both sides of the embankment. The planting would help to integrate the Proposed Scheme into the surrounding landscape and would provide visual screening for residents of Kegworth (see Volume 2: Map CT-06-428a, F5 to J6);
- A6 underbridge, 27m in length, 10m below track level and 2m below existing ground level, to carry the A6 Derby Road under the route of the Proposed Scheme on its existing alignment (see Volume 2: Map CT-06-428a, H5 to H6); and
- a balancing pond for railway drainage, east of the Proposed Scheme, 240m east of junction 24 of the M1 with access from the south via the A6 Derby Road (see Volume 2: Map CT-06-428a, H6 to I6, and CT-06-429a, A6 to A7).

2.2.28 An auto-transformer feeder station is also proposed to the north-west of Kegworth, on a site that is bounded by M1 junction 24, the A6 Derby Road and the A453 Remembrance Way. Further details of the Kegworth auto-transformer feeder station are provided in Volume 2: Community area report LA05, Ratcliffe-on-Soar to Long Eaton (see Volume 2: Maps CT-06-428a, H4 to I5, and CT-06-429a, A5 in the LA04 Map Book and maps CT-06-428b, H4 to I5, and CT-06-429b, A5 in the LA05 Map Book).

2.2.29 This section of the route would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes and hedgerow planting throughout this section. There

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

2.2.30 Construction of this section would be managed from the A6 Kegworth Bypass overbridge satellite compound and the Ashby Road main compound, which are described in Section 2.3, and shown on map CT-05-428a in the Volume 2: LA04 Map Book.

Demolitions

2.2.31 As set out in Volume 1, as the design develops, it is likely that not all the properties reported within the assessment would need to be demolished, for example where not all of the land is required for permanent works.

2.2.32 At this stage of the design development, it is anticipated that demolition of nine existing residential properties, one commercial/business property (including farm outbuildings) and six other structures would be required to construct the permanent features in the Coleorton to Kegworth area. These could be needed for construction of permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Coleorton to Kegworth area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

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

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

2.3.4 During the construction phase, public roads and PRoW routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRoW wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRoW may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.

2.3.5 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

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

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[17] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

- to set out how HS2 Ltd and its contractors would undertake community engagement during the construction of the project;
- to provide clarity and reassurance to HS2 Ltd's stakeholders about how community engagement activity would be managed; and
- to help HS2 Ltd be a good neighbour to local communities, including by providing accurate and timely information about construction works and offering opportunities to influence them, where appropriate.

2.3.9 A draft CoCP has been prepared and is published alongside this document, in Supporting document: Draft Code of Construction Practice. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

2.3.10 Building and preparing the Proposed Scheme for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul routes, site preparation and enabling works; main earthworks and structure works; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated

[17] HS2 Ltd (2017), Community Engagement Framework. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625971/hs2_community_engagement_framework.pdf

utility diversions;

- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

2.3.11 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP including:

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

Advance works

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

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

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

- civil engineering works, including earthworks such as embankments and cuttings and erection of bridges and viaducts; and
- works to install, test and commission railway systems, including track,

overhead line equipment, communications and signalling equipment and traction power supply.

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

2.3.15 The construction of the Proposed Scheme would be divided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main compounds or satellite compounds. Satellite compounds are generally smaller than main compounds. Compounds would either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

- space for the storage of bulk materials;
- space for the receipt, storage and loading and unloading of excavated material;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

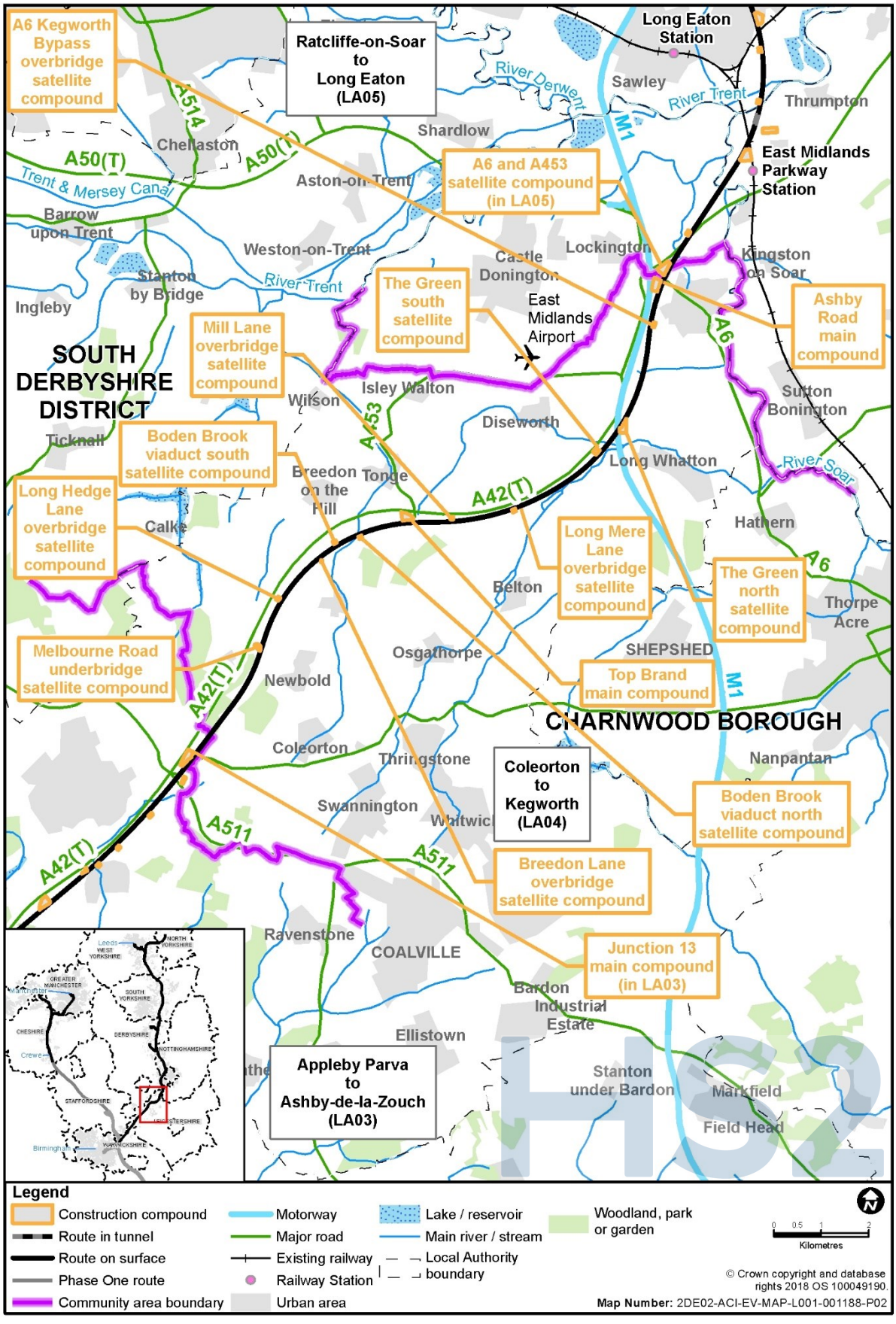
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.

2.3.18 Ten civil engineering satellite compounds would be located in the Coleorton to Kegworth area. Two civil engineering main compounds in the Coleorton to Kegworth area would manage eight of these civil engineering satellite compounds. The remaining two civil engineering satellite compounds would be managed from the Junction 13 main compound in the Appleby Parva to Ashby-de-la-Zouch area (LA03) (see Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch).

2.3.19 On completion of the civil engineering works, the two civil engineering main compounds and three of the civil engineering satellite compounds would remain and continue to be used as railway installation satellite compounds. All railway installation satellite compounds in the Coleorton to Kegworth area would be managed from the Junction 13 main compound in the Appleby Parva to Ashby-de-la-Zouch area (LA03).

2.3.20 The location of construction compounds in the Coleorton to Kegworth area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA04 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds associated with the Coleorton to Kegworth area



2.3.21 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.22 In the Coleorton to Kegworth area there would be no worker accommodation for the construction workforce.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-419b, CT-05-423, CT-05-426 and CT-05-428a in the Volume 2: LA04 Map Book.

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

Construction traffic routes, site haul routes and transfer nodes

2.3.25 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Where reasonably practicable, movements between the construction compounds and the working areas would be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.26 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Coleorton to Kegworth area are described in the subsequent sections of this report.

2.3.27 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.

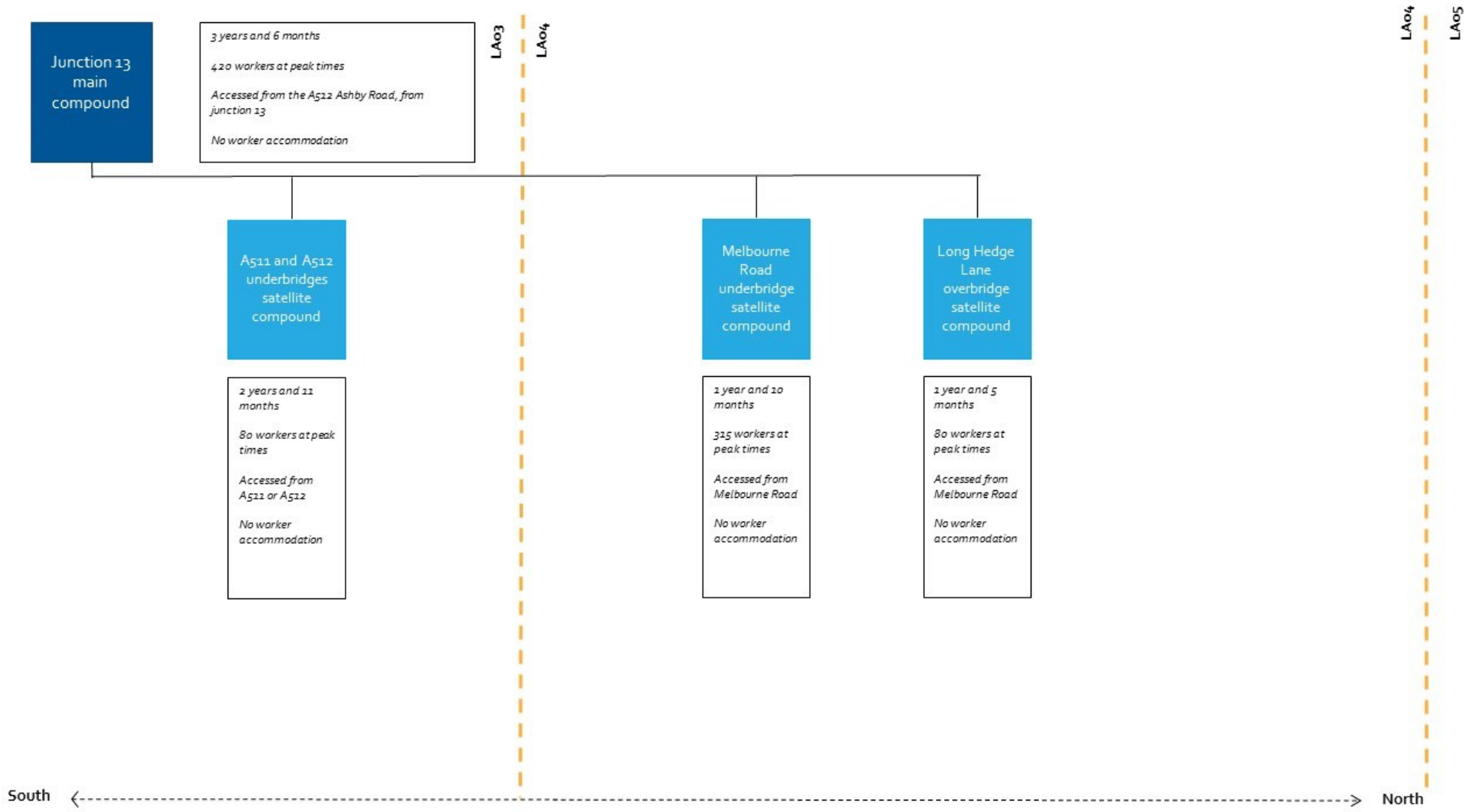
2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Maps CT-05-419b, CT-05-423, CT-05-426 and CT-05-428a in the Volume 2: LA04 Map Book.

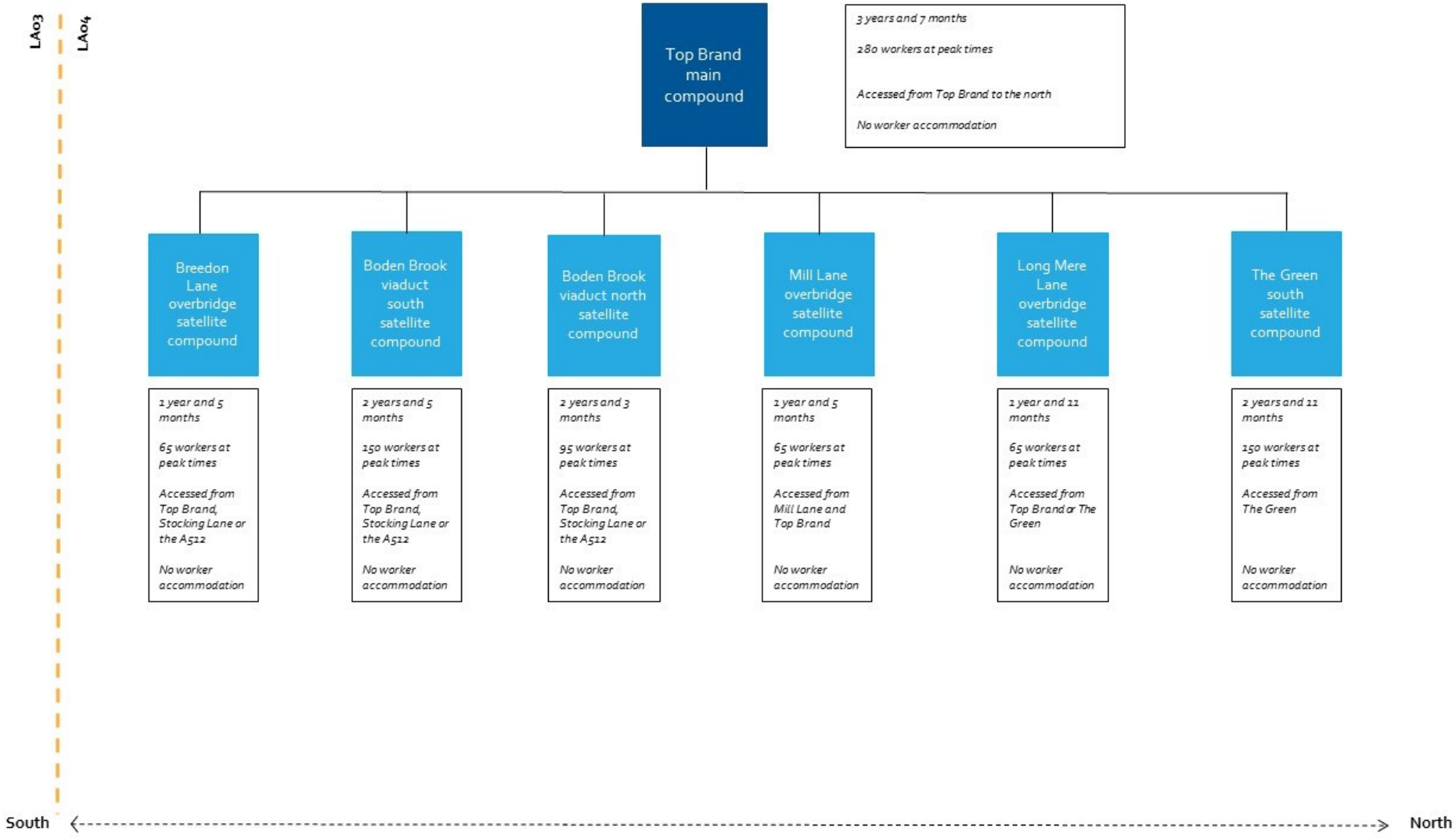
Construction compounds

2.3.29 This section provides a summary of the works to be managed from the construction compounds in the Coleorton to Kegworth area, as illustrated in Figure 5 and Figure 6.

2.3.30 All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works




LA03
LA04
Top Brand main compound
3 years and 7 months
280 workers at peak times
Accessed from Top Brand to the north
No worker accommodation
Breedon Lane overbridge satellite compound
1 year and 5 months
65 workers at peak times
Accessed from Top Brand, Stocking Lane or the A512
No worker accommodation
Boden Brook viaduct south satellite compound
2 years and 5 months
150 workers at peak times
Accessed from Top Brand, Stocking Lane or the A512
No worker accommodation
Boden Brook viaduct north satellite compound
2 years and 3 months
95 workers at peak times
Accessed from Top Brand, Stocking Lane or the A512
No worker accommodation
Mill Lane overbridge satellite compound
1 year and 5 months
65 workers at peak times
Accessed from Mill Lane and Top Brand
No worker accommodation
Long Mere Lane overbridge satellite compound
1 year and 11 months
65 workers at peak times
Accessed from Top Brand or The Green
No worker accommodation
The Green south satellite compound
2 years and 11 months
150 workers at peak times
Accessed from The Green
No worker accommodation
South
North

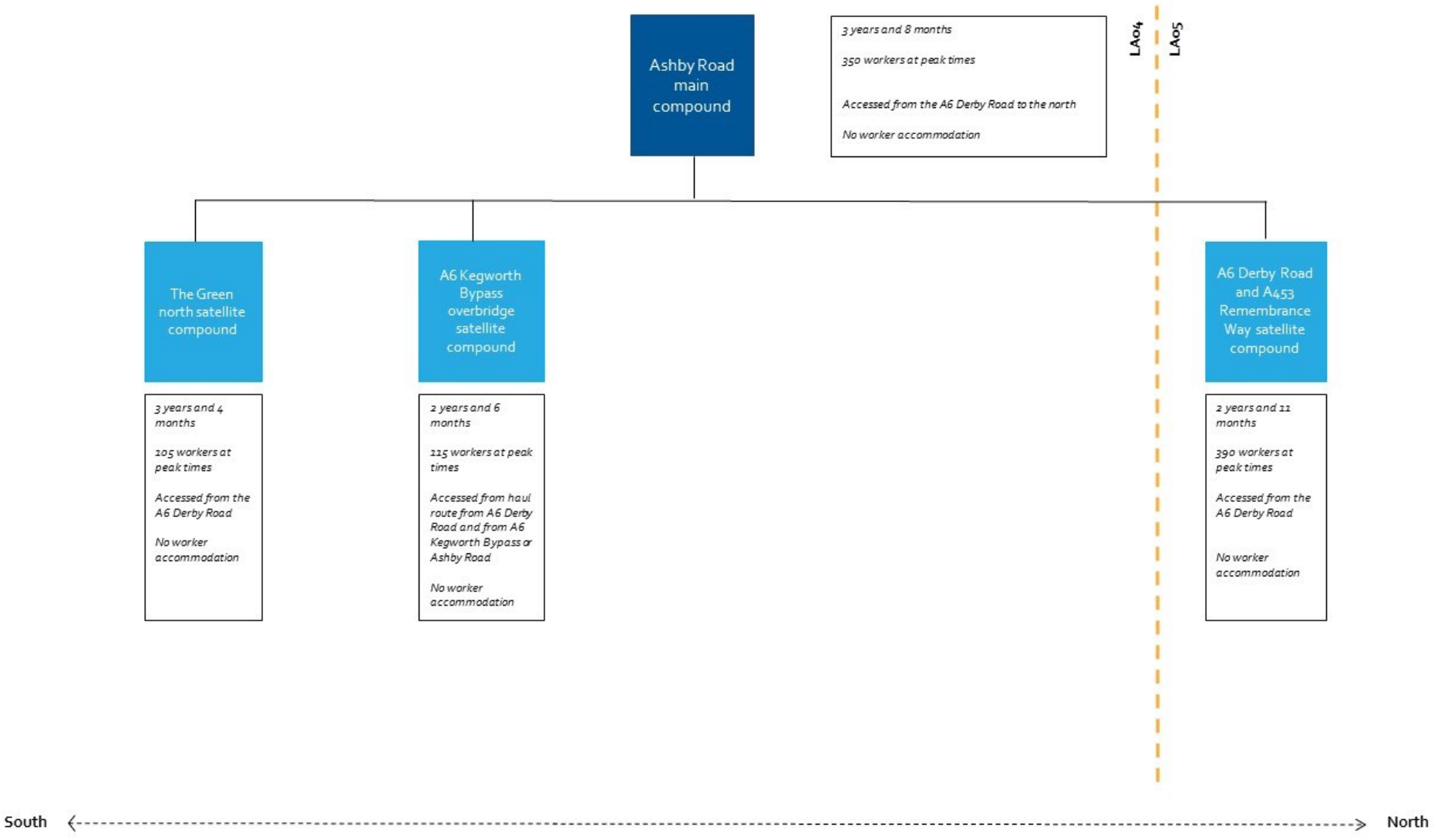
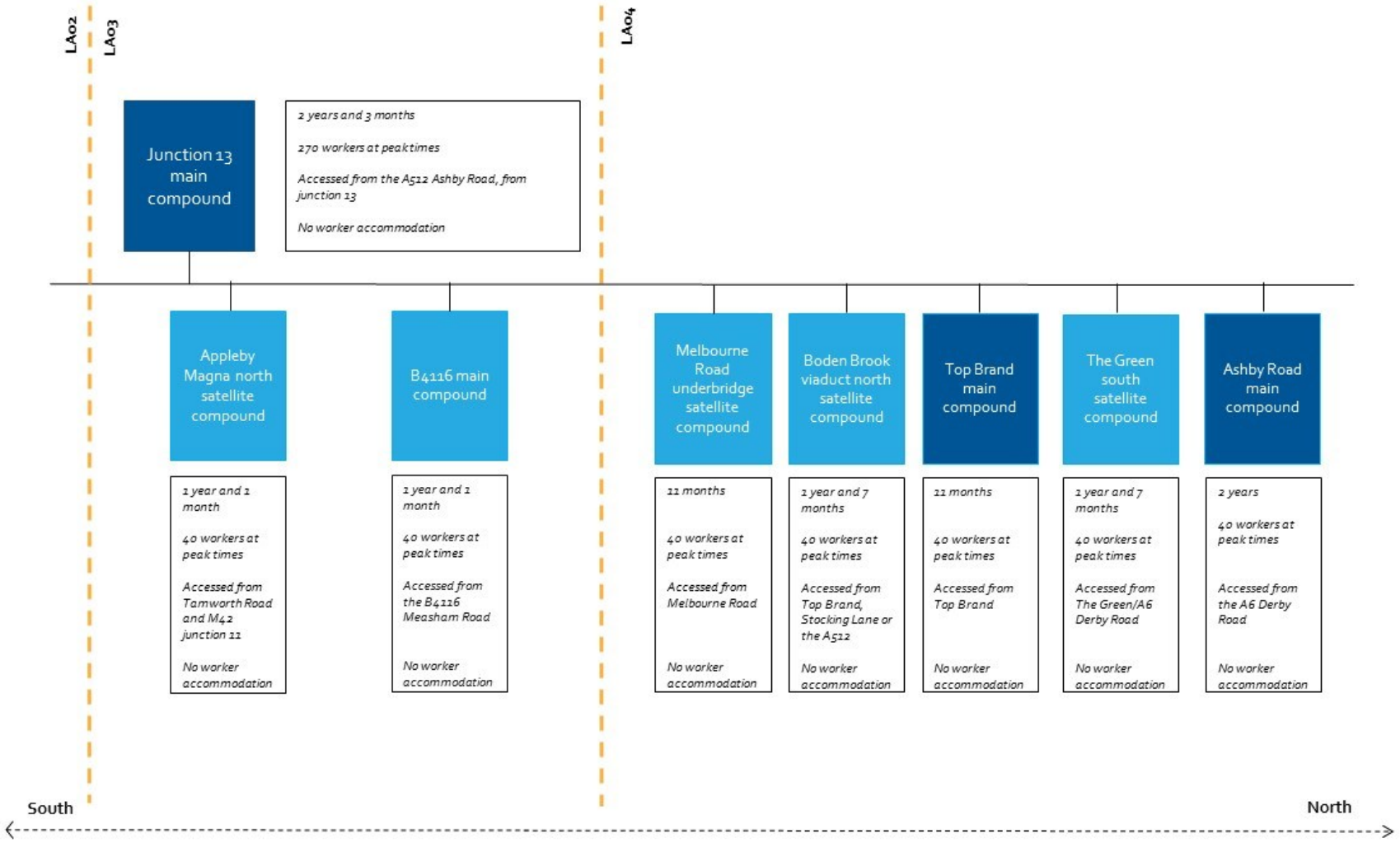

Ashby Road main compound
3 years and 8 months
350 workers at peak times
Accessed from the A6 Derby Road to the north
No worker accommodation
LA04
LA05
The Green north satellite compound
3 years and 4 months
105 workers at peak times
Accessed from the A6 Derby Road
No worker accommodation
A6 Kegworth Bypass overbridge satellite compound
2 years and 6 months
115 workers at peak times
Accessed from haul route from A6 Derby Road and from A6 Kegworth Bypass or Ashby Road
No worker accommodation
A6 Derby Road and A453 Remembrance Way satellite compound
2 years and 11 months
390 workers at peak times
Accessed from the A6 Derby Road
No worker accommodation
South
North

Figure 6: Construction compounds for railway systems works



Junction 13 main compound

2.3.31 This compound (see Map CT-05-419b, C5 to E5) would be located in and be used to manage works within the Appleby Parva to Ashby-de-la-Zouch area (LA03), as described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch. In addition, this compound would be used to manage civil engineering works within the Coleorton to Kegworth area and also provide main compound support to the Melbourne Road underbridge satellite compound and the Long Hedge Lane overbridge satellite compound, as illustrated in Figure 5, for a period of three years and six months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works and manage railway systems compounds in the Coleorton to Kegworth area, as illustrated in Figure 6, for a period of two years and one month.

2.3.32 The works to be managed from this compound within the Coleorton to Kegworth area would require demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the Junction 13 main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Field House, Nottingham Road, Staunton Harold	Worthington cutting
Residential property and outbuildings	Lodge Farm, Long Hedge Lane, Worthington	Worthington cutting
Residential property and outbuildings	White House Fields Farm, Breedon Lane, Worthington	Worthington cutting
Other		
Outbuildings	Worthington Field Farm, Long Hedge Lane, Worthington	Worthington cutting
Silo	Mill House Farm, Worthington	Worthington cutting

2.3.33 The compound would be used to manage the construction of the Lount underbridge, which would take eight months to complete.

2.3.34 The compound would be used to manage the construction of the following earthworks:

- Lount embankment, which would take three years and five months to complete; and
- Worthington cutting, which would take three years and five months to complete. Some of the works to construct this cutting would also be managed from the Top Brand main compound.

2.3.35 The works to be managed from this compound would require the following works to PRoW:

- permanent diversion of Leicestershire Footpath M56/1 to the south to connect with the diverted depot access road. During construction, alternative routes would be provided for a period of one year and five months; and
- permanent realignment of Leicestershire Footpath M35/1 to the south of its existing alignment to connect with Long Hedge Lane, east of Lodge Farm. During construction, alternative routes would be provided for a period of one year and five months.

2.3.36 The compound would be used to manage the construction of the Lount south culvert for surface water drainage under the route of the Proposed Scheme, which would take five months to complete.

2.3.37 There would also be utilities works managed from this compound.

2.3.38 Key railway systems works to be managed from this compound would include construction and installation of the Birch Coppice auto-transformer station, located 600m north of Hall Farm. Construction of the Birch Coppice auto-transformer station foundations and buildings would take six months to complete. The installation of the Birch Coppice auto-transformer station railway systems equipment would take one year and one month to complete. Construction works for the Birch Coppice auto-transformer station would be accessed from Melbourne Road.

Melbourne Road underbridge satellite compound

2.3.39 This compound (see maps CT-05-420, J5 to J6, and CT-05-421, B5 to B6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5, for a period of one year and 10 months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works, as illustrated in Figure 6, for a period of 11 months.

2.3.40 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions required as a result of the works to be managed from the Melbourne Road underbridge satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property and outbuildings	Gate House, Melbourne Road, Coleorton	Melbourne Road realignment
Residential property and outbuildings	Newbold Gate, Melbourne Road, Coleorton	Melbourne Road realignment
Residential property and outbuildings	Smoile Farm, Melbourne Road, Lount	Melbourne Road underbridge
Residential property and outbuildings	Basildon Lodge, Melbourne Road, Staunton Harold	Melbourne Road underbridge

Other		
Electricity sub-station	Melbourne Road, Newbold Coleorton	Melbourne Road underbridge

2.3.41 The compound would be used to manage the construction of the Melbourne Road underbridge, which would take one year and three months to complete.

2.3.42 The works to be managed from this compound would require the following works to public roads:

- permanent realignment of Melbourne Road, to the south-west of its existing alignment, which would take one year and three months to complete. The realignment would be built online and on completion of construction, temporary local lane closures and traffic management measures would be implemented for four months to enable connection of the realigned road to the existing road; and
- permanent diversion of the depot access road, to the south of its existing alignment to connect with the realigned Melbourne Road. During construction, alternative routes would be provided for a period of one year and three months.

2.3.43 The compound would be used to manage the construction of the Lount north culvert for surface water drainage under the route of the Proposed Scheme, which would take six months to complete.

2.3.44 There would also be utilities works managed from this compound.

2.3.45 Key railway systems works to be managed from this compound would include trackform installation. The installation would take 11 months to complete.

Long Hedge Lane overbridge satellite compound

2.3.46 This compound (see Map CT-05-421, G4 to H4) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.47 No demolitions would be required as a result of the works to be managed from this compound.

2.3.48 The compound would be used to manage the construction of the Long Hedge Lane overbridge, which would take one year and five months to complete.

2.3.49 The works to be managed from this compound would require the temporary closure of Long Hedge Lane. During construction, traffic would be diverted along Breedon Lane for a period of one year and five months. On completion of construction, Long Hedge Lane would pass over the route of the Proposed Scheme on its existing alignment via Long Hedge Lane overbridge.

2.3.50 There would also be utilities works managed from this compound.

Breedon Lane overbridge satellite compound

2.3.51 This compound (see Map CT-05-422, E5 to E6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.52 No demolitions would be required as a result of the works to be managed from this compound.

2.3.53 The compound would be used to manage the construction of the Breedon Lane overbridge, which would take one year and five months to complete.

2.3.54 The works to be managed from this compound would require the temporary closure of Breedon Lane. During construction, traffic would be diverted through Long Hedge Lane and along Stocking Lane for a period of one year and five months. On completion of construction, Breedon Lane would be permanently realigned to pass over the route of the Proposed Scheme on Breedon Lane overbridge.

2.3.55 The works to be managed from this compound would require the permanent diversion of Leicestershire Footpath M21/6 to the south to connect with the realigned Breedon Lane. During construction, alternative routes would be provided for a period of one year and six months.

2.3.56 There would also be utilities works managed from this compound.

Boden Brook viaduct south satellite compound

2.3.57 This compound (see Map CT-05-422, G4 to G5) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.58 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 3.

Table 3: Demolitions required as a result of the works to be managed from the Boden Brook viaduct south satellite compound

Description	Location	Feature resulting in the demolition
Other		
Operations buildings	Cloud Hill Quarry, Stocking Lane, Breedon on the Hill	Boden Brook viaduct

2.3.59 The compound would be used to manage the construction of the Boden Brook viaduct, which would take one year and eight months to complete. Some of the works required to construct this viaduct would also be managed from the Boden Brook viaduct north satellite compound.

2.3.60 The compound would be used to manage the construction of the Cloud Hill Quarry culvert for surface water drainage under the route of the Proposed Scheme, which would take five months to complete.

2.3.61 There would also be utilities works managed from this compound.

Boden Brook viaduct north satellite compound

2.3.62 This compound (see maps CT-05-422, J6 to J7, and CT-05-423, B6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5, for a period of two years and three months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works, as illustrated Figure 6, for a period of one year and seven months.

2.3.63 The works to be managed from this compound would require demolition of the buildings and structures as described under the Boden Brook viaduct south satellite compound.

2.3.64 The compound would be used to manage the construction of the following bridge and viaduct:

- Stocking Lane underbridge, which would take one year and one month to complete; and
- Boden Brook viaduct, which would take one year and eight months to complete. Some of the works to construct this viaduct would also be managed from the Boden Brook viaduct south satellite compound.

2.3.65 The works to be managed from this compound would require the temporary closure of Stocking Lane. During construction, traffic would be diverted through Worthington and along Top Brand for a period of one year and one month. On completion of construction, Stocking Lane would pass under the route of the Proposed Scheme on its existing alignment via Stocking Lane underbridge.

2.3.66 The compound would be used to manage the construction of the Boden Brook culvert to carry a tributary of Boden Brook under the route of the Proposed Scheme, which would take five months to complete.

2.3.67 There would also be utilities works managed from this compound.

2.3.68 Key railway systems works to be managed from this compound would include construction and installation of the Boden Brook auto-transformer station, located 400m north of Stocking Lane. Construction of the Boden Brook auto-transformer station foundations and buildings would take six months to complete. The installation of the Boden Brook auto-transformer station railway systems equipment would take one year and one month to complete. Construction works for the Boden Brook auto-transformer station would be accessed from Stocking Lane.

Top Brand main compound

2.3.69 This compound (see Map CT-05-423, G3 to H4) would be used to manage civil engineering and rail systems works and to provide main compound support to six satellite compounds in the Coleorton to Kegworth area, as illustrated in Figure 5: Construction compounds for civil engineering works, for a period of three years and seven months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works, as illustrated in Figure 6: Construction compounds for railway systems works, for a period of 11 months.

2.3.70 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 4.

Table 4: Demolitions required as a result of the works to be managed from the Top Brand main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property and outbuildings	Gelscoe Lodge Farm, Mill Lane, Belton	Gelscoe cutting
Other		
Pumping station	Doctor's Lane, Breedon on the Hill	Cloud Hill Quarry embankment No.2

2.3.71 The compound would be used to manage the construction of the Top Brand overbridge, which would take one year and six months to complete.

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

- Worthington cutting, which would take three years and five months to complete. Some of the works to construct this cutting would also be managed from the Junction 13 main compound;
- Cloud Hill Quarry embankment No. 1, which would take three years and three months to complete;
- Cloud Hill Quarry embankment No. 2, which would take one year and five months to complete;
- Gelscoe cutting, which would take three years and seven months to complete; and
- Diseworth south embankment, which would take three years and five months to complete.

2.3.73 The works to be managed from this compound would require the following works to public roads:

- temporary closure of Top Brand, with traffic diverted through Mill Lane (western branch) for a period of one year and six months. On completion of construction, Top Brand would cross the route of the Proposed Scheme on Top Brand overbridge on its existing alignment; and
- permanent diversion of Mill Lane (western branch) to the west of its existing alignment to connect with Top Brand. During construction, users would be diverted via alternative routes for a period of three years and seven months.

2.3.74 The works to be managed from this compound would require permanent diversion of Leicestershire Footpath M17/1 to the east to connect with the realigned Top Brand. During construction, alternative routes would be provided for a period of one year and four months.

2.3.75 The compound would be used to manage the construction of the following watercourse crossings:

- Gelscoe aqueduct to carry a tributary of Diseworth Brook over the route of the Proposed Scheme, which would take 10 months to complete;

- Diseworth south culvert No.1 to carry a tributary of Westmeadow Brook under the route of the Proposed Scheme, which would take five months to complete; and
- Diseworth south culvert No.2 to carry a tributary of Westmeadow Brook under the route of the Proposed Scheme, which would take six months to complete.

2.3.76 Key railway systems works to be managed from this compound would include slab track installation. The installation would take 11 months to complete.

2.3.77 Transfer nodes are areas for the storage and loading and unloading of bulk earthworks material, which would be moved to and from the site on public highways.

2.3.78 There would be a transfer node associated with Top Brand main compound within the Coleorton to Kegworth area occupying land between the A42 corridor and the Proposed Scheme, west of Top Brand. The transfer node would stretch from 400m to the west of Top Brand to the proposed Top Brand main compound.

2.3.79 The transfer node would be operational from 2025 for approximately three years and seven months. Access to the transfer node would be from Top Brand and the site haul route.

2.3.80 There would also be utilities works managed from this compound.

Mill Lane overbridge satellite compound

2.3.81 This compound (see Map CT-05-424, C5 to D5) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.82 No demolitions would be required as a result of the works to be managed from this compound.

2.3.83 The compound would be used to manage the construction of the Mill Lane overbridge, which would take one year and five months to complete.

2.3.84 The works to be managed from this compound would require the permanent diversion of Mill Lane (eastern branch), including NCN Route 15, to the west of its existing alignment to cross the route of the Proposed Scheme on Mill Lane overbridge and connect to Gelscoe Lane. During construction, users would be diverted via alternative routes for a period of one year and five months.

2.3.85 There would also be utilities works managed from this compound.

Long Mere Lane overbridge satellite compound

2.3.86 This compound (see maps CT-05-424, J5 to J6, and CT-05-425, B6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.87 No demolitions would be required as a result of the works to be managed from this compound.

2.3.88 The compound would be used to manage the construction of the Long Mere Lane overbridge, which would take one year and five months to complete.

2.3.89 The works to be managed from this compound would require the permanent realignment of Long Mere Lane, including Leicestershire Bridleway L31/1, to the west

of its existing alignment to cross the route of the Proposed Scheme on the Long Mere Lane overbridge. During construction, users would be diverted via alternative routes for a period of one year and five months.

2.3.90 The compound would be used to manage the construction of the Diseworth south culvert No.3 to carry a tributary of Westmeadow Brook under the route of the Proposed Scheme, which would take five months to complete.

2.3.91 There would also be utilities works managed from this compound.

The Green south satellite compound

2.3.92 This compound (see Map CT-05-426, D5 to E6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5, for a period of two years and 11 months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works, as illustrated in Figure 6.

2.3.93 No demolitions would be required as a result of the works to be managed from this compound.

2.3.94 The compound would be used to manage the construction of the Diseworth Brook viaduct, which would take two years and one month to complete. Construction of part of the viaduct would be managed from The Green north satellite compound.

2.3.95 The Diseworth Brook viaduct, crossing the M1 near Diseworth and Long Whatton, would be constructed using standard construction techniques. To maintain safe operation of the motorway it would be necessary to undertake the works under traffic management measures. The construction of the motorway crossings in this area would be coordinated to reduce the overall duration of disruption to the motorway. The traffic management would operate for a period of approximately two years over this length of the M1, and would be likely to include temporary speed restrictions for safety, temporary use of the hard shoulder, and reduced lane widths. Night-time closures are also likely to be required to enable installation of the deck over the carriageways and modifications to the motorway signage.

2.3.96 The works to be managed from this compound would require the following works to PRoW:

- permanent diversion of Leicestershire Footpath L32/1 to the east of its existing alignment to connect with the realigned Leicestershire Footpath L50/4. During construction, alternative routes would be provided for a period of one year and five months; and
- permanent realignment of Leicestershire Footpath L50/4 to the south-west of its existing alignment to connect with the diverted Leicestershire Footpath L32/1. During construction, alternative routes would be provided for a period of one year and five months.

2.3.97 Transfer nodes are areas for the storage and loading and unloading of bulk earthworks material, which would be moved to and from the site on public highways.

2.3.98 There would be a transfer node associated with The Green south satellite compound within the Coleorton to Kegworth area occupying land between the A42 corridor and

the Proposed Scheme, south of The Green. The transfer node would stretch from 300m to the south of The Green to The Green south satellite compound.

2.3.99 The transfer node would be operational from 2025 for approximately two years and 11 months. Access to the transfer node would be from The Green and the site haul route.

2.3.100 Key railway systems works to be managed from this compound would include slab track installation, which would take 11 months to complete, and construction and installation of the Diseworth auto-transformer station, located 450m south of The Green. Construction of the Diseworth auto-transformer station foundations and buildings would take six months to complete. The installation of the Diseworth auto-transformer station railway systems equipment would take one year and one month to complete. Construction works for the Diseworth auto-transformer station would be accessed from The Green.

2.3.101 There would also be utilities works managed from this compound.

The Green north satellite compound

2.3.102 This compound (see Map CT-05-426, H7 to I6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.103 No demolitions would be required as a result of the works to be managed from this compound.

2.3.104 The compound would be used to manage the construction of the Diseworth Brook viaduct, which would take two years and one month to complete. Construction of part of the viaduct would be managed from The Green south satellite compound. Construction of the viaduct is described under The Green south satellite compound.

2.3.105 There would also be utilities works managed from this compound.

A6 Kegworth Bypass overbridge satellite compound

2.3.106 This compound (see Map CT-05-428a, C6) would be used to manage civil engineering works in the Coleorton to Kegworth area, as illustrated in Figure 5.

2.3.107 No demolitions would be required as a result of the works to be managed from this compound.

2.3.108 The compound would be used to manage the construction of the following bridges:

- Runway approach lights overbridge, which would take two years and three months to complete;
- A6 Kegworth Bypass overbridge, which would take one year and five months to complete; and
- Ashby Road north overbridge, which would take one year and six months to complete.

2.3.109 The works to be managed from this compound would require the following works to public roads:

- temporary closure of the A6 Kegworth Bypass, with traffic diverted along the Ashby Road for 137m for a period of one year and five months. On completion of construction, the A6 Kegworth Bypass would cross the route of the Proposed Scheme on its existing alignment on the A6 Kegworth Bypass overbridge; and
- temporary closure of Ashby Road, with traffic diverted through the A6 Kegworth Bypass for 223m for a period of one year and six months. On completion of construction, Ashby Road would cross the route of the Proposed Scheme on its existing alignment on the Ashby Road north overbridge.

Ashby Road main compound

2.3.110 This compound (see Map CT-05-428a, F4 to H4) would be used to manage civil engineering works and provide main compound support to two satellite compounds in the Coleorton to Kegworth area and the A6 Derby Road and A453 Remembrance Way satellite compound in the Ratcliffe-on-Soar to Long Eaton area (LA05), as illustrated in Figure 5, for a period of three years and eight months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works in the Ratcliffe-on-Soar to Long Eaton area (LA05), as illustrated in Figure 6, for a period of two years. Details of the works to be managed from this compound in the Ratcliffe-on-Soar to Long Eaton area are provided in Volume 2: Community area report LA05, Ratcliffe-on-Soar to Long Eaton.

2.3.111 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 5.

Table 5: Demolitions required as a result of the works to be managed from the Ashby Road main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Molehill Farm, Ashby Road, Kegworth	Kegworth cutting
Commercial		
Commercial business at Mole Hill Farm	Ashby Road, Kegworth	Kegworth cutting
Other		
Telecommunications mast	Ashby Road, Kegworth	Kegworth cutting

2.3.112 The compound would be used to manage the construction of the A6 underbridge, which would take one year and one month to complete.

2.3.113 The compound would be used to manage the construction of the following earthworks:

- Diseworth north embankment, which would take two years and eight months to complete;

- Diseworth cutting, which would take three years to complete;
- Kegworth embankment, which would take three years and one month to complete;
- Kegworth cutting, which would take two years and nine months to complete; and
- A6 Kegworth embankment, which would take two years and four months to complete.

2.3.114 The works to be managed from this compound would require temporary closures of the A6 Derby Road during construction of the A6 underbridge, which would take one year and one month to complete. On completion of construction, the A6 Derby Road would cross the route of the Proposed Scheme on its existing alignment via the A6 underbridge.

2.3.115 The works to be managed from this compound would require the permanent realignment of Leicestershire Footpath L45a/1 to the north of its existing alignment. During construction, alternative routes would be provided for a period of three years and eight months.

2.3.116 The compound would be used to manage the construction of the Kegworth culvert to carry a tributary of the River Soar under the route of the Proposed Scheme, which would take five months to complete.

2.3.117 Transfer nodes are areas for the storage and loading and unloading of bulk earthworks material, which would be moved to and from the site on public highways.

2.3.118 There would be a transfer node associated with Ashby Road main compound occupying land between the M1 corridor and the Proposed Scheme in the Coleorton to Kegworth area. The transfer node would stretch from 450m to the south of A6 Derby Road to the proposed compound.

2.3.119 The transfer node would be operational from 2025 for approximately three years and eight months. Access to the transfer node would be from the A6 Derby Road and the site haul route.

2.3.120 There would also be utilities works managed from this compound.

Construction waste and material resources

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

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

2.3.123 Local excess or shortfall of excavated material within the Coleorton to Kegworth area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, with the aim of contributing to an overall balance of excavated

material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

2.3.124 Forecasts of the amount of waste generated at temporary worker accommodation sites will be reported in the formal ES.

Commissioning of the railway

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

Construction programme

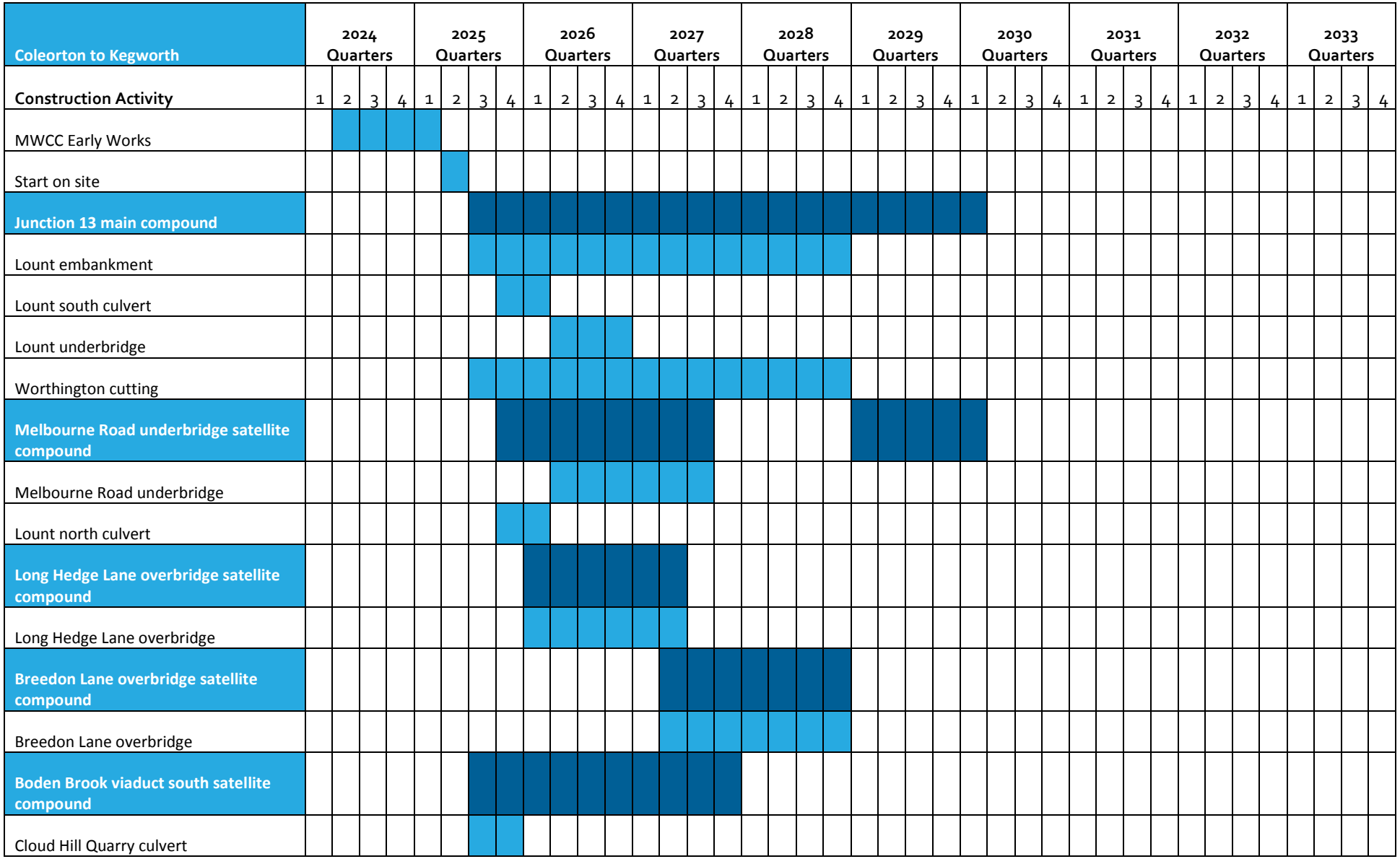
2.3.126 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

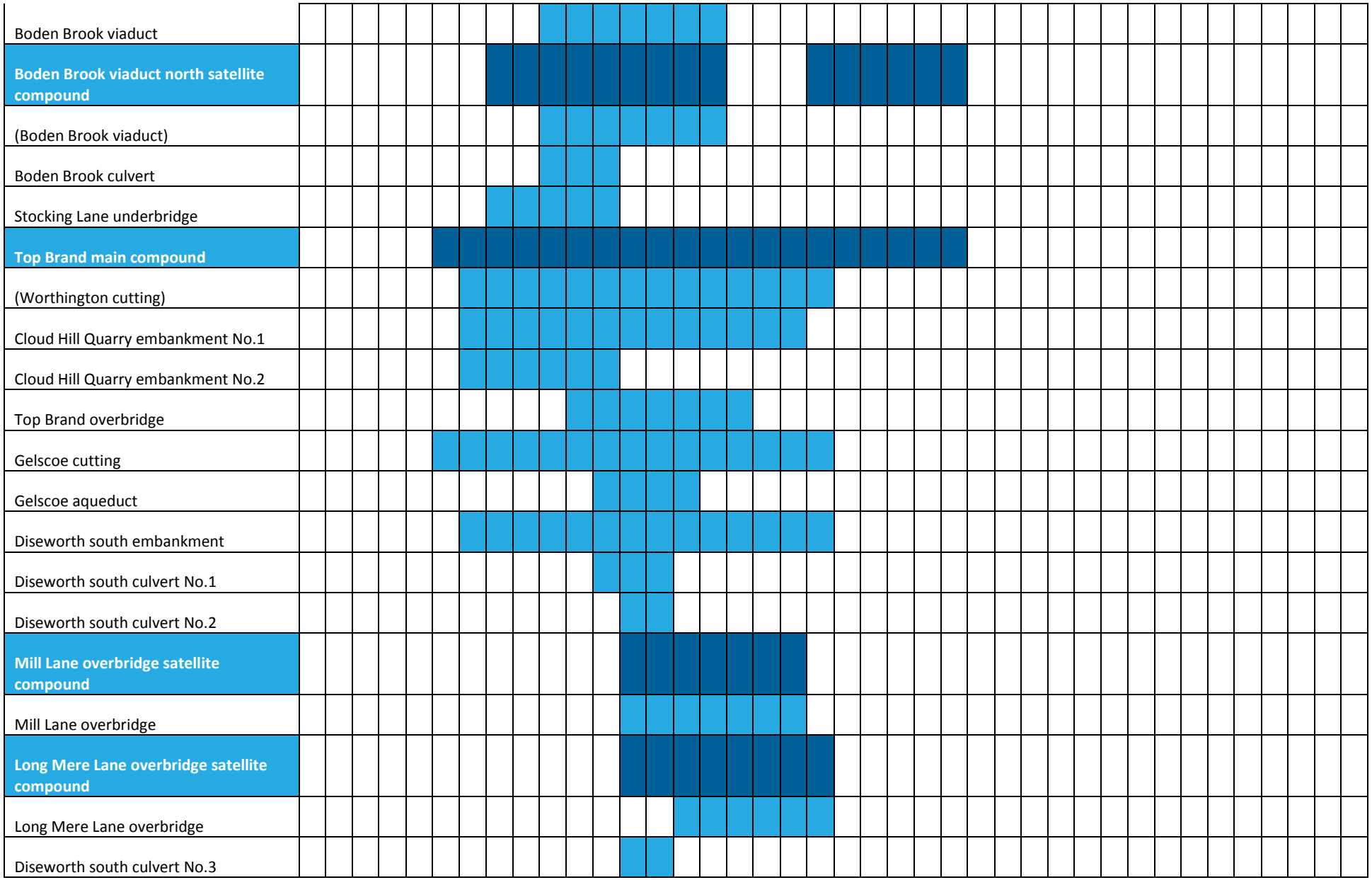
Monitoring during construction

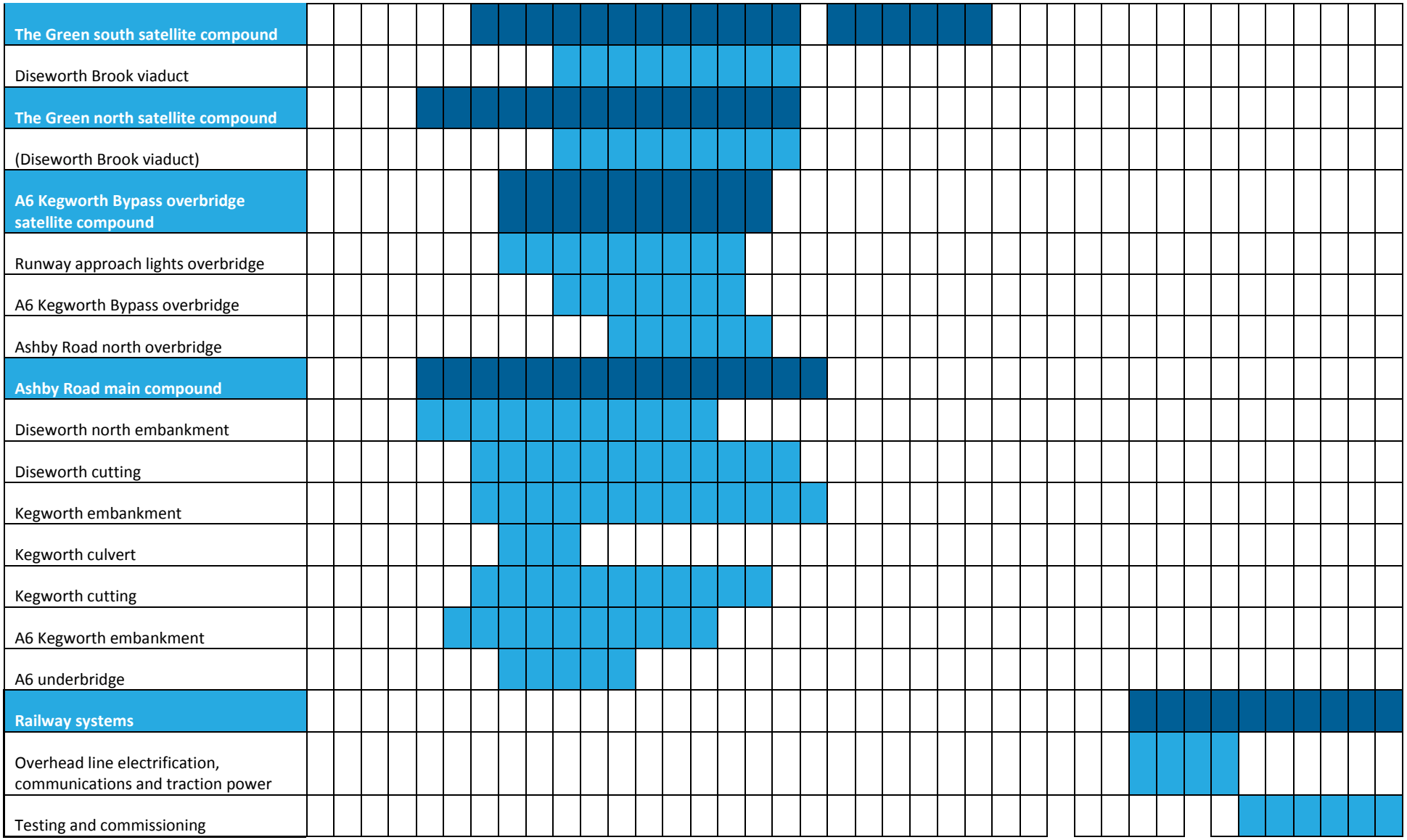
2.3.127 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated undertaker and remedial action identified.

2.3.128 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on the monitoring procedures to be implemented prior to construction commencement.

Figure 7: Indicative construction programme between 2023 and 2033




Boden Brook viaduct
Boden Brook viaduct north satellite compound
(Boden Brook viaduct)
Boden Brook culvert
Stocking Lane underbridge
Top Brand main compound
(Worthington cutting)
Cloud Hill Quarry embankment No.1
Cloud Hill Quarry embankment No.2
Top Brand overbridge
Gelscoe cutting
Gelscoe aqueduct
Diseworth south embankment
Diseworth south culvert No.1
Diseworth south culvert No.2
Mill Lane overbridge satellite compound
Mill Lane overbridge
Long Mere Lane overbridge satellite compound
Long Mere Lane overbridge
Diseworth south culvert No.3


The Green south satellite compound
Diseworth Brook viaduct
The Green north satellite compound
(Diseworth Brook viaduct)
A6 Kegworth Bypass overbridge satellite compound
Runway approach lights overbridge
A6 Kegworth Bypass overbridge
Ashby Road north overbridge
Ashby Road main compound
Diseworth north embankment
Diseworth cutting
Kegworth embankment
Kegworth culvert
Kegworth cutting
A6 Kegworth embankment
A6 underbridge
Railway systems
Overhead line electrification, communications and traction power
Testing and commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Coleorton to Kegworth area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to nine trains per hour each way passing through the Coleorton to Kegworth area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.

2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.

2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley depot in the Staveley to Aston area (LA11). Further information on the Staveley depot can be found in Volume 2: Community area report LA11, Staveley to Aston.

Operational waste and material resources

2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste will be undertaken for the Proposed Scheme as a whole and reported in Volume 3: Route-wide effects of the formal ES.

2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects will also be reported in the formal ES.

Monitoring during operation

2.4.9 The nominated undertaker would be responsible for monitoring during operation of the Proposed Scheme. Proposed indicative area-specific monitoring measures for each environmental topic area are presented in Sections 4 to 15 of this report based on the current level of assessment.

2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

2.5.1 The strategic, route-wide and route corridor alternatives to the Proposed Scheme and local alternatives considered prior to July 2017 are presented in Volume 1, Introduction and methodology and in Supporting document: Alternatives report. The local alternatives considered for the Proposed Scheme within the Coleorton to Kegworth area since the route announcement in July 2017 are described in this section.

2.5.2 In this area, the route of the Proposed Scheme would be carried on viaducts and embankments, in cuttings and through tunnels.

2.5.3 As part of the design development process since July 2017, consideration has been given to the impact of the Proposed Scheme on local residents of the Coleorton to Kegworth area and environmental receptors. This includes agricultural holdings, Lount Meadows Site of Special Scientific Interest (SSSI), Breedon Cloud Wood and Quarry SSSI, Pasture and Asplin Woods SSSI, areas of ancient woodland including Breedon Cloud Wood and Pasture and Asplin Woods, Breedon Lodge Farmhouse and Cottage (Grade II listed building), and Diseworth Brook.

2.5.4 Further consideration will be given to the construction and engineering options in this area, including design and construction methods and alternative engineering options. Further studies are ongoing and will be reported in the formal ES.

3 Stakeholder engagement and consultation

3.1 Introduction

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

3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.

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

3.1.4 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft ES and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016 is provided in Table 6.

Table 6: Mechanisms and timeline of stakeholder engagement since route announcement

Engagement and consultation activity and mechanisms	Date
Phase 2b initial preferred route announcement	15 November 2016
Phase 2b route refinement and property consultations	15 November 2016-9 March 2017
Phase 2b information events to support the route refinement and property consultations	January-February 2017
Confirmation of Phase 2b route announcement	17 July 2017
Start date of engagement with local communities and stakeholders on the confirmed Phase 2b route	July 2017
Consultation on the draft EIA and Equality Impact Assessment (EQIA) Scope and Methodology Report (SMR) to inform the EIA and EQIA and the proposed relocation of the Eastern Leg Rolling Stock Depot	17 July 2017-29 September 2017

Engagement and consultation activity and mechanisms	Date
Phase 2b information events to support SMR and Eastern Leg Rolling Stock Depot consultations	September 2017
Phase 2b information events to provide update on design development	June-July 2018
Phase 2b consultation on the working draft ES and working draft EQIA	October – December 2018

Draft EIA SMR consultation

3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft EQIA is also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft ES and EQIA Reports which inform it.

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

3.3 Informing the Proposed Scheme

3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to initial preferred route announcement in November 2016.

3.3.2 The main themes to emerge from stakeholder engagement in the Coleorton to Kegworth area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land requirements during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;

- retention or realignment of public rights of way (PRoW) such as the 45A/1 footpath at Kegworth;
- temporary or permanent changes to road access including access for businesses, development sites and provision of farm access tracks;
- traffic impacts on local roads during construction;
- impacts on access to local community educational/care/sporting/leisure/ cultural facilities;
- impacts to local businesses such as Cloud Hill Quarry, and maintaining future viability of the proposed extension at Stocking Lane;
- impacts leading to traffic impacts on the A42 and M1 junction 24;
- potential impacts to the runway approach lights at East Midlands Airport and to the operation of the airport; and
- maintaining the future viability of developments such as the East Midlands Gateway, A6 Kegworth Bypass and residential developments with associated recreational facilities such as in the village of Kegworth.

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

3.4 Engagement and consultation with stakeholder groups

Communities

3.4.1 Community stakeholders in the Coleorton to Kegworth area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, while also informing the separate EQIA being undertaken in parallel to the EIA.

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the community area and also at www.gov.uk/hs2. Documents have been made available online and in community libraries. Members of local communities and other interested parties have

been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 7 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design of the Proposed Scheme.

Table 7: Engagement to date with community stakeholders

Stakeholder	Area of focus
Coleorton to Kegworth area Councillors	Engagement to provide brief on the design, project progress and discuss concerns raised and opportunities to assist design development to remove and reduce impacts to the local area and residents as far as possible
Action Group - J24 Action Group (Kegworth)	Meeting to discuss impacts of the Proposed Scheme on local towns and villages, businesses and communities, highways, the environment and the wider Coleorton to Kegworth area
Leicestershire Local Access Forum	Meeting to discuss the potential impacts of the Proposed Scheme on PRoW, bridleways and National Cycle Network (NCN) routes in Leicestershire
Worthington Primary School	Meeting to discuss impact of the Proposed Scheme on the commute of students and staff, and concerns regarding the construction phase
Leicester and Leicestershire Enterprise Partnership	Meeting to discuss impacts of the Proposed Scheme in the Leicestershire area
Leicestershire Princes Trust	Meeting to discuss the potential impact of the Proposed Scheme and employment opportunities through the supply chain

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Coleorton to Kegworth area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

3.4.7 Engagement has focused on the technical areas which inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst other topics.

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 8.

Table 8: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Leicestershire County Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns. In addition, there has been discussion of the future of the prospective Kegworth playing fields
	Meeting to discuss sensitive ecological receptors, plans for mitigation and gather information to assist the ecological assessment within the working draft ES
	Engagement around the landscape and visual assessment and to discuss representative view point and photomontage locations
North West Leicestershire District Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and EIA. In addition, there has been discussion of the future of the prospective Kegworth playing fields
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality and sound, noise and vibration
	Engagement around the landscape and visual assessment and to discuss representative view point and photomontage locations
Kegworth Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Breedon on the Hill Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Castle Donnington Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Long Whatton and Diseworth Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Belton Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Coleorton Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Lockington cum Hemington Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Staunton Harold Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Isley cum Langley Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Midlands Connect	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns

Stakeholder	Area of focus
East Midlands Councils	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and WDES
	Meeting to discuss likely impacts to highways, including local roads, trunk roads and highway assets
	Meeting to discuss the traffic and transport assessment and gaining understanding of key local constraints
	Meeting to discuss development of the East Midlands Hub station
	Meeting to discuss participation in the East Midlands Councils' HS2 mitigation group

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[18].

Expert, technical and specialist groups

3.4.10 Engagement has also been undertaken with expert, technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged to date include:

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- Leicestershire and Rutland Wildlife Trust;
- Leicestershire and Rutland Archaeology Service;

[18] Supporting document: Draft Code of Construction Practice

- National Farmers Union;
- National Forest Company;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/The Wildlife Trusts; and
- Woodland Trust.

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.

3.4.12 Further information about topic-specific engagement is provided in Sections 4 to 15, where relevant.

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders such as Network Rail, Western Power Distribution, Cadent, Severn Trent Water, Mainline Pipeline, BT Openreach, Virgin Media, Colt, Genesys, Instalcom, Coal Authority, and the Oil and Pipelines Agency to establish what infrastructure exists in the Coleorton to Kegworth area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Coleorton to Kegworth area.

3.4.15 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. For example, the location of environmental mitigation will seek to reduce the loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.16 Information gathered from 10 farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.17 Engagement is also continuing with key representatives for the farmers and growers industry, in particular with the National Farmers Union and Country Land and Business Association.

3.4.18 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Coleorton to Kegworth area, an information event was held at the Best Western Yew Lodge Hotel on 18 June 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.19 Engagement has been undertaken with Cloud Hill Quarry, East Midlands Airport, Harworth Estates, Moto Hospitality, Uniper and Roxhill Developments (East Midlands Gateway).

3.4.20 HS2 Ltd is continuing to engage with directly affected individuals, major asset owners and businesses, as the design and assessment develops.

4 Agriculture, forestry and soils

4.1 Introduction

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

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[19].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[20].

4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[21] 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 BMV agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

[19] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers
[20] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[21] 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

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts on this feature have been calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation, carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.

4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1 (Section 8). These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this would ultimately be at the discretion of the landowner. For this reason, financial compensation is not a consideration in the assessment of effects on farm holdings, as set out under Impacts on holdings below. In the majority of cases, the details of land use have been obtained from face-to-face interviews. Where this has not been possible, holding data has been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

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

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Coleorton to Kegworth area is provided in Section 10, Land quality and Section 15, Water resources and flood risk. The underlying geology of the study area is mapped by the British Geological Survey

(BGS)[22]. Glacial till deposits, comprising the Oadby Member and the Thrussington Member, extend across higher ground between Worthington and Long Whatton. The deposits include rock fragments with lenses of sand, gravel, clay and silt.

4.3.3 Head deposits are present around Diseworth Brook, along a tributary of the River Soar to the south of Kegworth and south of Lockington. Head deposits typically comprise gravel, sand, silt and clay.

4.3.4 Alluvial deposits are associated with the Boden Brook to the north of Worthington and also with the Westmeadow and Diseworth Brooks further north. These deposits mostly comprise consolidated silty clay but also contain silt, sand, peat and gravel.

4.3.5 A small area of glacio-lacustrine deltaic deposits, which include sand, gravel and clay, is mapped north of Cloud Hill Quarry.

4.3.6 River terrace deposits are mapped to the immediate north of Kegworth and comprise sand and gravel or silt and gravel of the Egginton Common Sand and Gravel Member, Wanlip Member and Hemington Member.

4.3.7 The bedrock throughout most of the study area comprises the Mercia Mudstone Group, along with the Sherwood Sandstone Group, the Pennine Coal Measures Group and the Peak Limestone Group.

4.3.8 There are two outcrops of the Helsby Sandstone Formation (within the Sherwood Sandstone Group) in the south of the study area. The formation comprises fine- to medium-grained sandstones, which weather to sand near the surface.

4.3.9 The Pennine Lower and Middle Coal Measures Formations within the Pennine Coal Measures Group outcrop in the Lount, Coleorton and Newbold area, and are characterised by interbedded mudstone, siltstone and sandstone.

4.3.10 The Peak Limestone Group, comprising the Milldale Limestone Formation and the Cloud Hill Dolostone Formation, is mapped to the north of Worthington and quarried at Cloud Hill Quarry.

4.3.11 The Sidmouth Mudstone Formation of the Mercia Mudstone Group underlies most of the study area, and outcrops from south of Breedon on the Hill to south-west of Kegworth, along with a number of small outcrops of Diseworth Sandstone, which also include pale grey siltstone and fine-grained sandstone.

4.3.12 The Tarporley Siltstone Formation of the Mercia Mudstone Group outcrops between Worthington and Tonge, and to the west and south of Kegworth. The formation includes red-brown mudstone, siltstone and sandstone, which may be interbedded and interlaminated.

4.3.13 The Arden Sandstone Formation within the Mercia Mudstone Group is mapped at the northern end of the study area, and includes grey, green and purple mudstones with interbedded siltstones and sandstones.

4.3.14 The Tarporley Siltstone Formation of the Mercia Mudstone Group outcrops between Worthington and Tonge, and to the south and west of Kegworth.

[22] British Geological Survey (2018). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Topography and drainage

4.3.15 Topography in this study area reflects the underlying geology, with the valleys of the Boden, Westmeadow and Diseworth Brooks cut into underlying siltstone and mudstone.

4.3.16 Land in the study area is undulating with shallow to moderate slopes with gradients of up to seven degrees, with the steeper slopes found south of Lount, and west and north-east of Cloud Hill Quarry.

4.3.17 In the south of the study area, the highest ground is at approximately 150m to 160m above Ordnance Datum (AOD), whilst the highest ground in the north of the study area is at up to approximately 80m AOD. Altitudes fall to approximately 50m AOD in the valleys of the Westmeadow and Diseworth Brooks.

4.3.18 Land at risk of flooding by rivers is confined to the valleys of the Boden, Westmeadow and Diseworth Brooks. This land is classed as predominantly Flood Zone 3 on the Environment Agency's Flood map[23], in which there is a 1 in 100 or greater annual probability of flooding. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.19 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[24] and their general distribution is shown on the National Soil Map[25]. Soils possessing similar characteristics are amalgamated into associations.

4.3.20 There are three known soil types likely to be present in this study area. The presence of the main two groups has been confirmed in parts of the study area by published survey data[26,27]. The most prevalent includes soils of the Bardsey, Hodnet, Ragdale, Salop and Worcester associations, which typically develop over mudstone. Soil profiles generally include clay loam topsoils, though sandy clay loam, sandy silt loam and clay may also be present. Subsoil horizons are typically clay or silty clay, which is imperfectly to poorly drained, of Wetness Class[28] (WC) III or IV. The Hodnet association may be slightly better draining, of WC II, although this is dependent upon the local climate. Soils of this type have been identified in a semi-detailed survey undertaken in the south of the study area, east of Lount[29], and in a detailed survey undertaken at Diseworth[30].

[23] Environment Agency (undated), Flood map for planning. Available online at https://flood-map-for-planning.service.gov.uk/confirm-location?easting=440323&northing=317458&placeOrPostcode=coleorton
[24] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden
[25] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute
[26] ADAS (1996). Agricultural Land Classification; Land North of Melbourne Road, Lount, Leicestershire. Reference 126/95. Semi-detailed survey undertaken at an observation density of one per 2 hectares
[27] MAFF (1996). Agricultural Land Classification; North-West Leicestershire Local Plan – Land South of East Midlands Airport (Site No 6597), ref 30/96. Detailed survey undertaken at an observation density of one per hectare
[28] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained
[29] ADAS (1996), *op. cit*
[30] MAFF (1996), *op. cit*

4.3.21 The second most prevalent soil type comprises soils the Bromsgrove association, developed over Triassic and Carboniferous sandstone and mapped to the south of Breedon on the Hill and to the north of Kegworth. Profiles are characterised by reddish sandy loam throughout, overlying soft sandstone at depth. Soils of this type have been identified in a detailed survey undertaken north of Kegworth[31]. Additional surveys have been undertaken west of Kegworth, although these data are not available.

4.3.22 The least prevalent soil type has developed in river alluvium and comprises stoneless clays of the Fladbury 2 association. Soils are poorly drained, of WC IV, and are variably affected by groundwater due to their proximity to water channels.

Soil and land use interactions

Agricultural land quality

4.3.23 The principal soil/land use interaction is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate, topography and drainage.

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

4.3.25 The interaction of rainfall and accumulated temperature limits agricultural land quality to Grade 2 in the south of the study area, west of Rough Park, irrespective of other site and soil properties. The interactions of climate with soil characteristics are also important in determining the wetness and droughtiness[32] limitations of the land.

4.3.26 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[33] for four points within the study area. The data show climate in the study area to be generally mild, other than in the south where the climate is shown to be cold. The number of Field Capacity Days[34] (FCDs), when the moisture deficit[35] is zero, ranges from 137 to 157 days per annum and is lower than or about average for lowland England (150 days). Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately large.

4.3.27 Site factors include flood risk which limits agricultural land quality within the valleys of the brooks and watercourses to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk. There is no limitation to agricultural land quality from gradient within the study area.

[31] MAFF (1995). Agricultural Land Classification; North West Leicestershire Local Plan, Site J13/J13b. Reference 77/95. Detailed survey undertaken at an observation density of one per hectare
[32] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil.
[33] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*
[34] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate
[35] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season

4.3.28 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness and soil droughtiness. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures and stone contents and moisture deficits.

4.3.29 The main group of soil associations, including the Bardsey, Hodnet, Ragdale, Salop and Worcester associations, comprising loamy and clayey topsoils over clay or silty clay subsoils, are limited mostly by soil wetness and workability. Where profiles are WC III and have medium loamy topsoil textures, the limitation is to Subgrade 3a. Where topsoils are heavy loams or clay, and in all profiles of WC IV, the limitation is greater to Subgrade 3b.

4.3.30 Published survey data in the study area have confirmed that sandy clay loam, clay loam and clay topsoils over red clay subsoils fall within WC III or IV depending on the depth to the clay. Profiles are classified as Subgrade 3a or 3b accordingly.

4.3.31 A soil variant intermediate to the first and second soil types of the study area has been identified east of Diseworth, at Wood Nook Farm. Soil profiles comprise sandy clay loam throughout, and are well drained, of WC I. The main limitation to these soils is topsoil stone content, with the proportion of those larger than 2cm exceeding 15% by volume. These soils are limited to Subgrade 3b.

4.3.32 Soils characteristic of the Bromsgrove association comprise well drained (WC I) profiles of sandy loam overlying soft sandstone at depth. The moisture deficits in this part of the study area are moderate, and it is not anticipated that soils will be significantly droughty. Soils of the Bromsgrove association are likely to have only minor limitations to their agricultural use and to be of Grade 1 or 2.

4.3.33 The presence of this soil type is confirmed by published survey data to the north-west of Kegworth, where profiles of medium sandy loam of around 70-90cm depth are limited slightly to Grade 2 by droughtiness. A variant developed over river terrace deposits, comprising sandy loam or sandy clay loam over gravelly sand, is less able to retain water due to coarser subsoils, and is limited by droughtiness to Subgrade 3a.

4.3.34 The alluvial clays of the Fladbury 2 association, present in the valleys of the Boden, Westmeadow and Diseworth Brooks, are likely to be waterlogged for long periods throughout the year (WC IV). These soils are limited by wetness and workability to Subgrade 3b.

4.3.35 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[36] shows that there is a moderate likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.

[36] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*. Available online at http://publications.naturalengland.org.uk/file/5955660136579072

4.3.36 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

4.3.37 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[37] and the Government's White Paper, The Natural Choice: securing the value of nature[38], and include:

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

4.3.38 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment of the value and sensitivity of woodland resources is reported in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.3.39 The floodplains of the Boden, Westmeadow and Diseworth brooks occupy land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils and floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.40 The study area is predominantly rural with agricultural land within traditional mixed arable and livestock holdings. Two large estates, the Staunton Harold Estate and the Whatton Estate, are located in the southern and northern sections of the study area respectively. The livestock enterprises on farms are mainly herds of beef cattle, although there is a dairy enterprise on the Whatton Estate and some smaller sheep flocks on various holdings.

4.3.41 Woodland is found across the study area, with a substantial area of woodland including Rough Park and Birch Coppice associated with the Staunton Harold Estate. Much of this woodland has been planted on restored open cast workings, and is

[37] Defra (2009), *Soil Strategy for England*
[38] Department for Environment, Food and Rural Affairs (2011), *The Natural Choice: securing the value of nature*

managed commercially for forestry products as well as for various recreational uses. There are also substantial broadleaved woodlands to the north-east of Worthington at Cloud Wood, Pasture Wood and Asplin Wood. Further north, there are a number of smaller copses and woods, particularly south of the A42/M1 intersection, and also on the Whatton Estate.

4.3.42 A number of environmental designations influence land use within the study area. The entire Coleorton to Kegworth area is a nitrate vulnerable zone, where statutory land management measures apply, limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.43 Some agricultural land is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS), which has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of Environmental Stewardship, the England Woodland Grant Scheme and Catchment Sensitive Farming grants.

4.3.44 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focussed than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme less than that covered under Environmental Stewardship. However, four new simpler non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up the scheme to more farmers and land managers. Holdings that have land entered into an agri-environment scheme are identified in Table 9.

Number, type and size of holdings

4.3.45 Table 9 sets out the current understanding of main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain information about farm holdings where it has not yet been possible to arrange interviews, and this information will be validated as survey work continues. Other farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.46 Table 9 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 9: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Staunton Harold Estate	Arable and livestock	809	House and open garden; commercial forestry; weddings and events; holiday lets; commercial lets; recreational uses	ELS and HLS	Medium
Worthington Fields Farm	Arable and beef cattle	342	None	None	Medium
Lodge Farm	Arable and beef cattle	82	Shoot	None	Medium
Fields Farm Worthington	Arable and beef cattle	76	Business lets	None	Medium
Land west of Breedon Lane*	Equestrian	2	None	None	Low
White House Fields Farm	Equestrian and sheep	7	Contracting; livery	None	Medium
Mill House Farm*	Livestock	20	Unknown	None	Medium
Barrow Hill Farm	Arable	170	Commercial and storage lets; forestry	None	Medium
Breedon Lodge Farm*	Arable and equestrian	115	Unknown	None	Medium
Gelscoe Lodge Farm Brandgate Farm*	Arable and beef cattle	135	Unknown	HLS	Medium
Middle Merrill Grange*	Arable and livestock	75	Unknown	None	Medium
Wood Nook Farm Long Mere Farm Mole Hill Farm	Arable and livestock (including dairying)	164	Shoot; commercial lets	None	High
Riste Farm*	Arable and livestock	130	Unknown	ELS and HLS	Medium
Spring House Farm	Sheep	2	None	None	Medium

Whatton Estate*	Arable and livestock	728	House and open garden; weddings and events; art studio	ELS and HLS	Medium

* It has not yet been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.

4.4.2 Compliance with the Code of Construction Practice (CoCP) will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP[39] and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement within the farm pack 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 would include any remediation measures necessary following the completion of works (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);

[39] Supporting document: Draft Code of Construction Practice

- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

4.4.3 As part of the ongoing development of the design, the following measures have been incorporated at this stage to avoid or mitigate adverse impacts on agriculture, forestry or soils:

- Flagstaff Farm accommodation access, to retain access to Flagstaff Farm which forms part of the Staunton Harold Estate (see Volume 2: Map CT-06-419b, E8 to E9);
- Hall Farm accommodation access, to retain access to Hall Farm (part of the Staunton Harold Estate) from the realigned A512 Ashby Road (see Volume 2: Map CT-06-419b, E9 to F9);
- Lount underbridge to provide access across the Proposed Scheme on the Staunton Harold Estate (see Volume 2: Map CT-06-420, D6 to D7) and accommodation access from Melbourne Road (see Volume 2: Map CT-06-420, G6 to I6); and
- Breedon Lodge Farm accommodation access realignment (see Volume 2: Maps CT-06-422, I6 to J7, and CT-06-423, B6 to D5), which would replace the farm's access from Stocking Lane, with access to land severed between the Proposed Scheme and the A42 available via Top Brand overbridge and the existing farm overbridge over the A42.

4.4.4 The effect of severance of agricultural land for various holdings would also be reduced by the realignment and re-instatement of public highways in this study area, including the Long Hedge Lane overbridge for access to Worthington Fields Farm; the Long Mere Lane realignment for access to Long Mere Farm; and the Mill Lane overbridge for access to Gelscoe Lodge Farm and Brandgate Farm. However, as the design develops it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land.

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

4.4.6 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. Some poorly or very poorly drained land or land with heavier textured soils (such as the Fladbury 2 association) may also require particularly careful management, such

as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

4.4.7 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, preclude existing land uses or sever and fragment individual fields and operational units of agricultural and forestry land. This could result in potential effects associated with the ability of affected agricultural and forestry interests to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The Proposed Scheme seeks to reduce this disruption and, where appropriate and reasonably practicable, incorporate residual parcels of land no longer effective for agricultural use due to their size and/or shape as part of environmental mitigation works, such as ecological habitat creation.

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

- part of the operational railway or associated infrastructure and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.9 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 600ha of agricultural land within the Coleorton to Kegworth area during the construction phase, of which approximately 270ha (45%) are likely to be classified as BMV land Grades 2 and 3a. This would be a medium magnitude of impact on BMV land.

4.4.10 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land during the construction phase would be moderate adverse, which would be significant.

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

Nature of the soil to be disturbed

4.4.12 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction

and the re-instatement of land; whereas soils with a high sand fraction in areas with the fewest number of FCDs and during the driest times of the year are the least susceptible.

4.4.13 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[40]. These principles would be followed throughout the construction period.

4.4.14 Clayey, alluvial and seasonally waterlogged soils (including Bardsey, Hodnet, Ragdale, Salop, Worcester and particularly the Fladbury 2 associations) are least able to remain structurally stable if moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.15 Implementation of the measures set out in the draft CoCP would reduce the magnitude of impact on soil. The detailed soil survey data will define the sensitivity of soil, and the assessment of the effects on soils to be disturbed will be reported in the formal ES.

Impacts on holdings

4.4.16 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. During the construction period, some agricultural land would be restored and the impact on individual holdings would reduce.

4.4.17 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal ES. The formal ES will present the total area of land required on a particular holding during the construction period in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.18 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 10 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these would generally be the same during and post construction.

4.4.19 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

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

Table 10: Summary of temporary effects on holdings from construction

Holding name/Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Staunton Harold Estate Medium sensitivity	Medium	Low	Moderate adverse
Worthington Fields Farm Medium sensitivity	Medium	Medium	Moderate adverse
Lodge Farm Medium sensitivity	High	Medium	Major/moderate adverse
Fields Farm Worthington Medium sensitivity	High	Medium	Major/moderate adverse
Land West of Breedon Lane Low sensitivity	High	Negligible	Moderate adverse
White House Fields Farm Medium sensitivity	High	Medium	Major/moderate adverse
Mill House Farm Medium sensitivity	High	Medium	Major/moderate adverse
Barrow Hill Farm Medium sensitivity	Low	Negligible	Minor adverse
Breedon Lodge Farm Medium sensitivity	High	Low	Major/moderate adverse
Gelscoe Lodge Farm Brandgate Farm Medium sensitivity	High	Medium	Major/moderate adverse
Middle Merrill Grange Medium sensitivity	Medium	Medium	Moderate adverse
Wood Nook Farm Long Mere Farm Mole Hill Farm High sensitivity	High	Medium	Major adverse
Riste Farm	High	Negligible	Major/moderate adverse

Holding name/Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Medium sensitivity			
Spring House Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Whatton Estate Medium sensitivity	Low	Negligible	Minor adverse

4.4.20 Overall, the construction of the Proposed Scheme is currently anticipated to affect 15 holdings in the Coleorton to Kegworth area temporarily. On the basis of information currently available, 13 holdings are currently expected to experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.

4.4.21 Wood Nook Farm, which is farmed as one unit along with Long Mere and Mole Hill Farm, is currently expected to experience a major adverse effect during construction due to high land requirements from a high sensitivity dairy farm. Eight farm holdings are currently expected to experience major/moderate adverse temporary effects due to the proportion of land required for the construction of the Proposed Scheme. Four farm holdings are currently expected to experience moderate adverse temporary effects during construction.

4.4.22 Although financial compensation would be available under existing statutory arrangements to offset these impacts, it is not a consideration in the assessment of effects on farm holdings.

Permanent effects of construction

Impacts on agricultural land

4.4.23 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 380ha of agricultural land permanently within the Coleorton to Kegworth area, of which approximately 140ha (37%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium impact of magnitude on BMV land.

4.4.24 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land following construction would be moderate adverse, which would be significant.

Impacts on forestry land

4.4.25 It is currently expected that an area of commercial forestry land on the Staunton Harold Estate, some of which has been planted on restored open cast workings, would be required for the Proposed Scheme. This woodland is managed as a commercial forestry enterprise and for a number of commercial recreational activities, including archery, husky racing and fishing. Land from small copses (Tonge Gorse and Diseworth Gorse) would also be required. The effects on forestry land will be reported in the formal ES. The qualitative assessment of loss of woodland is presented in Section 7, Ecology and biodiversity.

Impacts on holdings

4.4.26 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 11 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

4.4.27 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 11: Summary of permanent effects on holdings from construction

Holding name/Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Staunton Harold Estate Medium sensitivity	Low	Low	Medium	Moderate adverse
Worthington Fields Farm Medium sensitivity	Negligible	Medium	High	Major/moderate adverse
Lodge Farm Medium sensitivity	Medium	Medium	Low	Moderate adverse
Fields Farm Worthington Medium sensitivity	Medium	Medium	Low	Moderate adverse
Land West of Breedon Lane Low sensitivity	High	Negligible	Low	Moderate adverse
White House Fields Farm Medium sensitivity	High	Medium	High	Major/moderate adverse
Mill House Farm Medium sensitivity	High	Medium	Low	Major/moderate adverse
Barrow Hill Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Breedon Lodge Farm Medium sensitivity	High	Low	Low	Major/moderate adverse
Gelscoe Lodge Farm	High	Medium	High	Major/moderate adverse

Brandgate Farm Medium sensitivity				
Middle Merrill Grange Medium sensitivity	Medium	Medium	Low	Moderate adverse
Long Mere Farm Wood Nook Farm Mole Hill Farm High sensitivity	High	Medium	High	Major adverse
Riste Farm Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Spring House Farm Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Whatton Estate Medium sensitivity	Low	Negligible	Low	Minor adverse

4.4.28 Overall, the construction of the Proposed Scheme could potentially affect 15 holdings in the Coleorton to Kegworth area permanently. On the basis of information currently available, 13 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.29 Wood Nook Farm is currently expected to experience a major adverse permanent effect from construction of the Proposed Scheme due to the high proportion of land required and the impact on its buildings at Mole Hill Farm.

4.4.30 Seven farm holdings are expected to experience major/moderate adverse permanent effects due to the high proportion of land required for the Proposed Scheme. In the cases of Worthington Fields Farm and Gelscoe Lodge Farm, there would also be high impacts on farm infrastructure with the demolition of farm buildings at Worthington Fields Farm, and the demolition of residential property and farm buildings at Gelscoe Lodge Farm.

4.4.31 The five farm holdings that are expected to experience moderate adverse permanent effects are mostly medium sensitivity holdings that would incur medium impacts of land requirements or severance. In one case, there is a high proportion of land required from a low sensitivity holding.

4.4.32 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst

case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.33 Other mitigation would incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.

4.4.34 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all farmers and landowners, setting out baseline conditions on the farm and the assurances and obligations that HS2 Ltd would accept upon entering the land. This would include advice and appropriate assistance where there is a need for the landowner to relocate or re-provide agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

4.4.35 Although the extent of land required permanently by ALC grade is not yet known in the Coleorton to Kegworth area, current indications based on publicly available information are that the temporary and permanent effects on BMV agricultural land during and following construction would be moderate adverse, which would be significant. The area of land required by ALC grade will be assessed and reported in the formal ES.

4.4.36 Of the farm holdings, 13 out of 15 holdings are expected to experience moderate, major/moderate or major adverse temporary effects during construction and 13 are expected to experience moderate, major/moderate or major adverse permanent effects of construction, which would be significant for each holding.

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

4.5.3 Five sets of farm buildings at Worthington Fields Farm, White House Fields Farm, Breedon Lodge Farm, Gelscoe Lodge Farm and Mole Hill Farm lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is a consequence of:

- the management of the highway and railway land; and
- the propensity of the weeds to spread onto such land from adjoining land, which could be exacerbated by the effects of climate change.

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

Other mitigation measures

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

Summary of likely residual significant effects

4.5.7 No residual significant effects on agriculture, forestry and soils have been identified at this stage as a result of the operation of the Proposed Scheme.

Monitoring

4.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Coleorton to Kegworth area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality identified to date arising from the construction and operation of the Proposed Scheme within the Coleorton to Kegworth area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[41] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with North West Leicestershire District Council (NWLDC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2, LA04 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[42].

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur[43]:

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

5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

5.2.4 The assessment of construction traffic impacts will use traffic data, based on an estimate of the average daily flows in the peak year during the construction period (2023-2032). The assessment will assume vehicle emission rates and background

[41] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter
[42] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[43] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment

pollutant concentrations from 2023. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Coleorton to Kegworth area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the A42, the A453 Ashby Road and the A6 Derby Road.

5.3.2 There is one industrial installation (regulated by the Environment Agency) with a permit for emissions to air, namely Cott Beverages, involving treatment and processing of vegetable raw materials. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)[44] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Coleorton to Kegworth area.

Local monitoring data

5.3.4 There are currently 12 local authority diffusion tube sites located within the Coleorton to Kegworth area for monitoring NO2 concentrations. Measured concentrations in 2016 were within the NO2 air quality standard[45].

Air quality management areas

5.3.5 There are two air quality management areas (AQMA) within the Coleorton to Kegworth area. These are the M1 AQMA, which covers properties associated with Mole Hill Farm and part of the M1 carriageway between junction 23A and the A453 Ashby Road, and the Kegworth AQMA, which is located along the A6 Derby Road through Kegworth. Both AQMAs were declared in July 2004. The AQMAs were designated for exceedances in the annual mean NO2 standard. The M1 AQMA was amended in July 2011 to include exceedances of the hourly mean NO2 standard.

Receptors

5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust generating activities or traffic routes during construction or operation of the Proposed Scheme.

[44] Department for Environment, Food and Rural Affairs (Defra) (2013), Defra Background Pollutant Concentration Maps. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015
[45] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include various schools and businesses.

5.3.8 There are three statutory designated ecological sites identified within the Coleorton to Kegworth area, namely the Lount Meadows Site of Special Scientific Interest (SSSI), Breedon Cloud Wood and Quarry SSSI and Pasture and Asplin Woods SSSI. Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include the Rough Park Ancient Woodland Inventory Site (AWIS), Birch Coppice AWIS and Pasture/Asplin Woods AWIS. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP)[46]. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:

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

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

[46] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme could arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[47] have been assessed for their effect on dust soiling, human health[48] and ecological sites. There are residential and ecological receptors located within the Coleorton to Kegworth area.

5.4.6 It has been identified that there would be a low to medium risk of dust effects and a negligible to low risk of human health effects from demolition. For earthworks and construction, there would be a medium to high risk of dust effects and a low risk of human health effects. For trackout, there would be a medium risk of dust effects and a low risk of human health effects. There would also be a negligible to medium risk of ecological effects from all dust generating activities.

5.4.7 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with dust generating activities.

Construction traffic effects

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

5.4.9 The M1, the A42, the A453 Ashby Road, the A6 Kegworth Bypass, the A6 Derby Road, the B587 Nottingham Road, B5324 Rempstone Road, Melbourne Road, Bull Hill/Manor Road/Main Street/Newbold Lane, Breedon Lane, Stocking Lane, Top Brand, Gelscoe Lane, Mill Lane (both western and eastern branches), Long Mere Lane and The Green would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on these roads and on Ashby Road (west of Kegworth). A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

[47] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network

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

Permanent effects

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

Other mitigation measures

5.4.12 No other mitigation measures are proposed at this stage in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust emissions and, therefore, no significant residual effects would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 No specific mitigation measures for air quality are proposed during operation of the Proposed Scheme.

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition, and/or speed of road traffic and changes in road alignment.

5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

5.5.4 Direct and indirect effects from changes in air quality, such as those arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. Any effects will be reported in the formal ES.

Other mitigation measures

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

Summary of likely residual significant effects

5.5.6 Any significant residual effects for air quality from the operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

5.5.8 Any area specific requirements for monitoring air quality effects during operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Coleorton to Kegworth area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of facilities including Leicestershire County Council (LeCC), Leicestershire Local Access Forum, Breedon on the Hill Parish Council, Long Whatton and Diseworth Parish Council. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information and inform the design development of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in the SMR[49] and Volume 1.

6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination and isolation effects on community facilities and resources will be reported in the formal ES.

6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

[49] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure then this will be discussed with the relevant local authority and local groups and reported in the formal ES.

6.2.6 The assessment in the working draft ES is based on the design information including demolitions as set out in Section 2 available at the time of assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.

6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.

6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, HGV traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

6.2.9 For the working draft ES, the full details of construction traffic routes and geographical scope of likely in-combination (amenity) effects are not yet known. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.

6.2.10 At this stage it has not been possible to complete surveys of public open spaces in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Coleorton to Kegworth area would be approximately 15.2km in length and lie within the local authority areas of North West Leicestershire District Council (NWLDC) and LeCC. It would extend from Coleorton in the south, passing close to the settlements of Newbold Coleorton, Lount, Worthington, Breedon on the Hill, Diseworth, Long Whatton, and Kegworth in the north. The Coleorton to Kegworth area is predominantly rural in nature, with agriculture being the main land use. This is interspersed with small villages, scattered isolated dwellings and farmsteads. The majority of community resources within the Coleorton to Kegworth area are recreational, including publicly accessible countryside, promoted PRoW and publicly accessible woodland.

Lount, Newbold Coleorton and surrounds

6.3.2 This area covers the villages of Lount, Newbold Coleorton and surrounds. Together they have approximately 400 residential properties.

6.3.3 Lount is located approximately 3km north-east of Ashby-de-la-Zouch, and to the west of the route of the Proposed Scheme. Scattered residential properties associated with Lount would be on the route of the Proposed Scheme.

6.3.4 Community resources within Lount, Newbold Coleorton and surrounds include the Ferrers Arms public house and Ashby Moto Park off-road motorbike practice track. There are also areas of recreational open space within the village, including a children's play area. The area surrounding the village of Lount includes open space areas comprising the National Forest and Staunton Harold Estate. Both resources offer walks and trails open to the public.

6.3.5 Newbold Coleorton (also known as Newbold) is located east of Lount and approximately 725m east of the route of Proposed Scheme. This area also includes scattered residential properties, some of which would be on the route of the Proposed Scheme. Newbold Coleorton's community resources within the study area include Newbold Primary School and the Cross Keys Inn public house. Community Education Enterprise Project (CEEP) has their Community Enterprise Centre located at Hall Farm, which would be located approximately 300m east of the route of the Proposed Scheme. There is also an allotment garden located on Worthington Lane and a children's playground and playing field to the south of Ashby Road.

6.3.6 In the surrounding area, there are a number of areas of open space, including the New Lount Local Nature Reserve south of Newbold, which offers walking trails and picnic areas. Further areas of open space include Rough Park Ancient Woodland and Birch Coppice Ancient Woodland. The route of the Proposed Scheme would cross the Ivanhoe Way, which is a long-distance footpath. It is used for events such as the Ivanhoe Way Challenge charity walk. The outdoor activity centre Field Sport UK would be located approximately 150m east of the route of the Proposed Scheme.

Worthington

6.3.7 Worthington is a village of approximately 300 residential properties, located to the east of the route of the Proposed Scheme. Scattered residential properties associated with Worthington would be adjacent to the route of the Proposed Scheme.

6.3.8 Community facilities in Worthington include a shop, which serves as a post office and general store. The village has two places of worship: St. Matthew's Worthington and Worthington Methodist Church. Further community resources include Worthington Primary School and the Malt Shovel public house. The Cloud Trail is located immediately north of Worthington and is a 20.9km recreational route, used by horse riders, pedestrians and cyclists. This route forms part of National Cycle Network (NCN) Route 6, which runs from London to the Lake District. The Ivanhoe Way crosses the A42 to the west of Worthington, passing through the village before leading southwards to the east of Newbold.

Breedon on the Hill and surrounds

6.3.9 This area includes the villages of Breedon on the Hill and Tonge. Together they have approximately 500 residential properties. Breedon on the Hill is located approximately 800m north of the route of the Proposed Scheme. This area also includes several scattered residential properties.

6.3.10 Community resources within the study area include St. Hardulph's Primary School. Recreational facilities include NCN Route 6, which is located to the south and east of Breedon on the Hill and links with Worthington to the south and Derby to the north. It is a shared-use path for walkers, cyclists and horse riders and is used for a range of charity events. Breedon Cloud Wood Ancient and Semi-Natural Woodland is an area of publicly accessible open space that is adjacent to the route of the Proposed Scheme.

Diseworth, Long Whatton and Kegworth

6.3.11 This area includes the villages of Diseworth, Long Whatton and Kegworth.

6.3.12 The village of Diseworth is located approximately 3km south-west of Kegworth, and to the west of the route of the Proposed Scheme. Long Whatton is located approximately 2km south-east of Diseworth, and to the east of the route of the Proposed Scheme. Diseworth and Long Whatton connect via The Green, which would be crossed by the route of the Proposed Scheme. Together Diseworth and Long Whatton have approximately 800 residential properties. The nearest residential properties would be located approximately 250m north-west of the route of the Proposed Scheme.

6.3.13 Community resources within the area of Diseworth and Long Whatton include Long Whatton Cricket Club and NCN Route 15. This area offers several community resources outside the study area, including a community hall, a primary school, places of worship, public houses, and a heritage centre.

6.3.14 The village of Kegworth comprises approximately 1,600 residential properties. The nearest residential properties would be located approximately 50m east of the route of the Proposed Scheme.

6.3.15 There are many community resources in the village of Kegworth including Kegworth Museum, Kegworth Library, Orchard Surgery, and several shops, public houses and restaurants. There are educational facilities such as the Kegworth Village Hall Pre-School and Kegworth Primary School. There are places of worship in the village including Kegworth Parish Church St. Andrews, Kegworth Baptist Church, St Andrews Church and Kegworth Methodist Church. There are also a number of sports facilities including Kegworth Tennis Club and Kegworth Town Cricket Club. There are children's play parks, recreational fields and allotment gardens.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[50] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);

[50] Supporting document: Draft Code of Construction Practice

- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of PRoW during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16)
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 No temporary effects on residential properties have been identified as a result of the land required for construction of the Proposed Scheme.

Community facilities

6.4.3 No temporary effects on community facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Recreational facilities

6.4.4 No temporary effects on recreational facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Open space and recreational PRoW

6.4.5 Construction of the Lount embankment would result in the temporary loss of approximately 26ha of Rough Park and Birch Coppice. This would represent a temporary loss of approximately 25% of Rough Park and Birch Coppice, which have a total combined area of approximately 95ha. The two sites provide natural and semi-natural green space that is publicly accessible via a footpath and permissive bridleway, which run through the woodlands. During construction the permissive bridleway could be closed, and the site would be partially inaccessible to the public for approximately three years and five months. The temporary loss of publicly accessible woodland would result in a moderate adverse effect, which would be significant.

6.4.6 The construction of Worthington cutting would result in the temporary severance of Ivanhoe Way, which is a 56km long distance walking route. Temporary severance could deter walkers and other users from using this route for leisure journeys. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.7 The construction of Boden Brook viaduct would result in the temporary diversion of the Cloud Trail (including part of NCN Route 6). Temporary diversion could deter cyclists, walkers and other users from using this route for leisure journeys. Details of the temporary diversion and an assessment of the likely effects will be reported in the formal ES.

6.4.8 The construction of Mill Lane diversion would result in the temporary diversion of NCN Route 15, which runs along Mill Lane. It would be temporarily diverted via alternative routes for a period of approximately one year and five months, until the permanent alternative route is operational. The temporary diversion may deter the users of this route during the construction period. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.9 Land required for the Melbourne Road underbridge and the Melbourne Road realignment would require the demolition of four residential properties on Melbourne Road, which are located between Newbold Coleorton and Lount. These residential properties would be permanently lost.

6.4.10 Land required for construction of the Worthington cutting would require the demolition of one residential property, which is located on Lodge Hedge Lane to the west of Worthington. This residential property would be permanently lost.

6.4.11 Land required for construction of the Worthington cutting would require the demolition of Field House, which is located off Nottingham Road, and approximately 600m to the west of Worthington. This residential property would be permanently lost.

6.4.12 Land required for construction of the Worthington cutting would require the demolition of one residential property, which is located on Breedon Lane to the north of Worthington. This residential property would be permanently lost.

6.4.13 Land required for the Gelscoe cutting would require the demolition of Gelscoe Lodge Farm off Gelscoe Lane, which is located approximately 1.5km south-east of Tonge. This residential property would be permanently lost.

6.4.14 Land required for construction of the Kegworth cutting would require the demolition of one residential property on Ashby Road approximately 600m to the south-west of Kegworth. This residential property would be permanently lost.

Community facilities

6.4.15 No permanent effects on community facilities have been identified as a result of the land required for construction for the Proposed Scheme.

Recreational facilities

6.4.16 No permanent effects on recreational facilities have been identified as a result of the land required for construction for the Proposed Scheme.

Open space and PRoW

6.4.17 The land required for the Lount embankment would result in the permanent loss of approximately 16ha of Rough Park and Birch Coppice, equivalent to 17% of the total area. The Proposed Scheme would include the reinstatement of the permissive bridleway, and Lount underbridge would maintain public access to the area of the woodland that lies to the north-west of the route of the Proposed Scheme. The woodland would also be partially re-planted following construction. As a result, Rough Park Ancient Woodland and Birch Coppice Ancient Woodland would continue to provide publicly accessible open space following construction. The area of woodland permanently lost would result in a minor adverse community effect, which would not be significant.

6.4.18 The construction of Worthington cutting would result in the permanent diversion of Ivanhoe Way. The footpath would be diverted to run parallel to the route of the Proposed Scheme and connect with Long Hedge Lane. The permanent diversion for the footpath would add approximately 650m to the total length of Ivanhoe Way, which is not expected to affect its use for recreation. The permanent diversion of Ivanhoe Way would result in a minor adverse effect, which would not be significant.

6.4.19 The construction of Mill Lane diversion would result in the permanent diversion of the NCN Route 15. The diversion would add approximately 220m to the total length of the route. The permanent diversion of Mill Lane would result in a negligible effect, which would not be significant.

Other mitigation measures

6.4.20 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in this assessment.

6.4.21 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.4.22 Temporary loss of publicly accessible woodland would result in a temporary residual significant effect.

6.4.23 Land required for construction of the Proposed Scheme is not likely to result in permanent residual significant adverse effects.

Cumulative effects

6.4.24 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.4.25 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 Avoidance and mitigation measures will be reported in the formal ES.

Assessment of impacts and effects

6.5.2 Operation of the Proposed Scheme could lead to in-combination effects on the community in this area which will be reported in the formal ES.

Other mitigation measures

6.5.3 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.5.4 A summary of the likely residual significant effects will be reported in the formal ES.

Cumulative effects

6.5.5 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.5.6 No cumulative effects have been identified at this time. Any combined effects on a community during operation of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

Monitoring

6.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

6.5.8 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that would contribute to the in-combination assessments, will be described in the relevant topic sections of the formal ES.

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Coleorton to Kegworth area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, The National Forest Company, Leicestershire County Council (LeCC), and Leicestershire and Rutland Wildlife Trust has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

7.1.4 All distances and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Introduction and Methodology, (Section 8) and the SMR[51].

7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.

7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. The surveys include (but are not limited to) broad habitat and detailed plant surveys, great crested newt surveys, wintering and breeding bird surveys, bat surveys, otter and water vole surveys. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area as known at this time.

7.3.2 Land required for, and adjacent to, the Proposed Scheme in the Coleorton to Kegworth area consists mainly of agricultural land, woodland, floodplain, villages and farmsteads. In much of the Coleorton to Kegworth area the Proposed Scheme would

[51] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

run parallel and close to the A42. The Proposed Scheme would cross Diseworth Brook and Boden Brook, which are part of the catchment for the River Trent and River Soar.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2, LA04 Map Book.

Designated sites

7.3.4 There are no internationally important sites relevant to the assessment in the Coleorton to Kegworth area.

7.3.5 There are three nationally important Sites of Special Scientific Interest (SSSI) that are relevant to the assessment in the Coleorton to Kegworth area. For each of these sites, the Proposed Scheme would be within the Impact Risk Zone[52] relevant to railway infrastructure as identified by Natural England. They are:

- Lount Meadows SSSI, which is made up of four SSSI units and covers a total area of 9.8ha. The site is designated for some of the best examples of slightly acidic neutral grassland in Leicestershire, representative of such grasslands in the English Midlands. SSSI units two, three and four are located north-east of Ashby-de-la-Zouch and unit one is located north of Ashby-de-la-Zouch. SSSI unit four, which is listed as 'area 3' on the SSSI citation, is located adjacent and immediately west of the land required for the Proposed Scheme. SSSI units two and three are located 75m west of the land required for the Proposed Scheme; and unit one is 790m west of the land required for the Proposed Scheme.

- Breedon Cloud Wood and Quarry SSSI, which covers an area of 63ha and is designated for its ancient semi-natural woodland of a type that is now scarce in lowland Britain. The SSSI supports ground flora that is exceptionally diverse and includes several species, which are rare in Leicestershire. The SSSI is located north of Worthington, 18m east of the land required for the Proposed Scheme; and

- Pasture and Asplin Woods SSSI, which covers an area of 42ha and is designated for one of the best examples of ash-hazel woodland in Leicestershire. According to the citation, it is "representative of ancient woodland developed on somewhat poorly drained clay soils in Central and Eastern England."[53] The SSSI is north-west of Worthington and is adjacent to an area of land required for the Proposed Scheme, to be used for the purpose of woodland creation.

7.3.6 There is one Local Nature Reserve (LNR) of potential relevance to the assessment in the Coleorton to Kegworth area, which is of up to county/metropolitan value. This is New Lount LNR, which comprises 21ha of species-rich grassland, ponds (some of

[52] The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSI posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts. Those listed are where rail infrastructure triggers consultation with Natural England

53 Natural England (1983), Pasture and Asplin SSSI Citation. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001129.pdf

which are also within New Lount Local Nature Reserve Local Wildlife Site (LWS)), plantation woodland and scrub. All ponds have pondweed species and two of the ponds and grassland/scrub support Red Data Book[54] species. The LNR is north-west of Coleorton on the site of the former New Lount Colliery, and 335m east of the land required for the Proposed Scheme.

7.3.7 There are two Local Wildlife Sites (LWS) of potential relevance to the assessment in the Coleorton to Kegworth area, each of which is of county/metropolitan value. For this assessment, formally notified LWS have been included here, and habitats within potential and deferred LWS are described below under the relevant habitat and species subsections. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- New Lount Local Nature Reserve LWS, which covers an area of 1ha and is split into five areas. These areas are within the New Lount LNR. The LWS comprises four ponds with associated grassland and scrub habitat. The LWS is north-west of Coleorton and is 530m east of the land required for the Proposed Scheme; and
- Stocking Lane Lount Grassland LWS, which covers an area of 6ha and is designated for its neutral grassland. The LWS is south-west of Newbold and is 120m south-east of the land required for the Proposed Scheme.

7.3.8 There are five ancient woodland inventory sites (AWIS) of potential relevance to the assessment in the Coleorton to Kegworth area. Due to the habitats and species present, these sites are considered to be up to county/metropolitan value. They are:

- Rough Park AWIS, covering an area of 33ha, to the north-west of Coleorton. The AWIS is entirely a Plantation on Ancient Woodland Site (PAWS). The site lies adjacent to the land required for the Proposed Scheme, to the east;
- Lount Wood AWIS, covering an area of 13.5ha to the north-east of Ashby-de-la-Zouch. The AWIS is 363m west of the land required for the Proposed Scheme and is separated from the Proposed Scheme by the A42;
- Birch Coppice AWIS, covering an area of 7ha, is entirely a PAWS and is located west of Newbold. The AWIS lies adjacent to the land required for the Proposed Scheme;
- Breedon Cloud Wood AWIS, forming the western part of Breedon Cloud Wood and Quarry SSSI and covering an area of 32ha. The AWIS is 150m south of the land required for the Proposed Scheme; and
- Pasture/Asplin Woods AWIS, which covers a total area of 44ha. It comprises both ancient semi-natural woodland (31ha) and PAWS (13.4ha). The site includes the slightly smaller Pasture and Asplin Woods SSSI. It is recognised as

[54] The Red Data Book is produced by the International Union for Conservation of Nature (IUCN) which identifies the global conservation status of biological species with the Red List identifying those at risk of global extinction

one of the best examples of ash-hazel woodland in Leicestershire. The AWIS is adjacent to the land required for the Proposed Scheme.

7.3.9 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

7.3.10 The Coleorton to Kegworth area includes some of The National Forest. This is not a designated site but is a national initiative aiming to increase woodland cover to approximately one third of all land within its boundary, with new woodland linking ancient woodland, meadows, lakes, rivers and parks. There is a parcel of land within the land required for the Proposed Scheme that is part of an area set aside for future woodland planting within the National Forest.

Habitats

7.3.11 The following habitat types that occur in this area are relevant to the assessment.

Woodland

7.3.12 In addition to the woodlands within designated sites, there are 11 other areas of lowland deciduous woodland outside the designated sites (likely to qualify as habitats of principal importance[55], and local Biodiversity Action Plan (BAP)[56] habitats), which are within or partly within the land required for the Proposed Scheme. These are listed below:

- one woodland area to the east of the A42 that extends from an area north-west of Hall Farm northwards to link into woodland south of Smoile Farm;
- one woodland area to the east of the A42 leading into Rough Park and Birch Coppice;
- the Smoile, consisting of five woodland parcels including one to the west of Smoile Farm;
- a portion of an unnamed woodland 300m north-east of Smoile Farm;
- a linear area of woodland following the line of Boden Brook;
- Tonge Gorse, a broadleaved woodland adjacent to Diseworth Gorse to the south lying south-west of Belton; and
- Diseworth Gorse, a broadleaved woodland adjacent to the north of Tonge Gorse lying north-west of Belton.

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

7.3.14 An area of wood pasture and parkland habitat is indicated to the east of the A42 which covers Rough Park AWIS and Birch Coppice AWIS.

[55] Section 41 of the Natural Environment and Rural Communities Act (2006) (c.16). London, Her Majesty's Stationery Office
[56] Leicestershire County Council (2016), Space for Wildlife: Leicester, Leicestershire and Rutland Biodiversity Action Plan 2016-2026. Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2017/1/25/LLR_BAP_Space_for_Wildlife_2016-26_part_1.pdf

Grassland

7.3.15 Grasslands outside designated sites that occur within the land required for the Proposed Scheme include those that may qualify as a habitat of principal importance and local BAP habitat. This includes 1.2ha of semi-improved grassland 166m south of White House Fields Farm, 1ha of possible floodplain grazing marsh, which is located 2.5km north of Belton along Westmeadow Brook and 1.8ha of mesotrophic grassland at Long Whatton Meadow, immediately north of West End and west of the M1 motorway, all of which are within potential LWS. On a precautionary basis, pending the findings of field surveys (which may identify some of these as unimproved grasslands) these grasslands are considered to be of up to county/metropolitan value. Other grasslands are considered to be of up to district/borough value.

Existing baseline

Introduction

7.3.16 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area as known at this time.

7.3.17 Land required for, and adjacent to, the Proposed Scheme in the Coleorton to Kegworth area consists mainly of agricultural land, woodland, floodplain, villages and farmsteads. In much of the Coleorton to Kegworth area the Proposed Scheme would run parallel and close to the A42. The Proposed Scheme would cross Diseworth Brook and Boden Brook, which are part of the catchment for the River Trent and River Soar.

7.3.18 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA04 Map Book.

Designated sites

7.3.19 There are no internationally important sites relevant to the assessment in the Coleorton to Kegworth area.

7.3.20 There are three nationally important Sites of Special Scientific Interest (SSSI) that are relevant to the assessment in the Coleorton to Kegworth area. For each of these sites, the Proposed Scheme would be within the Impact Risk Zone[57] relevant to railway infrastructure as identified by Natural England. They are:

- Lount Meadows SSSI, which is made up of four SSSI units and covers a total area of 9.8ha. The site is designated for some of the best examples of slightly acidic neutral grassland in Leicestershire, representative of such grasslands in the English Midlands. SSSI units two, three and four are located north-east of Ashby-de-la-Zouch and unit one is located north of Ashby-de-la-Zouch. SSSI unit four, which is listed as 'area 3' on the SSSI citation, is located adjacent and immediately west of the land required for the Proposed Scheme. SSSI units two and three are located 75m west of the land required for the Proposed Scheme; and unit one is 790m west of the land required for the Proposed Scheme.

[57] The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSI posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts. Those listed are where rail infrastructure triggers consultation with Natural England.

- Breedon Cloud Wood and Quarry SSSI, which covers an area of 63ha and is designated for its ancient semi-natural woodland of a type that is now scarce in lowland Britain. The SSSI supports ground flora that is exceptionally diverse and includes several species, which are rare in Leicestershire. The SSSI is located north of Worthington, 18m east of the land required for the Proposed Scheme; and

- Pasture and Asplin Woods SSSI, which covers an area of 42ha and is designated for one of the best examples of ash-hazel woodland in Leicestershire. According to the citation, it is 'representative of ancient woodland developed on somewhat poorly drained clay soils in Central and Eastern England.'[58] The SSSI is north-west of Worthington and is adjacent to an area of land required for the Proposed Scheme, to be used for the purpose of woodland creation.

7.3.21 There is one local nature reserve (LNR) of potential relevance to the assessment in the Coleorton to Kegworth area, which is of up to county/metropolitan value. This is New Lount LNR, which comprises 21ha of species-rich grassland, ponds (some of which are also within New Lount Local Nature Reserve Local Wildlife Site (LWS)), plantation woodland and scrub. All ponds have pondweed species and two of the ponds and grassland/scrub support Red Data Book[59] species. The LNR is north-west of Coleorton on the site of the former New Lount Colliery, and 335m east of the land required for the Proposed Scheme.

7.3.22 There are two local wildlife ites (LWS) of potential relevance to the assessment in the Coleorton to Kegworth area, each of which is of county/metropolitan value. For this assessment, formally notified LWS have been included here, and habitats within potential4 and deferred LWS are described below under the relevant habitat and species subsections. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- New Lount Local Nature Reserve LWS, which covers an area of 1ha and is split into five areas. These areas are within the New Lount LNR. The LWS comprises four ponds with associated grassland and scrub habitat. The LWS is north-west of Coleorton and is 530m east of the land required for the Proposed Scheme; and

- Stocking Lane Lount Grassland LWS, which covers an area of 6ha and is designated for its neutral grassland. The LWS is south-west of Newbold and is 120m south-east of the land required for the Proposed Scheme.

[58] Natural England (1983), Pasture and Asplin SSSI Citation. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001129.pdf
[59] The Red Data Book is produced by the International Union for Conservation of Nature (IUCN) which identifies the global conservation status of biological species with the Red List identifying those at risk of global extinction

7.3.23 There are five ancient woodland inventory sites (AWIS) of potential relevance to the assessment in the Coleorton to Kegworth area. Due to the habitats and species present, these sites are considered to be up to county/metropolitan value. They are:

- Rough Park AWIS, covering an area of 33ha, to the north-west of Coleorton. The AWIS is entirely a Plantation on Ancient Woodland Site (PAWS). The site lies adjacent to the land required for the Proposed Scheme, to the east;
- Lount Wood AWIS, covering an area of 13.5ha to the north-east of Ashby-de-la-Zouch. The AWIS is 363m west of the land required for the Proposed Scheme and is separated from the Proposed Scheme by the A42;
- Birch Coppice AWIS, covering an area of 7ha, is entirely a PAWS and is located west of Newbold. The AWIS lies adjacent to the land required for the Proposed Scheme;
- Breedon Cloud Wood AWIS, forming the western part of Breedon Cloud Wood and Quarry SSSI and covering an area of 32ha. The AWIS is 150m south of the land required for the Proposed Scheme; and
- Pasture/Asplin Woods AWIS, which covers a total area of 44ha. It comprises both ancient semi-natural woodland (31ha) and PAWS (13.4ha). The site includes the slightly smaller Pasture and Asplin Woods SSSI. It is recognised as one of the best examples of ash-hazel woodland in Leicestershire. The AWIS is adjacent to the land required for the Proposed Scheme.

7.3.24 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

7.3.25 The Coleorton to Kegworth area includes some of The National Forest. This is not a designated site but is a national initiative aiming to increase woodland cover to approximately one third of all land within its boundary, with new woodland linking ancient woodland, meadows, lakes, rivers and parks. There is a parcel of land within the land required for the Proposed Scheme that is part of an area set aside for future woodland planting within the National Forest.

Habitats

7.3.26 The following habitat types that occur in this area are relevant to the assessment.

Hedgerows

7.3.27 Many of the hedgerows in the study area (including hedgerows within the land required for the Proposed Scheme) are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[60]. In addition, they could also provide commuting corridors and nesting and feeding habitats for wildlife. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

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

Watercourses

7.3.28 Boden Brook and Diseworth Brook, along with an additional 14 smaller watercourses, land drains and dry valleys, would be crossed by the Proposed Scheme. Sections of Long Whatton Brook and Westmeadow Brook are also within the land required for the Proposed Scheme. A minor watercourse, unnamed tributary 1 of Diseworth Brook, would cross over the Proposed Scheme on the Gelscoe aqueduct. Boden Brook, Diseworth Brook, Long Whatton Brook and Westmeadow Brook may support habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, Boden, Diseworth, Long Whatton and Westmeadow Brooks are considered to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value, pending confirmation through field surveys of their associated habitat context and water quality status.

Water bodies

7.3.29 There are 16 ponds that are located within, or partially within, the land required for the Proposed Scheme in the Coleorton to Kegworth area. Some may qualify as habitats of principal importance, or local BAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newt). On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

7.3.30 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within the land required for the Proposed Scheme. Information on ancient and veteran trees will be confirmed upon further survey and reported in the formal ES. On a precautionary basis, pending the findings of field surveys, these trees have been assumed to be of up to district/borough value in each case.

Protected and notable species

7.3.31 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 12.

Table 12*:* Species potentially relevant to the assessment within the Coleorton to Kegworth area

Resource/feature	Value	Rationale
Bats	Up to regional	There is suitable roosting and foraging habitat for bats in the Coleorton to Kegworth area. Common and soprano pipistrelle bats have been recorded in New Lount LNR[61]. There are records for brown long-eared and noctule bat between Breedon Cloud Wood and Quarry SSSI and the land required for the Proposed Scheme. There are also previous records for bats at Breedon Cloud Wood and Quarry SSSI of soprano pipistrelle, lesser noctule (more commonly referred to as Leisler's bat) and common pipistrelle. There is also a record for brown-long eared bat between Pasture and Asplin Woods SSSI and the land required for the Proposed Scheme. There are records for

[61] Leicestershire County Council (undated) *NatureSpot – New Lount.* Available online at: https://www.naturespot.org.uk/wild-place/new-lount

Resource/feature	Value	Rationale
		noctule, common pipistrelle and soprano pipistrelle in Pasture and Asplin Woods SSSI. Boden Brook, Westmeadow Brook, Long Whatton Brook and Diseworth Brook, as well as other watercourses, are likely to provide foraging and commuting habitat for bats. Woodland and hedgerows across the area, particularly vegetation linking into the ancient woodland of Rough Park, Birch Coppice, Pasture and Asplin Woods and riparian woodland associated with Westmeadow Brook are likely to provide foraging habitats and commuting routes for a range of bat species. Trees within these woodlands may have features that could support bat roosts.
Otter	County/metropolitan	Habitat suitable for otter is present along the watercourses and drainage ditches, and there are two records of their presence along Boden Brook within the land required for the Proposed Scheme. There are also records near Tonge, downstream of the land required for the Proposed Scheme, along Boden Brook and within the Long Whatton Brook catchment. Terrestrial habitat for otter is also present within the land required for the Proposed Scheme, including woodland, scrub and other dense vegetation.
Water vole	Up to county/metropolitan	Records from 2002/2003[62] identified water voles in only six significant colonies in Leicestershire and Rutland. Habitat suitable for water vole is present along the watercourses and drainage ditches within the land required for the Proposed Scheme, and there are records of their presence along the River Soar and its tributaries, which lie to the west of the Coleorton to Kegworth area. There is also a record from 2008 at Tonge pumping station, 1km north of the land required for the Proposed Scheme.
Polecat	Up to county/metropolitan	Habitat suitable for this species is present including hedgerows, farmland and woodland.
Great crested newt	Up to county/metropolitan	Ongoing surveys have recorded five ponds with positive environmental DNA (eDNA) records for great crested newt within the Coleorton to Kegworth area, including four ponds north of the A42, south-east of Tonge. These are outside the land required for the Proposed Scheme, the nearest being 150m to the north. There are 16 ponds within the land required for the Proposed Scheme. These ponds may have habitat suitable to support amphibians such as great crested newt. There are an additional 24 ponds within 250m of the land required for the Proposed Scheme, which may have habitat suitable to support amphibians, including great crested newt.

[62] Leicester, Leicestershire and Rutland Wildlife Trust (2010), Space for Wildlife: Leicester, Leicestershire and Rutland Biodiversity Action Plan 2010-2015. Available online at: http://www.lrwt.org.uk/media/uploads/miscellaneous/space_for_wildlife_2010-2015__2011_revision_.pdf

Resource/feature	Value	Rationale
Birds	County/metropolitan	Farmland and woodland provide suitable habitat for a range of both breeding and wintering birds. Schedule 1 species for which there are records within 1km of the land required for the Proposed Scheme include barn owl, kingfisher and peregrine. Wintering bird surveys in 2017/2018 recorded a total of 56 species within 250m of the land required for the Proposed Scheme including 13 red-listed Birds of Conservation Concern (BoCC) species and a further 12 amber-listed species. The red-list species include willow tit, a fast-declining species in the UK, in woodland east of Lount, and marsh tit to the west of Cloud Hill Quarry.
White-clawed crayfish	Up to county/metropolitan	Populations of white-clawed crayfish are rare in Leicestershire and are declining. Suitable habitat for white-clawed crayfish is likely to be present in watercourses including Boden Brook, Long Whatton Brook, Diseworth Brook and Westmeadow Brook within the land required for the Proposed Scheme.
Other aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates (other than white-clawed crayfish) is likely to be present in watercourses including Boden Brook, Long Whatton Brook, Diseworth Brook and Westmeadow Brook in addition to ponds found within the land required for the Proposed Scheme.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is likely to occur in areas of woodland, scrub, hedgerows and grassland. There are a number of records for dingy skipper butterfly in New Lount LNR, as well as brown and southern hawker dragonflies and common blue and azure damselflies.
Fish	Up to county/metropolitan	Suitable habitats for fish are present in watercourses including the Boden Brook, Long Whatton Brook and Diseworth Brook, along with an additional 14 smaller watercourses, land drains and dry valleys, which would be crossed by the Proposed Scheme. There are records in the river catchments that would be affected by the Proposed Scheme of spined loach and European bullhead (which are listed on Annex II of the Habitats Directive[63]), the latter associated with Westmeadow Brook and Long Whatton Brook. There are also records of European eel in the River Soar (2013) and brown trout in the Diseworth Brook catchment. Suitable habitat for coarse and salmonid fish species is likely to be present in the watercourses that would be crossed by or located near the land required for the Proposed Scheme.
Reptiles	Up to county/metropolitan	There are records of grass snake within 500m of the land required for the Proposed Scheme at New Lount LNR and there are records for slow worm, common lizard and adder close to New Lount LNR and south of Kegworth. Suitable habitat such as along the watercourses, as well as other areas such as grassland habitats, is likely to be present for

[63] Species for which sites can be designated under the Habitats Directive are listed on Annex II of the EU Habitats Directive

Resource/feature	Value	Rationale
		these species of reptile within and close to the land required for the Proposed Scheme.

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 (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigating the losses of habitat and effects on species:

- construction of viaducts over the Boden Brook and Diseworth Brook, which would avoid direct effects to these watercourses and allow free passage for wildlife beneath them including along the rivers and their banks;
- provision of 12.7ha of wetland habitat creation in the floodplain of Boden Brook, Westmeadow Brook, Diseworth Brook and Long Whatton Brook, which would help towards compensating for the loss of floodplain habitat and maintaining connectivity along the river corridors;
- a network of 89ha of new woodland planting (including landscape woodland planting) would contribute towards compensating for the losses of non-ancient woodland between the A42 and the Proposed Scheme, in the area to the west of Birch Coppice where there are also areas of scrub and secondary woodland, in the area of Tonge Gorse and Diseworth Gorse, and to enhance connectivity between remaining woodlands. The full extent of these areas will be reported in the formal ES;
- provision of new ponds in the Appleby Parva to Ashby-de-la-Zouch area (LA03) to the south, which would form part of the measures to address loss of water bodies and effects on great crested newt and other species in the Coleorton to Kegworth area. These ponds are described in Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch;
- provision of 18.9 km of new species-rich hedgerows, using appropriate native species, to contribute towards compensating for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the route of the Proposed Scheme; and
- provision of 32.9 ha of new grassland habitats, including species-rich grasslands and wetland habitat creation to contribute towards compensating for the losses as a result of the Proposed Scheme.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[64], which includes translocation of protected species where appropriate.

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

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

Assessment of impacts and effects

7.4.4 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. All assessments have been undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

Designated sites

7.4.5 Lount Meadows SSSI is split into three separate areas. 'Area 3' (SSSI unit four) is adjacent to the land required for the Proposed Scheme, next to Melbourne Road, which would be realigned. The SSSI would be protected throughout construction in line with implementation of measures within the draft CoCP. No hydrological or water quality effects are predicted for the SSSI (refer to Section 15, Water resources and flood risk). It is anticipated that potential indirect effects would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects. Therefore, no significant adverse direct or indirect effects on the integrity of the SSSI are expected.

7.4.6 Construction relating to Cloud Hill Quarry embankment No.1 and Cloud Hill Quarry embankment No.2 would be 20m from the boundary of Breedon Cloud Wood and

[64] Supporting document: Draft Code of Construction Practice

Quarry SSSI. The SSSI would be protected throughout construction in line with the draft CoCP. It is anticipated that potential indirect effects would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects. Therefore, no significant adverse direct or indirect effects on the integrity of the SSSI are expected.

7.4.7 Construction of Gelscoe cutting, which would be over 2km in length, could affect Pasture and Asplin Woods SSSI at its northern-most edge, which for a 230m length of the SSSI boundary is immediately adjacent to the land required for the Proposed Scheme. However, this area of the Proposed Scheme is to be used for the purpose of additional woodland planting, and construction work would be controlled through the implementation of measures in the draft CoCP. It is anticipated that potential indirect effects would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects. Therefore, no significant adverse direct or indirect effects on the integrity of the SSSI are anticipated.

Habitats

Woodland

7.4.8 Construction of the Proposed Scheme would result in the loss of 22ha of broadleaved woodland outside of designated sites. This would include the partial loss of areas of woodland west of Rough Park and Birch Coppice, the total loss of The Smoile, woodland to the north of Smoile Farm and Tonge Gorse and partial loss of Diseworth Gorse, and the unnamed wood and tree line along Boden Brook. Habitat loss also includes woodland within an area of possible parkland and wood pasture which is currently being assessed as part of ongoing surveys. This loss would be an effect significant at up to the county/metropolitan level. The proposed planting of woodland would help compensate for loss of woodland and would reduce the residual effect (following establishment of new woodland) to a level that is not significant. However, if the ongoing review identifies the presence of additional ancient woodland, the residual adverse effect would be significant at up to the county/metropolitan level.

Grassland

7.4.9 Construction of the Proposed Scheme would result in the loss of grasslands and this includes 4ha of grassland outside designated sites that may be a habitat of principal importance or BAP habitat, including possible floodplain grazing marsh and grassland within potential LWS. Creation of new grasslands would provide compensation for this habitat loss and the residual effect would be reduced to not significant.

Hedgerows

7.4.10 The Proposed Scheme would cross hedgerows within the Coleorton to Kegworth area, some of which may be 'important' hedgerows[65]. The land required for the Proposed Scheme would result in the permanent loss of 44km of hedgerows and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The Proposed Scheme would include new hedgerow planting, which would help mitigate losses. Further hedgerow planting will be proposed as part

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

of the design development. In the absence of this additional mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.11 The Proposed Scheme would cross Boden Brook and Diseworth Brook on viaducts. These and construction of Diseworth south embankment adjacent to Westmeadow Brook and Long Whatton Brook would require temporary working within flood zones (refer to Section 15, Water resources and flood risk). The watercourses would not be directly affected, and indirect effects would be unlikely to produce a significant effect as they would be controlled through the implementation of measures in the draft CoCP. Once constructed, the viaducts would shade the brooks immediately below, but the likely effects of shading are not considered to be significant because the affected areas would be very small in comparison with the length of the watercourses.

7.4.12 The Proposed Scheme would require the realignment of a 75m length of unnamed tributary 1 of Diseworth Brook over Gelscoe aqueduct. This is a minor watercourse as described in the baseline section.

7.4.13 The Proposed Scheme would result in the loss of sections of watercourses and severance of river corridors due to culverts, including unnamed tributary of Boden Brook; unnamed tributary 1 of Diseworth Brook; unnamed tributaries 1 and 2 of Westmeadow Brook; and an unnamed tributary of the River Soar. This would result in a permanent effect that would be significant at up to the district/borough level.

Water bodies

7.4.14 It is expected that 16 ponds within the land required for the Proposed Scheme would be lost during construction. The loss of these ponds would result in an impact that would be significant at up to county/metropolitan level, particularly if it is confirmed through field surveys that they support great crested newts or other priority species.

Ancient and veteran trees

7.4.15 It is assumed that ancient and veteran trees within the land required for the Proposed Scheme in the Coleorton to Kegworth area would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at district/borough level in each case.

Species

Bats

7.4.16 At least five species of bat have been recorded in the Coleorton to Kegworth area. The demolition of buildings/structures and the permanent removal of vegetation may have impacts on bats. Habitat loss would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. Areas of woodland that would be lost would include parts of woodland west of Rough Park and Birch Coppice, and the entirety of The Smoile and Tonge Gorse and the partial loss of woodland north of Smoile Farm and Diseworth Gorse. The Proposed Scheme would result in the loss and/or severance of hedgerows and riparian

vegetation along watercourses, potentially affecting foraging and commuting routes. This could affect breeding populations of bat species within the Coleorton to Kegworth area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP.

7.4.17 The proposed woodland, grassland and hedgerow planting would help to reduce impacts to bats and further mitigation will be identified following ongoing surveys and assessment. On a precautionary basis, in the absence of further survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of bat populations that would be significant at up to the regional level.

Otter

7.4.18 Aquatic and terrestrial habitat suitable for otter is present along Boden Brook, Westmeadow Brook, Diseworth Brook and Long Whatton Brook in the Coleorton to Kegworth area, and there are records of otter along Boden Brook. Temporary habitat loss would occur due to the construction of the proposed viaducts over Boden Brook and Diseworth Brook. Indirect effects from construction activities may result in disturbance to these species during the construction period and prevent them from moving along the watercourses. However, it is anticipated that these indirect effects would be controlled through measures described in the draft CoCP. Habitat loss would occur along several smaller watercourses, land drains and dry valleys that would be crossed by the Proposed Scheme. On a precautionary basis, in the absence of survey information, impacts to otter would result in an adverse effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Water vole

7.4.19 Habitat suitable for water vole is present along Boden Brook, Westmeadow Brook, Diseworth Brook and Long Whatton Brook in the Coleorton to Kegworth area. The proposed viaducts over Boden Brook and Diseworth Brook would avoid significant loss of habitat along the river corridors. Indirect effects from construction activities may result in disturbance to water vole during the construction period, and prevent them from moving along watercourses. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would occur on several smaller watercourses, land drains and dry valleys crossed by the Proposed Scheme. On a precautionary basis, in the absence of survey information, impacts to water vole would result in an adverse effect on the conservation status of these species that would be significant at up to the county/metropolitan level.

Polecat

7.4.20 The loss of habitats such as grassland and arable land could affect polecat if surveys show this species to be present. Should polecat be discovered during surveys, the effects of habitat loss on this species would be significant at up to the county/metropolitan level.

Great crested newt

7.4.21 None of the four ponds that have had positive eDNA test results for great crested newt would be lost as they are outside of the land required for the Proposed Scheme,

and these ponds and surrounding habitats are already separated from the land required for the Proposed Scheme by the A42.

7.4.22 Five of the 16 ponds within the land required for the Proposed Scheme have been assessed as unsuitable for great crested newt. There are a further 11 ponds that are subject to ongoing surveys, and in the absence of a full survey for great crested newt in the Coleorton to Kegworth area, it has been assumed that these 11 ponds (and surrounding terrestrial habitat) within the land required for the Proposed Scheme may support great crested newt, and would be lost during construction.

7.4.23 The loss of ponds supporting great crested newt and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newt across this area. Where great crested newt is present, two new ponds would be created for every pond lost to the permanent works, and this would contribute towards reducing the effects to not significant. This also applies to any pond with great crested newt lost outside the area required for permanent works but within the land required for the Proposed Scheme. Suitable terrestrial habitat would be required around all new ponds created, along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat). In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newt that would be significant at up to the county/metropolitan level.

Birds

7.4.24 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These include barn owl and willow tit. Barn owl is a Schedule 1 species which has been recorded within 500m of land required for the Proposed Scheme, north of Pasture and Asplin Woods SSSI. Willow tit has been recorded in woodland east of Lount, within 100m of the land required for the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.25 The land required for the Proposed Scheme would result in loss of habitat potentially suitable for white-clawed crayfish including along Boden Brook, Westmeadow Brook, Diseworth Brook and Long Whatton Brook. Although the presence of this species in these watercourses is considered unlikely, on a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

7.4.26 The land required for the Proposed Scheme would result in loss of habitat potentially suitable for aquatic invertebrates other than white-clawed crayfish (potentially including species of principal importance). On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

Terrestrial invertebrates

7.4.27 The land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates. On a precautionary basis, in the absence of survey information, it has been assumed that Proposed Scheme would result in a permanent adverse effect that would be significant up to district/borough level.

Fish

7.4.28 There are records of fish from the main watercourses including European bullhead and spined loach (both listed on Annex II of the EC Habitats Directive), European eel and brown trout in the wider catchment. Significant effects from habitat loss would be avoided by the Proposed Scheme passing over Boden Brook and Diseworth Brook on viaducts. Indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, 14 other smaller watercourses would be affected by habitat loss and fragmentation. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

Reptiles

7.4.29 There are records of reptiles within 2km of the land required for the Proposed Scheme including grass snake within New Lount LNR, and common lizard, adder and slow worm in grassland and scrub habitats near to the LNR and directly south of Kegworth. On a precautionary basis, in the absence of survey information, it has been assumed that the land required for the Proposed Scheme would result in a permanent adverse effect on these species that would be significant at up to the county/metropolitan level.

7.4.30 Effects on other habitats and species that would be significant at the local/parish level during construction will be reported in the formal ES.

7.4.31 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered where appropriate. These effects will be reported in the formal ES.

Other mitigation measures

7.4.32 Further measures currently being considered, but which are not yet part of the design and which will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:

- provision of additional broadleaved woodland to replace (non-ancient) woodland habitat lost, and/or enhancement of remaining woodlands;
- options to modify construction areas locally to reduce impacts to LWS, other sites and priority habitats;
- provision of additional hedgerows, which would compensate for the losses and maintain the connectivity of the network;
- options to create new species-rich grasslands (including translocation where appropriate) and grassland within wetland habitat creation areas to

compensate for grassland losses including the floodplain grazing marsh habitat along Westmeadow Brook, and to compensate for loss of good quality semi-improved grassland;

- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.33 Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders.

Summary of likely residual significant effects

7.4.34 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 13.

Table 13: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Woodland	Permanent adverse effect on woodland that may be a habitat of principal importance and potential adverse effect on unidentified ancient woodland. New woodland planting is included in the Proposed Scheme design.	Up to county/metropolitan
Hedgerows	Permanent loss of 44km[66] of hedgerows and fragmentation of hedgerow network.	Up to district/borough
Watercourses	Permanent adverse effect from loss and fragmentation of minor watercourses.	Up to district/borough
Water bodies	Potential adverse effects through permanent loss of ponds and	Up to county/metropolitan

[66] This figure will be refined in the formal ES

Resource/feature	Residual effect	Level at which the effect would be significant
	associated habitat. New water bodies are included in scheme design to address losses.	
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees.	District/borough (in each case)
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Potential permanent adverse effect on conservation status due to loss of aquatic and terrestrial habitat in the form of resting sites and foraging habitat.	Up to county/metropolitan.
Water vole	Potential adverse effect on conservation status due to loss and fragmentation of habitat along watercourses.	Up to county/metropolitan.
Polecat	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan.
Great crested newt	Loss of 11 ponds and surrounding terrestrial habitat which may support great crested newt.	Up to county/metropolitan.
Birds	Potential permanent adverse effect on conservation status due to loss, fragmentation and/or severance of habitat for nesting and feeding.	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat and severance.	Up to county/metropolitan
Aquatic invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level
Fish	Potential permanent adverse effect on conservation status due to loss of habitat along watercourses.	Up to county/metropolitan

Resource/feature	Residual effect	Level at which the effect would be significant
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan

7.5 Effects arising during operation

Avoidance and mitigation measures

7.5.1 There are no specific measures currently identified to avoid or mitigate ecological effects during operation of the Proposed Scheme within this section of the route.

Assessment of impacts and effects

7.5.2 This section considers the impacts and effects on ecological features during operation of the Proposed Scheme. All assessments are based on a precautionary basis, in the absence of survey information.

7.5.3 Bats are at risk of being struck by trains or possibly harmed by turbulence, particularly at frequently used commuting/foraging routes that would be crossed by the Proposed Scheme. This represents a potential permanent adverse effect on conservation status of the bat species concerned that would be significant at up to the county/metropolitan level.

7.5.4 Barn owls are at risk of colliding with trains, particularly near Westmeadow Brook, Boden Brook and Diseworth Brook, where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

7.5.5 Effects on other habitats and species likely to be significant at the local/parish level during operation will be assessed and reported in the formal ES.

Other mitigation measures

7.5.6 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[67] which has been developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with landowners; and
- structures to reduce mortality to bats.

[67] Currently in development for Phase One of HS2

Summary of likely residual significant effects

7.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 14.

Table 14: Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains.	Up to regional
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

Monitoring

7.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

7.5.9 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Coleorton to Kegworth area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Coleorton to Kegworth area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies is underway, including with Public Health England (PHE), Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Coleorton to Kegworth area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA04 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)[68].

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

8.2.4 The health determinants of relevance within the Coleorton to Kegworth area are:

- for impacts during construction (temporary and permanent):
  - neighbourhood quality;

[68] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

  - access to services, health and social care;
  - access to green space, recreation and physical activity; and
  - social capital[69].
- for impacts during operation (permanent):
  - neighbourhood quality.

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

8.2.6 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a concise review of the key literature and included in the formal ES. The evidence varies in its strength; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.7 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.2.8 Potential health effects have been identified based on information that is available at this stage of the assessment. A full assessment of health effects, applying the assessment criteria set out in the SMR, will be provided in the formal ES.

8.3 Environmental baseline

Existing baseline

Description of communities in the Coleorton to Kegworth area

8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below, including those settlements that are situated within 1km of the route of the Proposed Scheme. A description of community facilities is provided in Section 6, Community.

[69] The connections between the individuals within communities, and the inclination that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to tangibly support each other

8.3.2 The route of the Proposed Scheme would mainly run through rural areas comprising agricultural landscapes, with woodland, villages, and some isolated dwellings and farmsteads. The route of the Proposed Scheme would pass close to the settlements of Lount, Newbold Coleorton, Worthington, Breedon on the Hill, Diseworth, Long Whatton and Kegworth.

Lount, Newbold Coleorton and surrounds

8.3.3 The village of Lount is located to the west of the route of the Proposed Scheme. The nearest residential properties within Lount and Newbold would be within the land required for the Proposed Scheme. The village of Lount is bounded to the west and south by forest and to the north by agricultural land. Lount is connected to Newbold Coleorton (also known as Newbold) by Melbourne Road, which passes under the A42. Newbold lies to the north-west of the larger villages of Coleorton, Gelsmore and Thringstone. Together, Lount and Newbold Coleorton comprise approximately 400 residential properties.

8.3.4 Within Lount, the community resources include the Ferrers Arms public house and Ashby Moto Park off-road motorbike practice track. There are also areas of recreational open space within the village, including a children's play area.

8.3.5 Within Newbold, the community resources include Newbold Primary School and the Cross Keys Inn public house. In addition, the Community Education Enterprise Project (CEEP) has their Community Enterprise Centre located at Hall Farm, which would be located approximately 300m east of the route of the Proposed Scheme. There is also an allotment garden located on Worthington Lane and a children's playground and playing field to the south of Ashby Road. Other facilities within the surrounding area include parks, recreational facilities, including the outdoor activity centre Field Sport UK, and woodlands, including New Lount Local Nature Reserve, and Rough Park and Birch Coppice.

Worthington and surrounds

8.3.6 Worthington is a village of approximately 300 residential properties located approximately 1km north of Newbold. The nearest residential properties would be situated approximately 600m east of the route of the Proposed Scheme. This area also includes several scattered residential properties; some of which are situated adjacent to the route of the Proposed Scheme. Worthington is surrounded by agricultural land on all sides.

8.3.7 Community resources within Worthington include a shop, which serves as a post office and general store, places of worship (Worthington Methodist Church and St Matthew's Worthington), Worthington Primary School and a public house (the Malt Shovel).

Breedon on the Hill and surrounds

8.3.8 This area includes the villages of Breedon on the Hill and Tonge which together comprise approximately 500 residential properties. Breedon on the Hill is a village situated approximately 800m north of the route of the Proposed Scheme. Breedon on the Hill and Tonge are connected by Tonge Lane and sit within open, agricultural land including several scattered residential properties.

8.3.9 Community resources in Breedon on the Hill include St Hardulph's Primary School. The area also includes Breedon Cloud Wood Ancient and Semi-Natural Woodland, an area of publicly accessible open space which is adjacent to the route of the Proposed Scheme.

Diseworth, Long Whatton, Kegworth and surrounds

8.3.10 Diseworth is located west of the route of the Proposed Scheme and Long Whatton is located east of the route of the Proposed Scheme, and together these villages comprise approximately 800 residential properties. Diseworth and Long Whatton are connected via The Green. The nearest residential properties would be located approximately 250m north-west of the route of the Proposed Scheme. The village of Kegworth comprises approximately 1,600 residential properties, the nearest of which would be located approximately 50m east of the route of the Proposed Scheme.

8.3.11 Community resources within the area of Diseworth and Long Whatton include the Old Boot Garden and Cottages bed and breakfast and Long Whatton Cricket Club. In addition, the area offers several community resources located outside of the study area including a community hall, a primary school, places of worship, public houses, a guest house and a heritage centre. Within the village of Kegworth, there are many community resources including Kegworth Museum, Kegworth Library, Orchard Surgery, several shops, public houses and restaurants. There are also a number of educational facilities such as the Kegworth Village Hall Pre-School and Kegworth Primary School, and places of worship including Kegworth Parish Church St. Andrews, Kegworth Baptist Church, St Andrews Church and Kegworth Methodist Church. The village also contains sport facilities, children's play parks, recreational fields and allotment gardens.

Demographic and health profile of the Coleorton to Kegworth area

8.3.12 Local communities potentially affected by the Proposed Scheme in the Coleorton to Kegworth area have a relatively low population density, commensurate with the rural nature of the area.

8.3.13 Data provided by the Office of National Statistics (ONS)[70] show that this population has a broadly similar health status to the national (England) averages.

8.3.14 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[71] and the health domain (a sub-set of the indices of multiple deprivation). The area as a whole is considered to be more resilient than the national average with regard to changes in relevant health determinants, and with few vulnerabilities in terms of the health status of the population.

8.3.15 The available data provide detail down to ward level and enable a profile to be made of the population within the Coleorton to Kegworth area. The description of the whole population, and the populations within wards, does not exclude the possibility that

[70] The ONS provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area
[71] Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. As far as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, insofar as reasonably practicable;
- reducing visual intrusion and noise, insofar as reasonably practicable;
- incorporating landscape design and screening into the design; and
- permanent realignment and diversion of a number of public rights of way (PRoW) and roads to maintain access (see Section 14, Traffic and transport for further detail).

8.4.2 The locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable.

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[72], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.

8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

8.4.6 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd would include:

[72] Supporting document: Draft Code of Construction Practice

- improving or altering the remaining portion of the community facility;
- improving other existing community facilities in the area that could reduce the effect;
- improving accessibility to other community facilities; and/or
- identifying land owned by the relevant local authority that could be brought into use as a community facility with its agreement.

Assessment of impacts and effects

Neighbourhood quality

8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels of satisfaction with their living environment may change. In turn, this could affect mental wellbeing or behaviours such as the use of outside space.

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGVs). These will be assessed in the relevant sections of the ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.

8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Coleorton to Kegworth area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme may have temporary and permanent[73] impacts on neighbourhood quality in areas close to construction sites, including those at Lount, Newbold and surrounds, Worthington, Breedon on the Hill, Tonge, Diseworth, Long Whatton, and Kegworth. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. It is currently anticipated that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

8.4.14 Traffic and transport impacts in the Coleorton to Kegworth area may include:

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

8.4.15 Construction traffic, including HGVs, may be present on a number of roads in the area, as listed in Section 14, Traffic and transport.

8.4.16 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments over man-made environments, and that exposure to views of natural environments is associated with increased wellbeing.

8.4.17 Settlements in the Coleorton to Kegworth area include the rural villages of Lount, Newbold, Worthington, Breedon on the Hill, Diseworth, Long Whatton, Kegworth, and the hamlet of Tonge. Construction activities and permanent structures would be visible from a number of locations due to the scale of the Proposed Scheme. Section 11, Landscape and visual, identifies locations that may experience changes to existing views, including country roads, PRoW and views from properties close to the Proposed Scheme. Changes to views of the rural landscape may have negative impacts on residents' perceptions of the quality and character of their local environment, leading to a reduction in wellbeing.

[73] The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months – 2 years), and long term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

8.4.18 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality. This will be assessed in the formal ES.

Access to services, health and social care

8.4.19 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also weak to moderate evidence to suggest that transport problems are a key barrier to people's ability to access these services. There is moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

8.4.20 The Coleorton to Kegworth area is predominantly rural in character. Typically, there is a reliance on shops and services in nearby towns and villages. Opportunities to access alternative services and facilities are limited, resulting in the necessity to travel longer distances to access alternative facilities. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be reported and assessed in the formal ES.

Access to green space, recreation and physical activity

8.4.21 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.22 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:

- impacts of construction traffic, including HGVs, on pedestrians and cyclists;
- any loss of green space or facility used for physical activity; and
- the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.

8.4.23 The route of the Proposed Scheme would intersect a number of PRoW in the Coleorton to Kegworth area. The effects on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be reported in the formal ES.

8.4.24 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme. Some construction traffic, however, including HGVs, would be present on a number of roads in this area, as outlined in Section 14, Traffic and transport. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. In the case of recreational users, it is considered that alternative routes are likely to be available in most cases, and therefore that impacts on the affected roads would not reduce overall levels of recreational non-motorised users. For those using affected routes for active travel to work or to access shops and services, there is the possibility

that people would choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

8.4.25 Land required for the construction of Lount embankment would result in the temporary loss of approximately 25% of Rough Park and Birch Coppice for a period of approximately three years and five months, and the permanent loss of approximately 17% of Rough Park and Birch Coppice. The site provides natural and semi-natural green space that is publicly accessible via a footpath and permissive bridleway, which run through the woodland. Access to Rough Park and Birch Coppice makes a positive contribution to the local community through the provision of an area for passive recreation and physical activity, and access to green space. The temporary loss of access to 25% of the woodland would have an adverse effect on health and wellbeing. However, the permanent loss of only 17% of the woodland would not result in an adverse health and wellbeing effect for users, given the small area of space lost compared to the overall quantum remaining.

Social capital

8.4.26 The connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. The Office for National Statistics defines social capital as follows:

'In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust.'[74]

8.4.27 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.28 Settlements in the Coleorton to Kegworth area support small, well-established communities. The size of the temporary construction workforce would be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including satellite compounds in the vicinity of the settlements of Lount, Worthington, Tonge, Breedon on the Hill, Long Whatton, Diseworth and Kegworth. The duration of the works at each site would range from approximately one to four years. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using facilities within local settlements,

[74] Office for National Statistics- Measuring Social Capital: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

particularly Lount, Worthington, Tonge, Breedon on the Hill, Long Whatton, Diseworth and Kegworth.

8.4.29 The introduction of a temporary construction workforce into communities has the potential to alter people's perceptions and interactions within their communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

8.4.30 The draft CoCP[75] includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.31 The Community section of the ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

8.4.32 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its characteristics. Therefore, not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.33 Within Lount, Newbold Coleorton and surrounds, four residential properties would be demolished as a result of the construction of Melbourne Road underbridge and Melbourne Road realignment. However, the demolition of these properties would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.34 Approximately 600m west of Worthington, two residential properties would be demolished as a result of the construction of Worthington cutting. However, the demolition of these properties would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.35 North of Worthington, one residential property would be demolished as a result of the construction of Worthington cutting. However, the demolition of this property would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

[75] HS2 Ltd, (2017), *HS2 Phase 2b Draft Code of Construction Practice*. A draft CoCP has been prepared. It will remain a draft document through the parliamentary process and will be finalised at Royal Assent. The CoCP sets out measures to be implemented by the nominated undertaker

8.4.36 Approximately 1.5km south-east of Tonge, one residential property would be demolished as a result of the construction of Gelscoe cutting. However, the demolition of this property would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.37 In the Coleorton to Kegworth area, one residential property would be demolished as a result of the construction of Kegworth cutting. However, the demolition of this property would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.38 Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.39 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities. Potential health and well-being effects will be reported in the formal ES.

Other mitigation measures

8.4.40 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.

8.4.41 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

8.4.42 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential adverse effects identified in this assessment. Any other mitigation measures will be described in the formal ES.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Coleorton to Kegworth area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

8.5.4 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

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

9.1.2 Engagement has been undertaken with Historic England, Leicestershire County Council (LeCC) and North West Leicestershire District Council (NWLDC). The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book. Only designated heritage assets within the Coleorton to Kegworth area are shown on maps CT-10-359b to CT-10-364a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed MLE). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[76], including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

[76] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m or 500m study area.

9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.

9.2.5 The historic environment methodology includes consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.

9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage significance of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. However, although the following assets are within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant:

- Tamworth to Sawley Roman road (MLE20490);
- Turnpike Road, Hinckley to Tonge, Ibstock to Measham (MLE20915);
- Midland Railway, Ashby to Derby line (MLE16085); and
- Turnpike Road, 'London to Manchester Road' (Loughborough to Derby) (MLE20650).

9.2.9 With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

9.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

9.2.11 In undertaking the assessment, the following limitations were identified and assumptions made:

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;

- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data were collated from a variety of sources in compiling this assessment, including:

- the NHLE (Historic England register of designated heritage assets);
- Leicestershire and Rutland historic environment record;
- conservation area appraisals; and
- historic maps and aerial photography.

9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

9.3.3 There are no designated heritage assets located partially or wholly within the land required for the Proposed Scheme.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study area:

- eight scheduled monuments: Coal mining remains at Birch Coppice and Rough Park, 950m and 1.5km south of Smoile Farm (NHLE 1018462), Coal mining remains in Lount Wood (NHLE 1018465), Coal mining remains 600m south-west of Smoile Farm (NHLE 1018463), Lock up known as The Round House (NHLE 1019307),The Bulwarks (earthworks) (NHLE 1018465, part of the Breedon on the Hill Conservation Area), Moated site with fishpond and flood banks at Long Whatton (NHLE 1008551) and Moated site with fishpond at Long Whatton (NHLE 1008550, both part of the Long Whatton Conservation Area) and Medieval settlement remains immediately east of The Wymeshead (NHLE 1018359), all of high value;
- three Grade I listed buildings: Staunton Harold Hall (NHLE 1177552), Chapel of the Holy Trinity, Staunton Harold (NHLE 1074386), Church of St. Mary and St. Hardulph, Breedon-on-the-Hill (NHLE 1361364, part of the Breedon on the Hill Conservation Area), all of high value;
- eleven Grade II* listed buildings: Church of St. Mary, Coleorton (NHLE 1073571), Grotto and Pool south-east of Coleorton Hall (NHLE 1067353), Coleorton Hall (NHLE 1361611), Gateway to Garden (NHLE 1074346), The Golden Gates and Bridge (NHLE 1074347), Church of St. Matthew, Worthington (NHLE 1361236), Langley Priory and attached railings (NHLE 1083563), Church of St. John the Baptist, Belton (NHLE 1074123), Church of St.

Michael, Diseworth (NHLE 1068865, part of Diseworth Conservation Area), Church of All Saints, Long Whatton (NHLE 1064262, part of Long Whatton Conservation Area) and Church of St. Andrew, Kegworth (NHLE 1084364), all of high value;

- one hundred and twenty-four Grade II listed buildings, including eight buildings within Grade II* Coleorton Hall Registered Park and Garden (NHLE 1000959), five buildings within Grade II* Staunton Harold Registered Park and Garden (NHLE 1000493), 12 buildings within Breedon Hill Conservation Area, five within Tonge Conservation Area, 21 buildings within Diseworth Conservation Area, 15 buildings within Long Whatton Conservation Area, 12 farmhouses, and 46 other domestic, rural, commercial and industrial buildings, all of moderate value;
- two Grade II* registered park and gardens: Coleorton Hall (NHLE 1000959) and Staunton Harold Hall (NHLE 1000493), of high value;
- one Grade II registered park and garden: Whatton House (NHLE 1000968), of moderate value;
- six conservation areas: Coleorton Hall and Staunton Harold Hall, both of high value, Breedon on the Hill, Tonge, Diseworth, and Long Whatton, of moderate value; and
- one proposed conservation area (2018): Kegworth, of moderate value.

Non-designated assets

9.3.5 One non-designated heritage asset of high value is located partially or wholly within the land required for the Proposed Scheme: medieval moated lodge north-west of Breedon Lodge (MLE4416).

9.3.6 The following non-designated assets of moderate value lie wholly or partially within the land required for the Proposed Scheme:

- Breedon Park (MLE4417);
- Tamworth to Sawley Roman road (MLE20490); and
- Moated site, High Woods, Diseworth (MLE4733).

9.3.7 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:

- three buildings at Newbold Gate;
- Turnpike Road, Hinckley to Tonge, Ibstock to Measham (MLE20915);
- Midland Railway, Ashby to Derby line (MLE16085);
- Coleorton wagonway (MLE4892);

- Cloud Hill Plateway[77] (MLE18778);
- Post-medieval lime kilns near Lount (MLE16189);
- Smoile Farm and associated outbuildings;
- Basildon Lodge;
- Lodge Farm and associated outbuildings;
- White House Fields Farm and associate outbuilding;
- site of post-medieval finds and features from Cloud Hill Quarry potentially removed by quarry activities (MLE10515);
- site of post-medieval field boundary at Cloud Hill Quarry potentially removed by quarry activities (MLE10517);
- Gelscoe Lodge Farm and associated outbuilding;
- Cropmark north-east of Long Mere Farm (MLE17145);
- Mole Hill Farm;
- Possible enclosure north-west of the computer centre (MLE22568);
- Turnpike Road, 'London to Manchester Road' (Loughborough to Derby) (MLE20650);
- Ring ditch, Fulcrum Site Field 17 (MLE9703); and
- Various features east of junction 24 (M1) (MLE16585).

9.3.8 Non-designated heritage assets located partially or wholly within the 500m study area include:

- eight assets of moderate value, including evidence for prehistoric, Iron Age and Romano-British occupation, and medieval coal mining remains; and
- twenty-two assets of low value, including cropmarks of unknown date, the location of post-medieval windmills, and 19th century mineral extraction remains and infrastructure.

Historic environment overview

9.3.9 The identification of a pre-Anglian river channel known as the Bytham River has enhanced the understanding of Palaeolithic activity in the East Midlands. The majority of Paleolithic finds have been discovered in Bytham Deposits or Brooksby deposits which underlie Bytham deposits. There is limited evidence for early prehistoric activity within the 2km study area. Evidence is focussed on the discovery of worked stone of later dates. For example, on higher ground above the River Soar, 1km east of the land required for the Proposed Scheme, two Mesolithic flints (microliths) have been recovered from land to the south of Kegworth. In addition, a scatter of prehistoric

[77] A track consisting of flanged strips used in early colliery railways

worked flint, a scraper and a possible core from Belton along with an undated prehistoric flint core from north-west of King Street Plantation, 600m west of the land required for the Proposed Scheme, have been retrieved.

9.3.10 The diversity of the geography of the East Midlands is reflected in the archaeology of Neolithic communities which employed a range of techniques designed to exploit the landscape. Finds such as Neolithic ceramics, lithic scatters and causewayed enclosures have been identified across the region. Neolithic axes have been found 400m west of the land required for the Proposed Scheme at Staunton Harold, and at St Hardulph's School, Breedon on the Hill, 1km north-west of the land required for the Proposed Scheme. A fragment of a Neolithic polished stone axe has been found at Diseworth, 1.5km west of the land required for the Proposed Scheme. The higher ground of Breedon on the Hill has been the focus of settlement activity since the early prehistoric period with Neolithic pits and ditches revealed within trial trenching as part of the Cloud Hill Quarry extension.

9.3.11 Pottery with an Early Bronze Age date has been found in several locations across the region, however little has been discovered in terms of evidence of settlement. Although relatively rare there is some evidence which may be attributed to the Late Bronze Age with sites at Glen Parva, Kirby Muxloe, Melton Mowbray, Eye Kettleby and Ridlington in Rutland. No evidence has been attributed a Bronze Age date within the study area.

9.3.12 The continuity of prehistoric activity around Breedon on the Hill is confirmed by the large Iron Age hillfort known as The Bulwark (NHLE 1018465). Hillforts were a focal point for Iron Age communities within the landscape. There were at least two phases of fortification and Iron Age occupation on the site before its construction. The hillfort, which was originally 9.5 hectares in size, has been reduced by quarrying since the late 19th century. This has revealed extensive occupation of the fort and evidence for its continuity into the late Iron Age and Romano-British period.

9.3.13 Beyond the hillfort, there is evidence within the study area for late prehistoric rural settlement. A late prehistoric saddle quern[78] with Roman pottery was discovered 1km east of the land required for the Proposed Scheme, during fieldwalking in Belton, south of Top Merril Grange. To the south of Kegworth, 650m east of the land required for the Proposed Scheme, a square enclosure with associated pits was investigated. The site is interpreted as an Iron Age farmstead.

9.3.14 Cropmarks of a small square enclosure and a linear feature running roughly north to south are visible north-east of Merril Grange, 600m east of the land required for the Proposed Scheme. A possible sub-circular enclosure is also visible on aerial photographs to the north-east of Long Mere Farm, Long Whatton and Diseworth, 150m east of the land required for the Proposed Scheme. A cropmark of a rectangular enclosure was noted from aerial photos, partially obscured by New Wood, 500m west of the land required for the Proposed Scheme. These cropmark enclosures are interpreted as potentially prehistoric in date from their morphology. The distribution

[78] A saddle quern comprises a flat stone bed with a rounded stone which is operated manually against it. The querns were generally used for the grinding of corn. They replaced by rotary querns in the Roman Period

and form of the cropmarks listed above indicate possible areas of settlement and agricultural activities during the Iron Age.

9.3.15 On land adjacent to the M1 in Kegworth, a geophysical survey has recorded potential pit-like features, ditch sections and circular gully features that may form an enclosure indicative of late prehistoric activity.

9.3.16 Three of Roman Britain's most important roads, Watling Street, Fosse Way and Ermine Street pass through Leicestershire. Leicester itself was one of two major urban settlements in the East Midlands and there is evidence for at least 12 Roman small towns across Leicestershire. Pottery, tile production and metal working are the two most archaeologically visible Roman industries within Leicestershire. In addition to the Romano-British activity recorded at Breedon on the Hill there is a Roman site at Ladygate Farm, Diseworth, 250m west of the land required for the Proposed Scheme. The site is located on higher ground between Diseworth Brook and Westmeadow Brook. The activity is defined by a dispersed spread of coins and pottery. The coins date from the 1st century BC to 2nd century AD and the pottery ranged from mid-2nd century AD to 4th century AD. Further Romano-British activity is indicated by Late Iron Age and Roman pottery west of Long Whatton, 600m west of the land required for the Proposed Scheme.

9.3.17 At the northern end of the study area, Roman pottery has been retrieved from the higher ground to the west of the River Soar, south of Kegworth. The postulated line of a Roman road west of Kegworth at King Street Plantation is inferred through historical placename evidence and a relatively straight parish boundary.

9.3.18 During the medieval period Leicester was the principal city for the region, with market towns established at Ashby-de-la-Zouch, Castle Donnington, Hallaton, Hinckley, Loughborough, Lutterworth, Markey Bosworth, Market Harborough, Melton Mowbray, Rutland, Oakham and Uppingham. The relationship between towns and the countryside during the medieval period is one that does not seem fully understood. There are no known physical remains of an early medieval date within the study area. The placename of Finger Farm, which now forms part of East Midlands Airport, near Diseworth is derived from the Old Norse (ON) 'phinghaugr', meaning 'an assembly mound or hill'. It appears in the 13th century as 'Thinghou'. Finger Farm perhaps represents the location of a moot-site, or meeting place, of an island of land lying between the Rivers Trent and Soar and the northern edge of Charnwood Forest.

9.3.19 There is evidence of medieval occupation across the study area and in areas beyond the historic cores of settlement that survive today. A larger rural population during the medieval period is indicated at Belton by the presence of earthworks that are indicative of a shrunken medieval village. The shrunken village may be indicative of the migration of the rural population to the market centres throughout the medieval period or population decrease as a result of the Black Death during the 14th century.

9.3.20 A small nunnery was founded in c.1150 at Langley Priory 1.2km west of the route of the Proposed Scheme. Fragments of the medieval buildings may survive in the fabric of Langley Hall. The land surrounding the priory was landscaped in the post-medieval period as a park. Other major church holdings of note include The Church of St. Mary and St. Hardulph, Breedon Hill (NHLE 1361364), now the parish church but was formerly the church of an Augustinian priory founded in the early 12th century.

9.3.21 Moated sites are important for the understanding of the distribution of wealth and status in the countryside, throughout the medieval period. There is evidence for high-status moated sites within the study area. At Breedon Lodge Farm there is a moated site, which may have served as a hunting lodge. Documentary evidence suggests the presence of a medieval deer park at this location, which was created in 1226. The park is marked on a map dating to 1758. Another moated site is noted as a cropmark at High Woods Diseworth, north of Little Rise Farm and within land required for the construction of the Proposed Scheme. Medieval pottery found at this location supports the theory that this site is a medieval settlement.

9.3.22 At the southern end of the study area the landscape is characterised by historic coal mining, which has occurred since the medieval period. Coal mines in the parish of Worthington were granted to Garendon Abbey in 1270 and there are medieval bell pits (Coal mining remains in Lount Wood, NHLE 1018465) located to the west of the land required for the Proposed Scheme. The area around Coleorton was the focus for early coal extraction. Coal Mining remains at The Conery, 500m south of Coleorton Hall (NHLE 1018464) represent a rare survival of medieval outcropping and pitting, whilst coal mining remains at Birch Coppice and Rough Park, 950m and 1.5km south of Smoile Farm (NHLE1018462) comprise remains dating to as early as 1204 through to the 1990s. Those at Lount Wood (Coal mining remains in Lount Wood, NHLE1018465) comprise well-preserved shaft mounds and earthworks thought to date to at least the 14th century. Throughout the study area, there is evidence of former transportation links such as tramways, plateways and railways that serviced the mining area. Modern opencast coal mining between Coleorton and the A42 will have significantly impacted on the survival of any potential archaeology in this area.

9.3.23 The 20th century saw the rapid mechanisation of farming which has resulted in a dramatic change in the historic landscape character, resulting in the loss of field boundaries as well as substantial loss of ridge and furrow. New transport networks including the construction of the M1 and M69 facilitated the growth of industry throughout Leicester resulting in urban expansion particularly to the towns in western Leicestershire, as demonstrated by the extensive modern housing located on the western outskirts of Kegworth and the western edge of Worthington.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area as far as reasonably practical.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[79] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;

[79] Supporting document: Draft Code of Construction Practice

- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

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

9.4.4 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.

9.4.5 Coleorton Hall (NHLE 1000959) is a Grade II* registered park and garden of high value, located adjacent to the east of the land required for the construction of the Proposed Scheme. It comprises parkland and a range of pleasure grounds around the country house of Coleorton Hall (NHLE 1361611) developed during the early 19th century. The parkland contains a well-preserved group of Grade II* and II listed buildings, which form the focal point of the parkland. The listed buildings are within the Coleorton Hall Conservation Area, which is of high value. The setting of the conservation area is intrinsically linked to the registered park and garden which encompasses the wider parkland as well as the historically associated estate land to the east. All listed buildings within the registered park and garden are effectively screened by topography and mature woodland from the land required for the construction of the Proposed Scheme and would not be subject to any effects. The registered park and garden and conservation area derive their significance from their historic, evidential and aesthetic values as a well-preserved parkland that is associated with visits from famous early 19th century artists such as Wordsworth, Coleridge, Constable and Wilkie. Its setting is defined by the surrounding estate of fields and woodland. Its spatial relationship and historical association with other designated heritage assets such as Hall Farmhouse (NHLE 1073576, labelled Hall Farm in Map Series CT-05, CT-06 and CT-10) to the west also positively contribute to its setting. The setting of the parkland would be affected by construction activities associated with Ashby-de-la-Zouch cutting No. 2 and Lount embankment to the west. This would adversely impact the ability to appreciate the registered park and conservation area within their historical context and rural setting. This constitutes a low magnitude of impact and a moderate adverse significance of effect.

9.4.6 Hall Farmhouse (NHLE 1073576) is a Grade II listed building of moderate value located 200m east of the land required for the construction of the Proposed Scheme. It comprises a late 18th century farmhouse that is associated with Coleorton Hall. The asset derives its significance from its architectural and historic interests as a well-

preserved example of an early farmhouse with later Georgian additions and association with famous artists (including Wordsworth and Wilkie[80]). The setting of the listed building is defined by its spatial relationship with its surrounding agricultural buildings, which reflect the agricultural character of the listed building, and its historical relationship with the Coleorton Hall estate. The surrounding farmland makes a positive contribution to the setting of the farmhouse by demonstrating the historic function of the listed building. The farmland lies within the land required for the Proposed Scheme and would be affected by construction activities associated with Ashby-de-la-Zouch cutting No. 2 and Lount embankment. The removal of the farmland would adversely affect the setting of the listed building by reducing the historic legibility of the surrounding agricultural landscape. This would be a medium magnitude of impact and a moderate adverse effect.

9.4.7 Mill Farmhouse (NHLE 1074355, labelled Mill Farm House on CT maps) and Old Mill (NHLE 1361237), although separately Grade II listed, form a discrete building complex of moderate value. The buildings are located adjacent to the land required for the construction of the Proposed Scheme. The buildings are early 19th century and the setting of the heritage assets is defined by the inter-relationship between the buildings and Boden Brook, which once fed the mill buildings. As such, the setting makes a positive contribution to the significance of the asset and how the assets are understood and appreciated. The assets derive their significance from architectural and historical interests as well as evidential value as a former rural industrial building with associated residential property. The setting would be affected by construction activities associated with Worthington cutting, Cloud Hill Quarry embankment No. 1 and Boden Brook viaduct. This would adversely affect the ability to fully appreciate the heritage value of the assets through the presence of construction machinery in proximity to the listed buildings within their associated rural landscape setting. This would be a temporary effect and constitutes a medium magnitude of impact and a moderate adverse significance of effect.

9.4.8 The Church of St. Mary and St. Hardulph (NHLE 1361364) at Breedon Hill is a Grade I listed building of high value located 1km from the land required for the construction of the Proposed Scheme. It is now the parish church, but was formerly the church of an Augustinian priory founded in the early 12th century, with earlier 9th century decoration. The asset derives its significance from its architectural interest and historic, evidential, aesthetic and communal value as a parish church. The immediate setting of the asset is defined by the surrounding churchyard and settlement. The church is situated on top of one of the highest points in the landscape within the Coleorton to Kegworth area and is visually prominent, which contributes to the value of the asset. As such, the setting which can be seen as contributing to the significance of the asset, is wider than its immediate surroundings. Views towards the church, especially from the east and south-east, would be affected by visual intrusion from construction activity associated with Breedon Lane overbridge, Cloud Hill Quarry embankment No.1, Boden Brook viaduct and Cloud Hill Quarry embankment No.2. This would occur through reduction of the ability to understand and appreciate the

[80] Sir George Beaumont is recorded as living at the farmhouse whilst Coleorton Hall was being rebuilt. During this time William Wordsworth composed a sonnet on the conquest of Switzerland by Napoleon whilst visiting and David Wilkie painted *The Blind Fiddler* in the kitchen

resource within its wider setting despite the disturbance caused by modern quarrying and infrastructure. This would be a low magnitude of impact resulting in a moderate adverse effect.

9.4.9 The medieval moated lodge north-west of Breedon Lodge (MLE4416) is a non-designated heritage asset of high value, identified from historic and modern mapping. It comprises a square earthwork with waterlogged ditches. The asset derives its significance from its archaeological interest and historic and evidential value as a hunting lodge associated with Breedon Park, a medieval deer park. Moated sites form a significant class of medieval monument and are important for the understanding of the distribution of wealth and status in the local area. Many examples provide conditions favourable to the survival of organic remains. Although the moated site at Breedon Lodge is non-designated it is considered the significance of the asset is such that it is of high value. Its setting is defined by its rural location, spatial relationship with the Grade II listed Breedon Lodge Farm and its historical association with Breedon Park, which contribute positively to the understanding and appreciation of its significance. The moat is located within land required for the construction of the Proposed Scheme, next to Gelscoe cutting. Although site haul routes have been designed to avoid the moated lodge, construction activities would adversely affect its setting and the ability to fully appreciate the heritage significance of the asset due to the loss of the current rural setting. This would constitute a medium magnitude of impact and a major significance of effect.

9.4.10 Breedon Lodge Farmhouse and Cottage (NHLE 1074125) is a Grade II listed building of moderate value. It is located adjacent to the land required for the construction of the Proposed Scheme. It comprises a late 18th century house with early 19th century cottage constructed as wing to the main building. The setting of the heritage asset is defined by the surrounding farm buildings and yard, the surrounding agricultural landscape, which includes the non-designated moated site to the north-west, and the surrounding rural character of the asset. The asset derives its significance from its architectural interest and historic and evidential value as a well-preserved example of a late 18th century farmhouse within a rural setting. The setting of the listed building would be affected by construction activities associated with Gelscoe cutting. These construction activities would take place within the associated farmland within the setting of Breedon Lodge Farmhouse and would adversely affect the ability to understand and appreciate the asset and its historical context and setting. This would be a medium magnitude of impact and a moderate adverse significance of effect.

Permanent effects

9.4.11 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

9.4.12 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.

9.4.13 The following non-designated heritage assets date from the prehistoric and Romano-British periods and demonstrate the former settlement of Leicestershire. They are all of low heritage value. The archaeological remains associated with these assets would

be physically impacted by the construction of Proposed Scheme. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- cropmark north-east of Long Mere Farm (MLE17145);
- possible enclosure north-west of the computer centre (MLE22568);
- ring ditch, Fulcrum Site Field 17 (MLE9703); and
- various features east of junction 24 (M1) (MLE16585).

9.4.14 The following non-designated heritage assets date from the medieval period and illustrate the former rural settlement of Leicestershire. They are all of moderate heritage value. The archaeological remains associated with these assets would be physically impacted by the construction of the Proposed Scheme. This would constitute a high magnitude of impact, and result in a major adverse significance of effect:

- Breedon Park (MLE4417); and
- moated site, High Woods, Diseworth (MLE4733).

9.4.15 The following non-designated heritage assets date from the post-medieval period and illustrate the transportation network of Leicestershire, the relationship Leicestershire holds with post-medieval industry and extraction, and how it linked to surrounding regions. They are all of low heritage value. The archaeological remains associated with these assets would be physically impacted by the construction of Proposed Scheme. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- Coleorton wagonway (MLE4892);
- Cloud Hill Plateway (MLE18778); and
- Post-medieval lime kilns near Lount (MLE16189).

9.4.16 The following non-designated heritage assets date from the post-medieval period and illustrate the rural settlement pattern of farmsteads, industry and designed landscapes. They are all of low heritage value. The archaeological remains and historic material associated with these assets would be physically impacted by the construction of the Proposed Scheme. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- three buildings at Newbold Gate;
- Smoile Farm and associated outbuildings;
- Basildon Lodge;
- Lodge Farm and associated outbuildings;
- White House Fields Farm and associated outbuilding;
- post-medieval finds and features from Cloud Hill Quarry (MLE10515);

- post-medieval field boundary at Cloud Hill Quarry (MLE10517);
- Gelscoe Lodge Farm and associated outbuilding; and
- Mole Hill Farm.

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

9.4.18 The Church of St. Mary and St. Hardulph (NHLE 1361364) at Breedon Hill, a Grade I listed building of high value situated 1km from the land required for the construction of the Proposed Scheme, would be subject to changes to its setting associated with the Proposed Scheme. The church is situated on top of the highest point in the landscape of the Coleorton to Kegworth area and is visually prominent. As such, the setting extends far outside of the immediate setting of the churchyard and village within which it is situated. This contributes to the ability to appreciate and understand the resource and its historical context and setting. The introduction of prominent new elements of infrastructure into the landscape, in the form of Boden Brook viaduct and associated earthworks of Cloud Hill Quarry embankments No. 1 and No. 2 would affect the setting of the resource especially in views approaching the church from Breedon Lane, Worthington and Stocking Lane. This would be a low magnitude of impact and a moderate adverse significance of effect.

9.4.19 The earthwork moat at Breedon Lodge Moat (MLE4416) is a non-designated heritage asset of high value. Its setting is defined by its rural location, spatial relationship with the Grade II listed Breedon Lodge Farmhouse and Cottage, and its historical association with Breedon Park, a medieval deer park. The moat is located next to Gelscoe cutting. The introduction of the Proposed Scheme immediately to the south of the asset, between the moat and Breedon Lodge Farmhouse, would permanently affect its setting and impact the ability to fully understand and read the asset within the landscape. This is assessed to be a medium magnitude of impact and a major adverse significance of effect.

9.4.20 Breedon Lodge Farmhouse and Cottage (NHLE 1074125) is a Grade II listed building of moderate value. The setting of the heritage asset is defined by the surrounding farm buildings and yard, the surrounding agricultural land, which includes the non-designated moated site to the north-west, and the surrounding rural character of the asset. Gelscoe cutting would be excavated next to the listed building. This would permanently affect its setting and impact the ability to fully understand and appreciate the heritage significance of the asset as the Proposed Scheme would run between the listed building and the Breedon Lodge moated site. This would constitute a medium magnitude of impact and a moderate significance of effect.

Other mitigation measures

9.4.21 No additional construction phase mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and

- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

9.4.22 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and would be restricted to the duration of the construction works.

9.4.23 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, the residual effects are the same as those reported under permanent effects. Over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the Map Series CT-06 within the Volume 2: LA04 Map Book:

- noise mitigation measures have been included within the Proposed Scheme that could reduce potential impacts on some heritage assets; and
- landscape planting could increasingly reduce impacts on the setting of the designated assets within the study area as it matures. Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.

9.5.3 During the operation of the Proposed Scheme, no further ground works are anticipated, and as such there would be no further physical impacts on heritage assets arising from the operation of the Proposed Scheme.

9.5.4 Impacts on heritage assets due to changes in their settings arising from the physical presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would continue throughout the operation of the Proposed Scheme.

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

9.5.6 It is currently anticipated that, in relation to the following heritage assets, there would be no significant effects as a result of the operation of the Proposed Scheme and that, therefore, the significance of effect would remain as described for the permanent construction effect:

- The Church of St. Mary and St. Hardulph (NHLE 1361364), at Breedon Hill;
- Medieval moated lodge north-west of Breedon Lodge (MLE4416); and

- Breedon Lodge Farmhouse and Cottage (NHLE 1074125).

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, 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, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

9.5.8 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Coleorton to Kegworth area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), the Environment Agency, the Coal Authority, Leicestershire County Council (LeCC), North West Leicestershire District Council (NWLDC), the Animal and Plant Health Agency (APHA), the Geological Society Regional Group East Midlands, Leicestershire and Rutland RIGS Group and the Open University Geological Society East Midlands. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[81].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased up to 1km.

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the lack of contact with nearby potentially contaminated sites, and the absence of

[81] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.

10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.7 The minerals assessment is based upon the mineral resources[82] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the relevant minerals plan).

10.2.8 The geo-conservation assessment is based upon local authority and publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the BGS, the Coal Authority, LeCC, NWLDC, Public Health England (PHE), the Environment Agency, Natural England, APHA, as well as from local geological trusts.

Geology

10.3.2 This section describes the underlying ground conditions within the Coleorton to Kegworth area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[83,84].

10.3.3 Table 15 provides a summary of the geology (made ground, superficial and bedrock units) underlying the study area.

[82] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDL), Shale Prospective Areas (SPA)'.
[83] British Geological Survey, (2014), Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01. Available online at: www.bgs.ac.uk/downloads/start.cfm?id=2904
[84] British Geological Survey, (2008), A formational framework for the Mercia Mudstone Group (Triassic) of England and Wales. Research Report RR/08/04

Table 15: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Present at Cloud Hill Quarry and to the north of Long Whatton Brook, with infilled ground also present at Lount.	Artificial ground comprising variable deposits of reworked natural and man-made materials.	Not classified
Superficial			
Head deposits	Associated with Boden Brook, Long Whatton Brook, Diseworth Brook and tributaries of the River Soar.	Composition dependent on source origin but typically gravel, sand, silt and clay.	Secondary undifferentiated
Alluvium	Associated with Boden Brook, Westmeadow Brook, Long Whatton Brook and Diseworth Brook. Further localised deposits are located to the east of Staunton Lodge Farm.	Clay, silt, sand and gravel.	Secondary A
River terrace deposits	Associated with the tributaries of the River Soar and the Trent and Derwent catchment. Further localised deposits are located to the south-east of Diseworth	Sand and gravel, locally with silt, clay or peat.	Secondary A Secondary (Undifferentiated) (higher silt content)
Glaciofluvial deposits	Localised deposits located south of Breedon on the Hill, around Belton and in the area south of East Midlands Airport.	Sand and gravel, locally with silt, clay or organic material.	Secondary A
Glaciolacustrine deposits[85]	Located across an area 60m south-west of Brandgate Farm.	Sand, gravel and clay.	Unproductive strata
Glacial till[86]	Distributed throughout the study area from West Farm Woodland, Pasture Woodland and south of Kegworth.	Variable deposit typically comprising sandy, silty clay with sand and gravel.	Secondary (Undifferentiated)
Bedrock			

[85] Glaciolacustrine deposits are sediments deposited into lakes that have come from glaciers
[86] Glacial till is sometimes called diamicton in the BGS lexicon. The term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case 'glacial till' refers to diamicton of glacial origin

Geology	Distribution	Formation description	Aquifer classification
Mercia Mudstone Group – Branscombe Mudstone Formation	Present just north of Kegworth to the far northern extent of the study area.	Mudstone and siltstone	Secondary B
Mercia Mudstone Group – Arden Sandstone Formation	Present as a narrow outcrop trending from west to east at the northern end of the study area.	Mudstones with siltstones and sandstones	Secondary A
Mercia Mudstone Group – Sidmouth Mudstone Formation	It underlies the majority of the land required for the Proposed Scheme in this study area. It outcrops between the south of Breedon on the Hill to the south-west of Kegworth.	Mudstone and siltstone thin beds of dolomitic siltstone and sandstone	Secondary B
Mercia Mudstone Group – Tarporley Siltstone Formation	Outcrops between Worthington and Tonge and to the west and south of Kegworth.	Sandstone, mudstone and siltstone.	Secondary A (sandstone) Secondary B (mudstone and siltstone)
Sherwood Sandstone Group – Helsby Sandstone Formation	Outcrops within the study area from north of Smoile Farm and Kegworth.	Sandstone, weathering to sand near surface.	Principal
Pennine Coal Measures Group - Pennine Middle Coal Measures Formation	Outcrops in the Newbold, Coleorton and Peggs Green areas, to the north of Farmtown.	Mudstone, siltstone and sandstone with coal seams.	Secondary A
Pennine Coal Measures Group - Pennine Lower Coal Measures Formation	Outcrops across the southern end of the study area, to the south of Lount.	Mudstone, siltstone and sandstone with coal seams.	Secondary A
Craven Group – Widmerpool Formation	Present to the south of Mill House Farm.	Mudstone with limestone, siltstone and sandstone.	Secondary A
Peak Limestone Group – Cloud Hill Dolostone Formation	Outcrops to the north of Worthington.	Dolostone (dolomitic limestone), with mudstone or clay partings and beds.	Principal
Peak Limestone Group – Milldale Limestone Formation	This formation outcrops across a limited area adjacent to the north of Boden Brook.	Limestone	Principal

Made ground

10.3.5 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the study area, which may comprise more significant deposits of made ground. Furthermore, colliery spoil tips are present.

10.3.6 The BGS geological mapping[87,88], including artificial ground mapping data, indicates the presence of made ground within the study area. Areas of made ground include Cloud Hill Quarry and its surroundings and a limited area 140m to the north of Long Whatton Brook. Infilled ground is also mapped by the BGS in the southern limits of the study area near Lount, corresponding with historical open cast coal mining areas.

10.3.7 No known farm burial or pyre sites associated with the 1967 and 2001 outbreaks of foot and mouth disease (FMD) are known to be present in the Coleorton to Kegworth area. The 2001 to 2000 FMD outbreak risk assessment map[89] identifies the Coleorton to Kegworth study area to lie within an FMD free county. However, older unrecorded sites may be present from the 1967 outbreak. In all cases, records do not provide an exact location for the burial or pyre sites. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of any such burials.

Superficial geology

10.3.8 Head deposits are present around Long Whatton Brook, around Diseworth Brook, along a tributary of the River Soar 800m south of Kegworth, south of Lockington, and within the Kegworth urban area. Head deposits are associated with slopes, forming down-slope layers and fans of accumulated material, and can typically comprise clay, silt, sand and gravel.

10.3.9 Alluvium deposits variably comprising silty clay, silt, sand and gravel occur along the courses of streams and rivers. They are present in the study area associated with Long Whatton Brook, Diseworth Brook and their tributaries within the northern extent of the study area. Further localised deposits are located to the east of Staunton Lodge Farm.

10.3.10 River terrace deposits consisting of sands and gravels are present in the study area. These deposits are located in the northern extent of the study area adjacent to the M1 junction 24 and are associated with the tributaries of the River Soar and the Trent and Derwent catchment. Further localised deposits are located to the south-east of Diseworth.

10.3.11 Glaciofluvial deposits comprising sand and gravel are present around Belton and along some of the tributaries of Long Whatton Brook. Some of the sands and gravels within the area have historically been worked or are currently being worked.

[87] British Geological Survey (2014), Geological map sheet 141 (Loughborough) 1:50,000 scale (Solid and Drift)
[88] British Geological Survey (2016), Geology – 1:50,000 (DIGMapGB-50) Artificial Version 8
[89] Animal Plant and Health Agency (2001), Foot and Mouth Disease 2001 County Series Map 01.10.2001

10.3.12 Glaciolacustrine deposits are present 60m to the south-west and 500m to the west of Brandgate Farm, in Breedon on the Hill. These deposits comprise sand, gravel and clay and were deposited as lakes formed during the melting of glaciers.

10.3.13 Glacial till deposits extend across most of the study area between Worthington, Shepshed, and Long Whatton. These are described as grey and brown sandy, silty clays and are characterised by rock fragments and lenses of sand and gravel.

Bedrock geology

10.3.14 The Mercia Mudstone Group underlies the majority of the study area and is present from Breach Woodland adjacent to the south of the land required for the construction of the Proposed Scheme to where the Proposed Scheme would pass Kegworth. The Mercia Mudstone Group in this area comprises (from the youngest to the oldest formation): the Branscombe Mudstone Formation, the Arden Sandstone Formation, the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation.

10.3.15 The Branscombe Mudstone Formation comprises mudstone and siltstone. The Arden Sandstone Formation consists typically of mudstones with siltstones and sandstones with occasional beds of conglomerate[90]. The Sidmouth Mudstone Formation typically consists of a mudstone and siltstone. There are also thin beds of dolomitic siltstone and sandstone. The Tarporley Siltstone Formation generally comprises siltstones, mudstones and sandstones in approximately equal proportions.

10.3.16 The Helsby Sandstone Formation of the Sherwood Sandstone Group is predominantly found in two different locations within the study area from north of Smoile Farm to the south of Tonge, to the west of Kegworth. This formation is described as sandstones, weathering to sand near to the surface. However, there are also outcrops where mudstone is the dominant bedrock geology.

10.3.17 The Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation of the Pennine Coal Measures Group outcrop to the east of Ashby-de-la-Zouch and between North Swannington and West Whitwick where the geology becomes faulted. Elsewhere in the study area, it underlies superficial geology or the younger Mercia Mudstone Group and Sherwood Sandstone Group. The Lower and Middle Pennine Coal Measures are generally described as mudstone, siltstone and sandstone with coal seams. The Middle Pennine Coal Measures contain coal seams throughout the unit.

10.3.18 The Widmerpool Formation of the Craven Group typically consists of dark to pale brown or grey mudstone with interbedded limestone, siltstone and sandstone. A small, localised outcrop is present within the study area south of Mill House Farm at Breedon Lane.

10.3.19 The Peak Limestone Group is present within the study area to the north of Worthington, to the north of Breedon on the Hill, and at Osgathorpe. The Peak Limestone Group comprises the Cloud Hill Dolostone Formation and the Milldale Limestone Formation. The Cloud Hill Dolostone Formation comprises dolostones with mudstone or clay. The Milldale Limestone Formation is characterised as limestone

[90] Conglomerate means a course-grained sedimentary rock composed of locally derived rock fragments embedded in a matrix of cementing material, in this case sandy mudstone

which is composed of calcareous particles, including marine fossil fragments within a calcite cement.

Radon

10.3.20 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[91].

10.3.21 Two sections of land required for the construction of the Proposed Scheme lie within radon affected areas:

- land immediately north and north-east of Worthington; and
- the land between Diseworth and Kegworth.

10.3.22 In both these areas, it is estimated that between 1% and 3% of homes have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties. The area north of Worthington, incorporating Cloud Hill Quarry and Cloud Wood, is shown to be an area where greater than 30% of homes are estimated to be at or above the radon action level.

10.3.23 The formal ES will include an assessment of areas where there are 5% or more of homes estimated to have radon levels at or above 200Bq/m^3.

Groundwater

10.3.24 Five aquifer designations have been identified within the study area, as defined by the Environment Agency:

- the Peak Limestone Group, comprising the Milldale Limestone Formation and the Cloud Hill Dolostone Formation, and the Sherwood Sandstone Group comprising the Helsby Sandstone Formation, are classified as Principal aquifers;
- the Pennine Coal Measures Group, comprising the Pennine Lower and Middle Coal Measures Formations, the Craven Group's Widmerpool Formation and the sandstone unit of the Tarporley Siltstone Formation, the Arden Sandstone Formation, alluvium, glaciofluvial deposits and the sand and gravel unit of river terrace deposits are designated as Secondary A aquifers;
- the Branscombe Mudstone Formation, the Sidmouth Mudstone Formation, the mudstone and siltstone unit of Tarporley Siltstone Formation, and river terrace deposits, where a higher content of silt is present are classified as Secondary B aquifers;
- head deposits and glacial till, which are classified as secondary (undifferentiated) aquifers; and
- glaciolacustrine deposits, which are designated as an unproductive stratum.

[91] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. This dataset underpins Public Health England's Indicative Atlas of Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). *Indicative Atlas of Radon in England and Wales*. Public Health England. ISBN: 978-0-85951-608-2. 29 pp) available at www.ukradon.org/information/ukmaps

10.3.25 The Environment Agency reports that there are four licensed private groundwater abstractions located in the study area. Two of these are for general agricultural processes and are located in Breedon on the Hill (890m to the north-west of the land required for construction of the Proposed Scheme) and to the west of Windmill Farm in Long Whatton, 570m to the east of the land required for construction of the Proposed Scheme. The remaining two are for process water and non-evaporative cooling and are located within Kegworth, 600m and 880m to the east of the land required for construction of the Proposed Scheme, respectively.

10.3.26 There are no groundwater Source Protections Zones (SPZ)[92] identified within the study area. Additionally, the study area is not identified to lie within a groundwater Drinking Water Safeguard Zone.

10.3.27 Details of licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.28 Further information on the groundwater in the Coleorton to Kegworth area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.29 Ramsley Brook, Diseworth Brook, Boden Brook and Westmeadow Brook are all designated by the Environment Agency as ordinary watercourses. The Proposed Scheme would cross the upstream tributaries of the Ramsley Brook, between Breedon on the Hill and Worthington. Westmeadow Brook flows along the eastern side of the route of the Proposed Scheme to the west of Long Whatton, and Diseworth Brook would be intersected by the Proposed Scheme to the east of Diseworth.

10.3.30 Other surface water features that would be intersected by the route of the Proposed Scheme include 10 unnamed land drains, located across Diseworth and Lount, to the north of Cloud Hill Quarry and to the west of Kegworth. Additionally, a number of ponds are located within the study area.

10.3.31 Surface water bodies in the Coleorton to Kegworth area are described in more detail in Section 15, Water resources and flood risk.

10.3.32 There is a single licensed surface water abstraction located within the study area. This is located to the east of Lodge Farm, Nottingham Road, 190m north-west of the land required for the construction of the Proposed Scheme. Surface water is abstracted from a tributary of Ramsley Brook for agricultural usage, including direct spray irrigation.

10.3.33 The Environment Agency's Drinking Water Protection Areas – Surface water Safeguard Zone mapping indicates that the southern end of the study area lies within a surface water safeguarding area that is under pressure from pesticides.

[92] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

10.3.34 There are no records of any registered private surface water supplies within the study area. Further information on surface water in the Coleorton to Kegworth area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.35 Current potentially contaminative land uses within the study area include one active landfill site and 10 industrial and commercial sites. The key potentially contaminative sites are:

- Lount landfill and recycling centre;
- Cotts Beverages Factory and Depot;
- Cloud Hill Quarry and processing facilities;
- sewage works; and
- several areas of railway land.

10.3.36 Historical land uses identified within the study area with the potential to have caused contamination include three historical landfill sites, approximately 120 mining sites, and approximately eight industrial sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are:

- Smoile Wood, Doles Quarry and Lount C Landfill;
- Coleorton Pottery Works;
- former collieries such as Stanton;
- historic and dismantled railway land; and
- Lount Pipe Works.

10.3.37 Further details of these key current and historical contaminative land uses within the study area are shown in Table 16, Table 17 and Table 18.

Table 16: Current and historical landfill sites located in the study area

Name and area reference	Location	Description
Doles Quarry Landfill and Lount Landfill Site C, Above Ground (LA04- 77)	Located along the B587 Nottingham Road north-east of Ashby-de-la-Zouch, 50m (in places 100m) to the north-west of the land required for the construction of the Proposed Scheme.	The Environment Agency records indicate the licence for Doles Quarry Landfill was issued in September 1996 and surrendered in July 2011. It is unknown when this landfill first and last accepted waste. A description of the type of waste that this landfill accepted is not available. The landfill occupied an area of approximately 4.2ha of the total 8.9ha land parcel. The Environment Agency records indicates that the Lount Landfill first accepted waste in August 1972 and last received waste in August 1991. It is unknown when the licence was surrendered. The Environment Agency describes the waste received as inert, industrial, commercial and household. The landfill occupied an area of approximately 4.7ha of the total 8.9ha land parcel.

Name and area reference	Location	Description
Lount Landfill (LA04-02)	Within a recycling centre at Lount Wood near Ashby-de-la-Zouch, 90m to the north-west of the land required for the construction of the Proposed Scheme.	The Environment Agency records that the landfill first accepted waste in August 1972. The records indicate that this landfill is currently active. The Environment Agency describes the waste received as commercial. The landfill occupied an area of approximately 18.8ha.
Smoile Wood (LA04- 08)	Located adjacent to the south-east of the A42, east of Lount. This landfill extends into the land required for the construction of the Proposed Scheme.	The Environment Agency records that the landfill first accepted waste in December 1981 and last received waste in June 1993. The licence was issued in January 1981 and it was surrendered in February 1994. The Environment Agency describes the waste received as inert, industrial, commercial, household and special waste. The landfill occupied an area of approximately of 7.5ha.

Table 17: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and area reference	Location	Description
Lounge Opencast (LA04-01, LA04-04 and LA04-08)	Located along and primarily to the east of the A42 north of Ashby-de-la-Zouch within the land required for the construction of the Proposed Scheme.	Extensive opencast workings operating between 1986 and 1993 in several waves and areas. Depths mined in excess of 50m.
Former coal pit (name unknown) (LA04-02)	Located to the east of Nottingham Road south of Lount within the land required for the construction of the Proposed Scheme.	Historical coal pit post-1923 to 1960. Name unknown, possibly originally Lounge workings as predates more modern workings.
Lount Pipe Works (LA04-07)	Located east of Lount beside the A42 within the land required for the construction of the Proposed Scheme.	Historical clay pit, present on historical mapping to 1978.
Quarry (unnamed) (LA04-13)	Located north of Lount beside the A42 within the land required for the construction of the Proposed Scheme.	Quarry shown on historical mapping between 1903 and 1993. Currently infilled.
Cloud Hill Quarry and works (LA04-18 and LA04-22)	Located between Worthington and Breedon on the Hill within the land required for the construction of the Proposed Scheme.	Originally sand pits then brick and tile works replaced prior to 1950 by opencast rock quarry with tanks. The quarry is still operational.
Unnamed shafts, pits and shallow coal mining areas	Located throughout the study area but primarily focused around the Lount opencast areas.	A number of mine entries, former opencast pits and quarries and shallow underground coal mining areas for which detailed records are not available.

Name and area reference	Location	Description
(LA04-40, LA04-47 to 48, LA04-50, LA04-68, LA04-80 to LA04- 82, and LA04-89)		

Table 18: Current and historical industrial sites located in the study area

Name and area reference	Location	Description
Lount Recycling Centre (LA04-02)	Located to the east of Nottingham Road 100m west of the land required for the construction of the Proposed Scheme.	Recycling facility licensed to Midland Land Reclamation Ltd by the Environment Agency to take special waste.
Disused railway (LA04-06 and LA04-20)	Located south of Lount running east-west towards Ashby-de-la-Zouch and turning north to run beside Cloud Hill Quarry within the land required for the construction of the Proposed Scheme.	Historical Derby, Melbourne and Ashby branch railway dating from the 19th century, originally for coal transportation. Areas were used by the British Army during World War II to test effective rail construction and demolition.
Lount Pipe works (LA04-07)	Located east of Lount beside the A42 within the land required for the construction of the Proposed Scheme.	Brick, tile and pipe works with pits and tanks from earliest mapping to 1978.
Coleorton Pottery Works (LA04-39)	Located in Lount 150m west of the land required for the construction of the Proposed Scheme.	Operated between 1835 and 1938 with clay being excavated locally.
TNT Courier Services Depot and former Stanton Colliery (LA04-09 and LA04-71)	Located east of Lount along Melbourne Road adjacent to the land required for the construction of the Proposed Scheme.	Stanton colliery and brick works with multiple tanks/silos up to 1953, then becoming the Worthington Pipe Works and an old clay pit up to the 1963 mapping. The current depot has been indicated from 1978 historical mapping.
Cotts Beverage Factory with depot and tanks (LA04-34)	Located in Kegworth north of Derby Road adjacent to the land required for the construction of the Proposed Scheme.	Currently a beverage factory.
Sewage Works (LA04-84)	Located on Long Lane north of Kegworth, 200m from the land required for the construction of the Proposed Scheme.	Currently a sewage works containing approximately 10 settlement tanks.

10.3.38 Contaminants commonly associated with sites in Table 16, Table 17, and Table 18 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate. Contamination with pathogens (micro-

organisms) and gases such as methane and hydrogen sulphide may also be encountered in relation to the sewage works.

10.3.39 Additional contaminants commonly associated with mining and mineral sites could include heavy metals, acid mine waters, and mine gases such as methane, carbon dioxide and hydrogen sulphide.

Other regulatory data

10.3.40 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences).

10.3.41 There are no Control of Major Accident Hazards (COMAH) sites in the study area.

10.3.42 There were 13 minor incidents (Category 3) to controlled water within the study area concerning the release of surfactants, oil, sewage sludge and other unspecified inorganic and organic chemicals over a four-year period between 1995 and 1999.

10.3.43 The Environment Agency reports that there are no discharge consents to groundwater within the study area.

10.3.44 There are three active and six revoked discharge consents to surface water within the study area. One active and one revoked consent is shown within the land required for the construction of the Proposed Scheme. Further details on discharge consents can be found in Section 15, Water resources and flood risk.

10.3.45 There is a single permitted integrated pollution prevention and control consent within the study area. This is owned by Cott Beverages Limited, located at the northern end of the study area, north-west of Kegworth and 120m south-east of the route of the Proposed Scheme.

10.3.46 There are four permitted local authority pollution prevention and control activities within the study area. One is located to the west of Newbold for concrete supplies and three are located within the Cloud Hill Quarry area for quarrying purposes. The reference points of all identified operations are located outside of the land required for the construction of the Proposed Scheme; however, the land required for the construction of the Proposed Scheme does extend over a number of quarry process buildings.

10.3.47 There are three nationally significant ecological designated sites, as defined in the land quality section of the SMR[93] within the study area, as follows:

- Breedon Cloud Wood and Quarry is designated as a SSSI with part of the eastern side, named Cloud Wood, classified as an ancient and semi-natural woodland by Natural England. This area is located north of Worthington from 20m east of the land required for the construction of the Proposed Scheme;
- Pasture and Asplin Woods are designated as a SSSI and an area of ancient and semi-natural woodland and are located 250m to the east of Cloud Wood and immediately south of the land required for the construction of the Proposed

[93] Sensitive ecological receptors are defined as national designations such as SSSI.

Scheme; and

- Lount Meadows consists of four SSSI units, three of which are located within the study area. Unit four is located south of Lount adjacent to the land required for the construction of the Proposed Scheme. Units two and three are also located south of Lount 75m to the west of the land required for the construction of the Proposed Scheme.

10.3.48 Further information on ecological designated sites in the Coleorton to Kegworth area is provided in Section 7, Ecology and biodiversity.

Mining/mineral resources

10.3.49 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These include sand, gravel, clay, stone, and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Minerals plans

10.3.50 LeCC is responsible for the overall mineral plan for the county. Current policy is guided by the Leicestershire Minerals Development Framework – Core Strategy and Development Control Policies up to 2021,[94] which was adopted in October 2009. The Leicestershire Minerals Development Framework sets out the key principles to guide the future winning and working of minerals in the county of Leicestershire to the end of 2021. The Minerals and Waste Local Plan (MWLP) for Leicestershire (2016 to 2031)[95] will eventually replace the current document.

10.3.51 The Leicestershire Minerals Core Strategy and Development Control Policies document notes one mineral extraction site in the study area, located at Cloud Hill Quarry, for limestone.

10.3.52 The Leicestershire Minerals Core Strategy and Development Control Policies document does not specify any MSAs, instead showing just the distribution of resources throughout the study area. The Mineral and Waste Safeguarding document for the North West Leicestershire District[96], which falls under the proposed LeCC MWLP, identifies one MSA for sand and gravel, one for coal and two for limestone. All three proposed MSA's are located within the study area.

10.3.53 The locations of specific mineral and mining resources within the study are described below.

[94] Leicestershire County Council (2016), *Leicestershire Minerals Development Framework.* Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/Minerals_core_strategy_development_control_policies.pdf
[95] Leicestershire County Council (2016) Leicestershire Minerals and Waste Local Plan (up to 2031). Pre-Submission Draft 2016.
[96] Leicestershire County Council (2015). Mineral and Waste Safeguarding [North West Leicestershire District], Document S6/2015. Available online at https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/north_west_leicestershire_district_s6_2015.pdf

Sand, gravel and clay deposits

10.3.54 The NWLD Mineral and Waste Safeguarding document identifies a proposed MSA for sand and gravel at the northern end of the study area to the east of East Midlands Airport. The Proposed Scheme has been identified to intersect this MSA.

10.3.55 The MSA listed above are proposed and not within the adopted minerals plan for LeCC. They have therefore not been considered in the assessment.

Limestone

10.3.56 The Mineral and Waste Safeguarding document for the North West Leicestershire District identifies two proposed MSA concerning limestone, one at Breedon on the Hill and another to the south of the village at Cloud Hill Quarry where quarrying for limestone is licenced. The Proposed Scheme has been identified to intersect the two MSA.

10.3.57 The MSA listed above are proposed and not within the adopted minerals plan for LeCC. They have therefore not been considered in the assessment.

Coal mining

Open cast coal mining

10.3.58 Available records from the Coal Authority show that the route of the Proposed Scheme would not pass through any areas of licensed coal mining. The Proposed Scheme would, however, pass through areas of unlicensed historical open cast coal mining at the southern end of the study area, near Lount and Newbold where Lounge A-J Colliery is located. Furthermore, the area near Lount and Newbold falls within a proposed MSA for coal as defined in the Mineral and Waste Safeguarding document for the North West Leicestershire District.

Deep coal mining

10.3.59 Available records from the Coal Authority show that the study area is in an area of probable shallow coal mining workings and probable deeper coal mining workings. These workings partially belong to the Lounge A-J Colliery and these would be crossed by the route of the Proposed Scheme. Other workings within the study area likely belong to New Lount Colliery, which is located 750m east of the land required for construction of the Proposed Scheme, to the south of Newbold.

10.3.60 The above areas also have a number of mine entries that indicate the recorded entrance to a mine working. The route of the Proposed Scheme would pass over a number of these historic features. Two of these mine entries are classified as adits, whilst the others are described as shafts. It is worth noting that the most recent open cast workings at the Lounge site, up to 50m in depth, have likely removed evidence of many mine entries and multiple layers of galleries. At least 15 seams are reported to have been mined at Lounge with a maximum thickness of 1.9m.

Petroleum exploration and development licences (PEDL)/hydrocarbons

10.3.61 Available records from the Oil and Gas Authority[97] show the route of the Proposed Scheme would not run through any coal bed methane, oil or gas fields.

10.3.62 The Proposed Scheme is not within a Shale Prospective Area (ShPA) or areas under a PEDL.

Geo-conservation resources

10.3.63 The Breedon Cloud Wood and Quarry SSSI is designated for geological interest and is located north of Worthington from 20m east of the land required for the construction of the Proposed Scheme.

Receptors

10.3.64 The sensitive receptors that have been identified within the study area are summarised in Table 19. A definition of receptor sensitivity is given in the SMR.

Table 19: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, schools, study centres, play areas and public open spaces.	High
		Employers and visitors at commercial areas, retail parks and areas, and hotels	Moderate
		Industrial	Low
	Groundwater	Principal aquifers – Cloud Hill Dolostone Formation, Milldale Limestone Formation and Helsby Sandstone Formation	High
		Secondary A aquifers – Lower and Middle Pennine Coal Measures Formations and the sandstone unit of the Tarporley Siltstone Formation, Craven Group Widmerpool Formation, alluvium, glaciofluvial deposits and river terrace deposits	Moderate
		Secondary B aquifers – siltstone unit of the Tarporley Siltstone Formation and Sidmouth Mudstone Formation Secondary undifferentiated aquifer – head deposits and glacial till Unproductive strata - glaciolacustrine deposits	Low

[97] Oil & Gas Authority (undated), Onshore Oil and Gas Activity. Available online at: https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa

Issue	Receptor type	Receptor description	Receptor sensitivity
	Surface water	Ramsley Brook, Diseworth Brook, Westmeadow Brook and Boden Brook	Moderate
		Unnamed streams, tributaries and ponds within the study area	Low
	Built environment	Underground structures and buried services	Low
	Natural environment	Breedon Cloud Wood and Quarry – ancient and semi-natural woodland and SSSI Pasture and Asplin Woods – ancient and semi-natural woodland and SSSI Lount Meadows SSSI	High
	Geo-conservation sites	Breedon Cloud Wood and Quarry SSSI	Moderate
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Proposed sand and gravel, coal and limestone bedrock MSA	Moderate

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[98]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Section 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Section 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6,7, 11 and 15);
- management of any unexpected contamination found during construction

[98] Supporting document: Draft Code of Construction Practice

(Section 11 and 15);

- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 5, 11 and 14);
- traffic management to ensure that there is a network of designated haul routes to reduce compaction/degradation of soils (Section 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Section 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[99] and British Standards BS10175[100] and BS8576[101] and Construction Industry Research and Information Association (CIRIA) SP32[102] CIRIA (1983) SP32, Construction over abandoned mine workings.

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[103]. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA04 Map Book.

[99] Environment Agency (2004), CLR11 Model Procedures for the Management of Land Contamination
[100] British Standard (2011), BS10175+A2:2017 Investigation of Potentially Contaminated Sites
[101] British Standard (2013), BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).
[102] CIRIA (1983), SP32, Construction over abandoned mine workings
[103] Sustainable Remediation Forum UK, (2010), A Framework for Assessing the Sustainability of Soil and Groundwater Remediation

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial and commercial sites.

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A simple summary of the baseline CSM is provided in Table 20. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 20: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference [104]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[105]						
LA04-14, LA04-15, LA04-19	Lodge Farm, Worthington Fields Farm and further unnamed farm	Very low to moderate/low	Moderate	N/A[106]	Low	Low

[104] Each potentially contaminated site is allocated a unique reference number
[105] 'On site' is within the area of land required for construction of the Proposed Scheme
[106] N/A refers to the receptor being absent or a receptor being not applicable to the contaminant source being assessed

Area reference [104]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
	(Farms group)					
LA04-02, LA04-06, LA04-20, LA04-34, LA04-74, LA04-76, LA04-87, LA04-88	Key sites include: sections of the Melbourne railway line, Cotts Beverage Factory and depot and Lount Recycling Centre (Industrial/ commercial group)	Very low to moderate	Moderate/low	Low	Moderate	Moderate/low
LA04-09	Key sites include: the TNT couriers depot and call centre (Light Industrial/ commercial group)	Very low to low	Moderate/low	N/A	Moderate	Low
LA04-01, LA04-04, LA04-12, LA04-13, LA04-18, LA04-22, LA04-86	Key sites include: Lount areas A-J and Cloud Hill Quarry (Quarry and open cast backfill group)	Very low to low	Moderate/low	Low	Moderate/low	Moderate
LA04-08, LA04-77	Smoile Wood, Doles Quarry and Lount C (Landfill group)	Low to Moderate/low	Moderate	Low	Moderate	Moderate/low
LA04-40, LA04-82, LA04-89	Areas of shallow coal mining including numerous mine entries (Shallow mining areas group)	Low to moderate	Low	Low	Moderate/low	Low
Off site[107]						

[107] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it

Area reference [104]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA04-07, LA04-16, LA04-39, LA04-71, LA04-78, LA04-84	Key sites include Stanton colliery, Kegworth sewage works and Coleorton Pottery works (Off site industrial/ commercial group)	Very low to moderate	Moderate/low	Low	Moderate	Low risk to moderate/low risk
LA04-38	Farm (unnamed) with tanks (Off site light industrial/ commercial group)	Very low to moderate/low	Moderate/low	N/A	Low	Low
LA04-50, LA04-80, LA04-81	Areas of mine entries (Off site shallow mining areas group)	Low to moderate/low	Low	Low	Moderate	Low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would 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 area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.

10.4.14 In the event that unexpected contamination is encountered during construction of the route in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

10.4.15 All of the sites set out in Table 20 have been assessed for the change in impact associated with the construction stage of the work.

10.4.16 Table 21 presents a summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 20 were found to have non-significant effects.

Table 21: Summary of construction CSM effects

Name and area ref	Receptor	Main baseline risk range	Main construction risk range	Temporary effect
On site				
LA04-40, LA04-82, LA04-89 Areas of shallow coal mining including numerous mine entries (Shallow mining areas group)	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Low to moderate/low	Moderate	Minor adverse to moderate adverse (significant)
	Controlled waters – groundwater	Low	Moderate	Moderate adverse (significant)
	Impact on property receptors	Low	Moderate	Moderate adverse (significant)
Off site				
LA04-50, LA04-80, LA04-81 Areas of mine entries (Off site shallow mining areas group)	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Low to moderate/low	Moderate	Minor adverse to moderate adverse (significant)
	Controlled waters – groundwater	Low	Moderate	Moderate adverse (significant)
	Impact on property receptors	Low	Moderate	Moderate adverse (significant)

10.4.17 The extent to which mine water and mine gas is controlled is subject to ongoing investigation. For mining sites, potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. Any mitigation measures required will be identified, in consultation with authoritative consultees, including measures to be set out in the draft CoCP, to mitigate any significant effects.

10.4.18 For other sites unrelated to mining, the adoption of the measures set out in the draft CoCP makes it unlikely that there would be significant adverse effects, but it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. These minor adverse effects during the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.19 The assessment has considered the extent of earthworks required together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issue has been identified which the draft CoCP

will address: construction around Smoile Wood Landfill, in particular cutting for the Melbourne Road realignment, presents the risk of exposing hazardous waste, which is known to have been deposited there. Soils extracted are likely to be moved off site for treatment, with leachate and gas management systems present at the site needing to be adequately protected or replaced.

10.4.20 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils, and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials.

Permanent effects

10.4.21 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.

10.4.22 The magnitude of the permanent effects and their significance have been determined by assessing 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 neutral even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme would not alter the risks from an existing potentially contaminated site that is outside the land required for the construction of the Proposed Scheme. As noted above, a worsening would result in adverse effects and an improvement would result in beneficial effects.

10.4.23 All of the sites set out in Table 20 have been assessed for a change in impact associated with the permanent post-construction stage.

10.4.24 Table 22 presents the summary of the resulting post construction effects that have been found to be significant. All other sites referenced in Table 20 were found to have non-significant effects.

Table 22: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA04-14, LA04-15, LA04-19 (Farm group) Lodge Farm, Worthington Fields Farm and further unnamed farm	Controlled waters – groundwater	Moderate	Very low	Moderate beneficial (significant)
LA04-02, LA04-06, LA04-20, LA04-34, LA04-74, LA04-76, LA04-87, LA04-88 (Industrial/ commercial group) Sections of the Melbourne railway line, Cotts Beverage Factory and depot and Lount Recycling Centre	Human health – direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site	Very low to moderate	Very low to low	Neutral to moderate beneficial (significant)
	Impact on ecological/geological designations	Moderate	Low	Moderate beneficial (significant)
LA04-09 TNT couriers depot and call centre (Light industrial/ commercial group)	Controlled waters – groundwater	Moderate/low	Very low to low	Minor beneficial to moderate beneficial (significant)
	Impact on ecological/geological designations	Moderate	Low	Moderate beneficial (significant)
LA04-01, LA04-04, LA04-12, LA04-13, LA04-18, LA04-22, LA04-86 Key sites include Lount areas A-J and Cloud Hill Quarry (Quarry and open cast backfill group)	Controlled waters – groundwater	Moderate/low	Very low to low	Minor beneficial to moderate beneficial (significant)
	Impact on ecological/geological designations	Moderate/low to moderate	Very low to low	Minor beneficial to moderate beneficial (significant)

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA04-08, LA04-77	Controlled waters – groundwater	Moderate	Very low to low	Moderate beneficial (significant)
Smoile Wood, Doles Quarry and Lount C (Landfill group)	Impact on ecological/geological designations	Moderate	Very low to low	Moderate beneficial (significant)

10.4.25 Table 22 indicates that where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there will in most instances, be overall moderate beneficial effects which are considered to be significant.

10.4.26 In relation to the potential significant effects associated with mining sites at construction stage, there will be a greater level of knowledge and understanding of the mine workings ground model and the best means to mitigate the potential effects on a permanent basis.

10.4.27 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people and property from gas and vapours in the ground would be controlled to an acceptable level.

Mining/mineral resources

10.4.28 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[108] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

Temporary effects

10.4.29 Temporary adverse effects may occur where construction compounds are proposed within an MSA or designated mineral site. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

Limestone

10.4.30 There is licenced mineral extraction occurring with quarries at Breedon-on-the-Hill and Cloud Hill.

[108] 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
[108] Each potentially contaminated site is allocated a unique reference number
[108] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site

10.4.31 The following compounds would fall within the resource area for limestone:

- Breedon Lane overbridge satellite compound;
- Boden Brook viaduct south satellite compound; and
- Boden Brook viaduct north satellite compound.

10.4.32 Part of the Cloud Hill Quarry is located within the land required for the construction of the Proposed Scheme. The effect of construction of the Proposed Scheme on the identified limestone deposits is a matter of ongoing liaison with the Breedon Group and suitable mitigation is being developed. Following implementation of mitigation measures the likely effect will be negligible.

Permanent effects

10.4.33 The majority of effects on mining and mineral sites would be permanent. There are no permitted or allocated mineral sites or MSAs for sand and gravel, coal, clay, salt or gypsum in the study area. There are no ShPA or areas operating under a PEDL.

10.4.34 The effects of construction of the Proposed Scheme on the limestone resource would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised.

Limestone

10.4.35 As a proportion of the total resource area, the strip of land which would become sterilised by the construction of the Proposed Scheme for limestone mineral would amount to 10-20%. The effect on the resource is considered to be moderate, although there are several constraints on economically working the mineral as there are watercourses and a bridleway that block extension of the existing Cloud Hill Quarry. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, LeCC and the mineral owner, and a minor adverse impact is expected.

10.4.36 Table 23 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 23: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Cloud Hill Quarry	Operational quarry (limestone)	Limestone quarry	Medium	Moderate	Minor adverse (Y)

10.4.37 The effect to the active Cloud Hill Quarry has been assessed as minor adverse, which is not significant.

Geo-conservation sites

10.4.38 There is a single geo-conservation area in the study area known as the Breedon Cloud Wood and Quarry SSSI (limestone and dolostones). This is located north of Worthington. The 80m-deep quarry has open exposures of rock. This is a key site for

studies of early Carboniferous paleogeography, sediments and fauna. Although within the study area this geo-conservation site is not within the land required for the Construction of the Proposed Scheme which would result in a negligible effect on this feature. Mitigation measures will need to be discussed with the relevant stakeholders, which could include careful design of the works and protection of the site, and delivered as part of the construction works.

Other mitigation measures

10.4.39 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site-specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

10.4.40 Mitigation of the effects on mineral resources within the licenced area could include extraction of the resource in landscaping areas within the land required for construction of the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at LeCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the licensed area.

Summary of likely residual significant effects

10.4.41 For mining sites, the potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. For all other sites, and based on the information currently available and with the application of the mitigation measures detailed above, no likely significant adverse residual effects are anticipated with respect to land quality. However, were remediation is undertaken there may be significant beneficial residual effects.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include three auto-transformer stations: Birch Coppice (500m north of Hall Farm), Boden Brook (400m west of Breedon Lodge

Farm) and Diseworth (350m south of Wood Nook Farm). Auto-transformer stations, feeder stations and sub-stations can, in principle, be sources of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

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

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Coleorton to Kegworth area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

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

11.1.3 Engagement with East Midlands Councils, Leicestershire County Council (LeCC), North West Leicestershire District Council (NWLDC) and Natural England has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: LA04 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT- 06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[109].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July to September 2017, and winter surveys from January to March 2018, to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES assumptions have been made about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

[109] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement will be used to further refine the study area to focus on likely significant effects.

11.2.4 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.

11.2.5 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area.

11.2.6 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. 'The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.7 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.2.8 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from Ashby-de-la-Zouch and Coleorton in the south to Kegworth in the north. Most of the study area is rural in character, despite the influence of the A42 transport corridor which passes through the central parts of the study area.

11.3.2 The Proposed Scheme would start at a high point of approximately 157m above Ordnance Datum (AOD), where it would cross the line of hills that run south-east to

Charnwood Forest. The southern part of the study area is heavily wooded and included within the National Forest boundary.

11.3.3 North-east of Ashby-de-la-Zouch, the Proposed Scheme would pass through an open, undulating landscape with predominantly arable fields and occasional woodlands. The landform gradually descends to a low point at the Diseworth Brook corridor. The landscape is populated at a low density with scattered farms, traditional villages such as Breedon on the Hill and Diseworth, and grand houses associated with country estates.

11.3.4 Outcrops of limestone occur at Breedon Hill and Cloud Hill Quarry, forming prominent features in the landscape. A ridgeline located to the east of the village of Tonge forms a watershed: streams to the west flow northwards into the River Trent, and streams to the east flow eastwards into the River Soar.

11.3.5 The northern part of the study area lies at the edge of the River Soar valley, where the land is approximately 34m AOD, and is dominated by a combination of major highways (the A42 and M1), the settlement of Kegworth and distant views of Ratcliffe-on-Soar power station cooling towers. Near Kegworth, the presence of the large-scale road infrastructure of the A42 and M1, East Midlands Airport and settlement at Kegworth village interrupt the rural landscape, reducing continuity and tranquillity of the countryside.

11.3.6 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[110], the East Midlands Regional Landscape Character Assessment[111], the National Forest Strategies 2004-2014 and 2014-2024[112], and the North-West Leicestershire Settlement Fringe Assessment[113]. These published LCAs have been adapted for this assessment, to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.7 For the purposes of this assessment, the study area for Coleorton to Kegworth has been subdivided into 13 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

[110] Natural England (2013, 2014), *National Character Area profiles*. Available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

[111] Natural England's East Midlands Region (2010), *East Midlands Regional Landscape Character Assessment*. Available online at: http://publications.naturalengland.org.uk/publication/5635681403535360?category=2431119

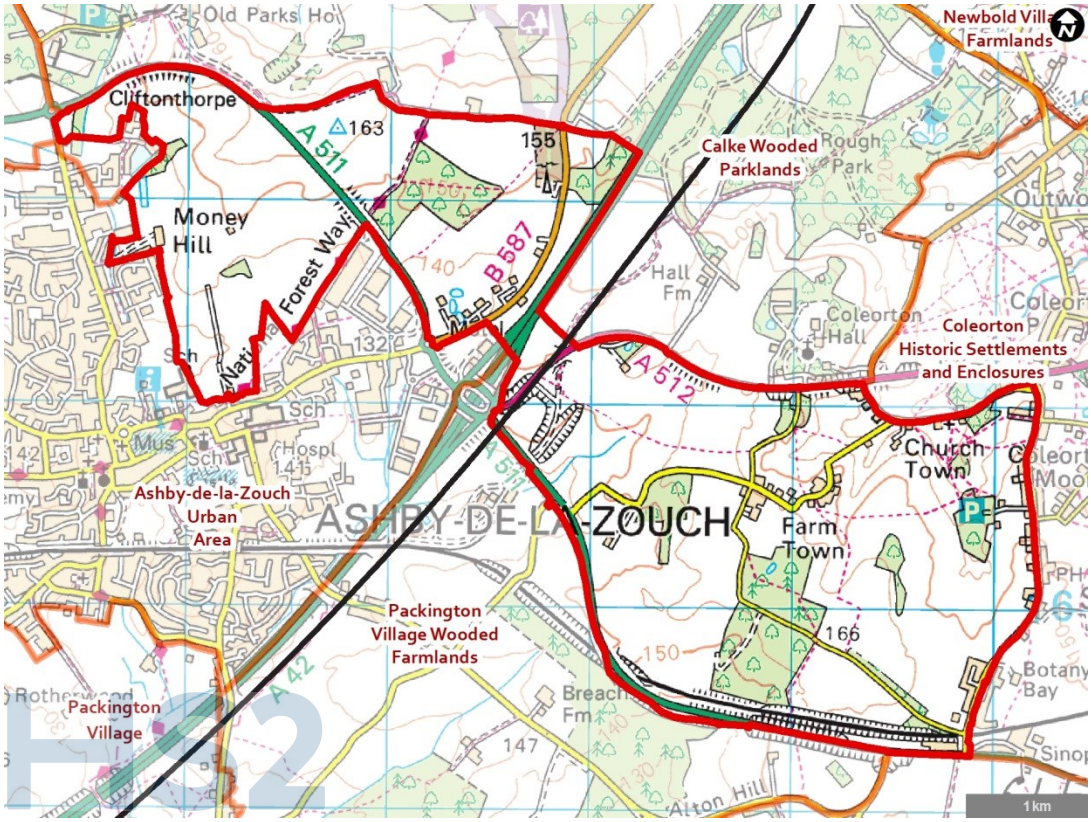
[112] The National Forest (2004-2014), The Strategy; The National Forest (2014-2024), Strategy 2014-2024. Available online at www.nationalforest.org

113 North West Leicestershire District Council (2010), North West Leicestershire Settlement Fringe Assessment. *Available online at:* https://www.nwleics.gov.uk/files/documents/settlement_fringe_assessment_august_2010/Settlement%20Fringe%20Assessment%20-%20August%202010.pdf

11.3.8 Five of the 13 LCAs would not be significantly affected by the Proposed Scheme on account of their distance from the Proposed Scheme or the small proportion of the LCA affected. River Soar Valley Farmlands LCA would be significantly affected by the Proposed Scheme and is described in Community area report LA05, Ratcliffe-on-Soar to Long Eaton as it is located for the most part within the Ratcliffe-on-Soar to Long Eaton area. A summary of the remaining seven LCAs that would be significantly affected in the Coleorton to Kegworth area is provided in Table 24.

Table 24: Summary of significantly affected LCAs

Packington Enclosed Farmlands LCA



Landscape north of Ashby-de-la-Zouch

Landscape west of Farm Town

The Packington Enclosed Farmlands LCA is an elevated landscape underlain by a complex mix of sandstones, mudstones and siltstones, which has resulted in a varied landform of gentle undulations and steeper slopes where the land falls away to the north and east.

Land use is a mix of agriculture and plantation woodland, with a few substantial areas of young National Forest woodlands. There is variation in field size and pattern. Large arable fields are predominant, with low clipped hedgerows and scattered hedgerow trees. Smaller pasture fields with more substantial hedgerows are located near to the town of Ashby-de-la-Zouch and in the east of the LCA. The open field system is preserved in some places with some areas of narrow fields. The character is, therefore, predominantly one of open, partially wooded, mixed farmland.

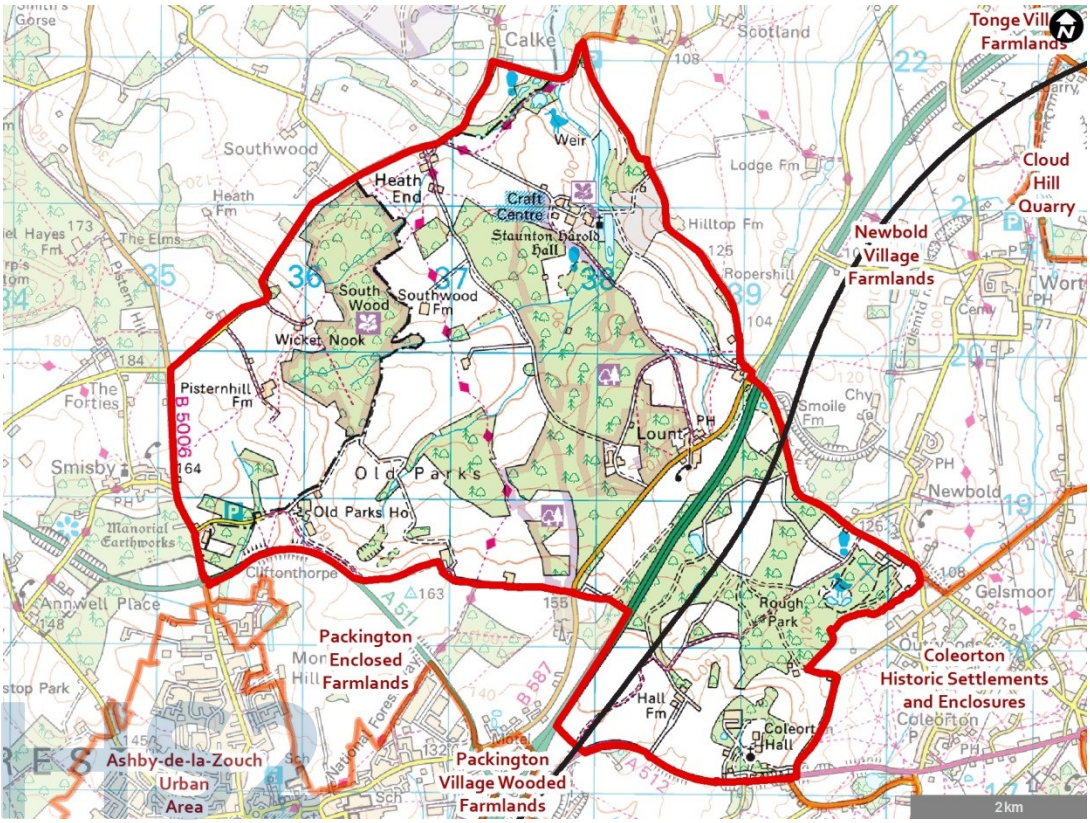
There is little settlement, apart from a cluster of dwellings at Farm Town. The LCA has a strong rural character, although urban influences include the urban fringe of Ashby-de-la-Zouch. Commercial energy generation infrastructure at Ashby Solar Farm further erodes the rural character. Traffic noise from the A42 notably detracts from an otherwise tranquil area.

There are medieval coal mining remains designated as a scheduled monument at The Conery, on the northern side of Farm Town. Shallow earthworks and hummocks are visible in the landscape, and represent the remains of coal extraction from surface outcrops, providing a sense of historic continuity.

On each side of the LCA there is reasonably good public access with open access land in wooded areas, and a network of public rights of way (PRoW), including the Ivanhoe Way and National Forest Way to the west of the A42. However, the two sides of the LCA are severed by the A42, with the only crossing point being at the junction 13 elevated intersection.

The overall value of this LCA is medium derived from its predominant rural character, varied and valued for recreation, but impacted by settlement, transport and energy generation infrastructure.

Calke Wooded Parklands LCA



Landscape north-west of Lount

Woodland south of Staunton Harold Hall

The Calke Wooded Parklands LCA has an undulating landform of low hills and ridges and steeply sloping stream valleys. The geology underlying the LCA is predominantly coal measures. The legacy of coal mining is evident from former earthworks still visible in the landscape and remains of this activity in several sites designated as scheduled monuments. Woodland is a characteristic feature of the LCA, and there are many large wooded estates, parkland with mature trees and fields with numerous hedgerow trees. New woodland planting associated with the National Forest, and planting along the A42 corridor, add to the predominance of woodland. There are three areas of ancient woodland close to the route of the Proposed Scheme – Lount Wood, Rough Park and Birch Coppice – and several more within the LCA further away, particularly on the east side of the LCA also characterised by lowland meadows, semi-improved grassland, wood pasture and parkland. The LCA includes areas designated as Lount Meadows Site of Special Scientific Interest (SSSI).

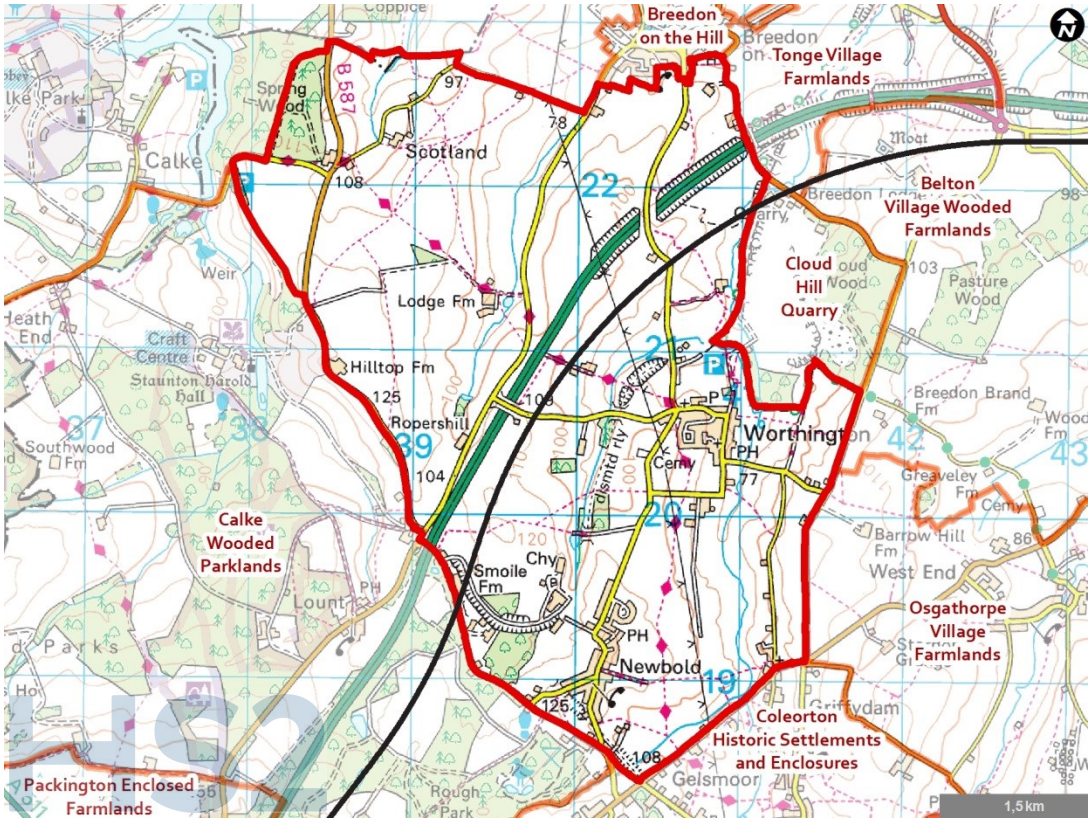
The LCA is predominantly rural, with few scattered farmsteads and country houses. The settlement of Lount lies close to the A42 on its western side, and comprises a cluster of mainly modern residential houses. Large estates such as the Staunton Harold Estate, which includes the Grade I Listed Staunton Harold Hall and Chapel, with Grade II* Registered Park and Garden, are characteristic features within the LCA, some attracting visitors with a mixture of amenities, such as

farm shops and garden centres. Coleorton Hall, a Grade II* Registered Park and Garden is located in the eastern part of the LCA, although it is not open to the public.

The A42 transport corridor, which cuts through the LCA, is the main adverse influence on its rural character. It physically and visually severs the LCA, although it is bounded by substantial woodland within the highway corridor that screens it and helps to integrate the highway into the landscape.

The overall value of this LCA is medium-high derived from the diverse nature of the landscape character, enhanced by a range of habitats and designed landscapes, with existing woodland reducing adverse effects of transport infrastructure.

Newbold Village Farmlands LCA



Open landscape north of Worthington

Church Street, Worthington

The Newbold Village Farmlands LCA is a predominantly rural landscape with scattered settlements underlain by a mixture of different sandstones, siltstones and mudstones, which has given rise to a gently rolling landform. There are substantial areas of agricultural land, predominantly in arable use, but with pasture occupying a shallow stream valley running north-south in the eastern part of this LCA.

Fields are generally delineated by low clipped hedgerows with few hedgerow trees, although there are some hedgerow boundaries that are more substantial. There are few areas of woodland within the LCA, apart from a series of copses that extend alongside the disused Derby, Melbourne and Ashby branch railway line (dismantled) that runs north, past Cloud Hill Quarry to Tonge. There is also a larger area of woodland in the south of the LCA, west of Newbold Coleorton. This area of woodland sits within a wider area of coal mining remains, which has been designated as a scheduled monument and lies

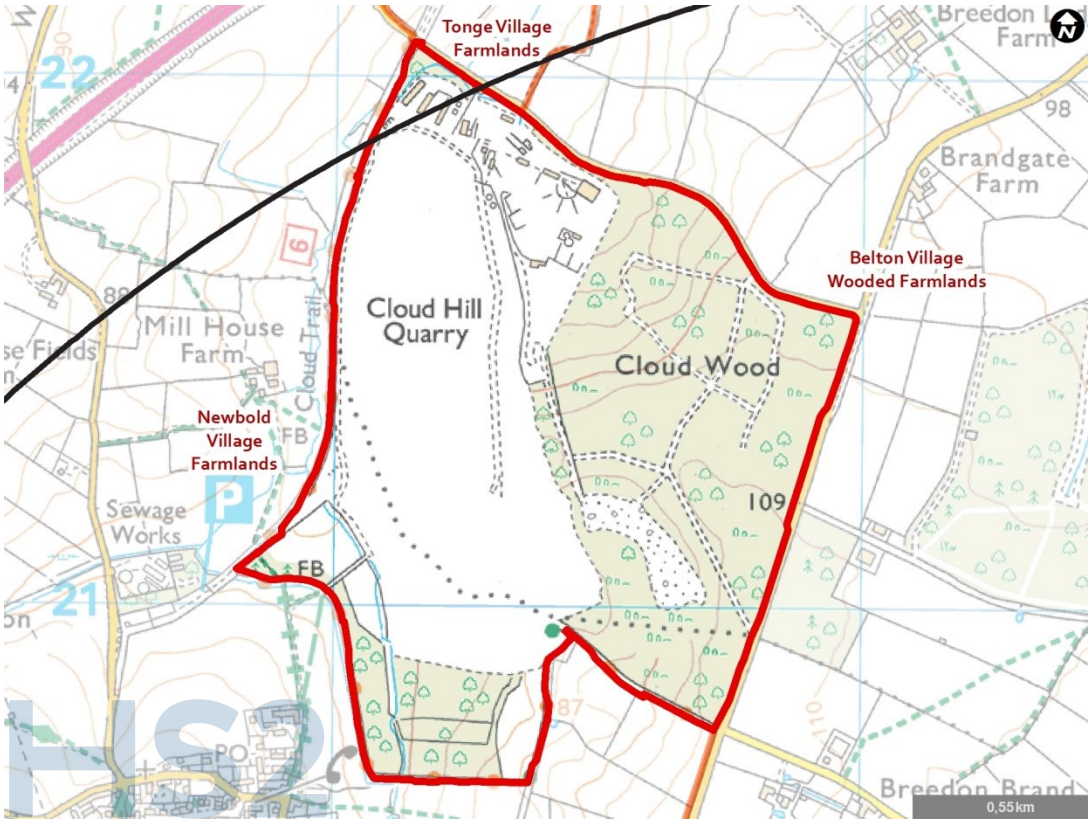
adjacent to the Lount Meadows SSSI. Linear belts of planting associated with the A42 transport corridor add to the tree cover within this LCA.

This LCA is predominantly rural, particularly to the north/west of the A42, where there are a few scattered farmsteads. The settlements of Worthington and Newbold are located to the south/east of the A42, along a gently dipping ridgeline: Newbold at 120m AOD and Worthington at 90m AOD. Both settlements consist of mainly modern suburban housing located around a small, older village core. Worthington contains several listed buildings, including The Round House (lock up), which is also a scheduled monument.

The A42 cuts through this LCA, generally running in shallow cutting, and often screened from view, although traffic noise detracts from tranquillity. There are several PRoW within or crossing this LCA, including the Ivanhoe Way Leicestershire Circular Walk, which passes through Worthington.

The overall value of this LCA is medium derived from its predominantly open rural character enhanced by heritage features, combined with the effects of transport infrastructure.

Cloud Hill Quarry LCA



Cloud Hill Quarry, south of Breedon Hill

Eastern face of Cloud Hill Quarry

Cloud Hill Quarry and a block of adjacent woodland form a discrete LCA, located to the north of the village of Worthington.

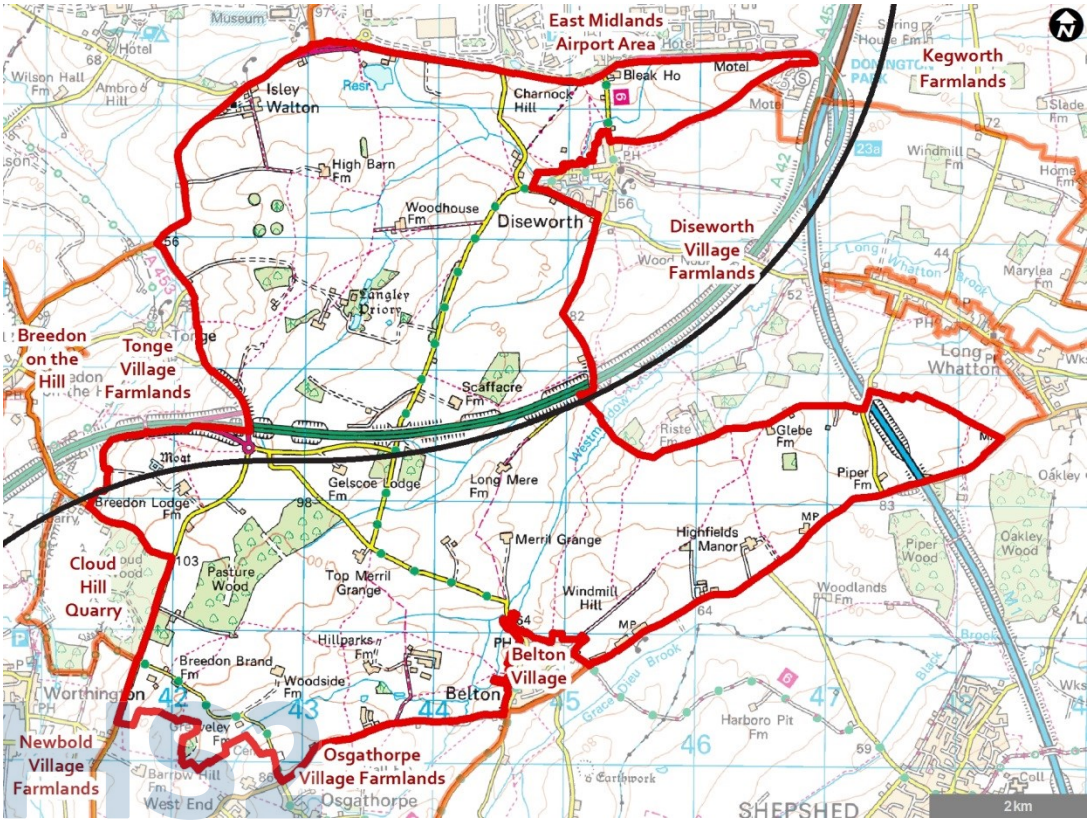
Cloud Hill Quarry is a working limestone quarry with a depth of approximately 70-80m. The eastern edge of the quarry is higher than the western side and forms a prominent feature in the landscape, visible from Worthington, the local highway network and PRoW. Occasional blasts from the working of the limestone are audible within the wider area beyond the quarry, which whilst detracting slightly from overall tranquillity, contribute to a distinctive sense of place.

Breedon Cloud Wood lies adjacent to the east of the quarry, and comprises a largely intact block of ancient and semi-natural woodland. The quarry and woodland together are designated as the Breedon Cloud Wood and Quarry SSSI: the quarry is a nationally important geological site, and the ancient woodland also supports an exceptionally diverse flora.

The disused Derby, Melbourne and Ashby branch railway line runs past Cloud Hill Quarry on the western side of this LCA. This is now the National Cycle Network (NCN) Route 6 /Cloud Trail recreational route.

The overall value of this LCA is medium derived from its geological and ecological interest, and its distinctive sense of place.

Belton Village Wooded Farmlands LCA



Landscape East of Tonge

Landscape North of Belton and Peters Close Junction near Long Mere Farm

The Belton Village Wooded Farmlands LCA is a large LCA, underlain for the most part by mudstones, which have produced a gently rolling lowland plateau.

Several watercourses cross this LCA, flowing in shallow valleys in a north-easterly direction towards the River Soar.

The predominant land use in this LCA is agriculture. Farmland is mixed, with arable use being predominant. Field boundaries are generally defined by low trimmed hedgerows, with occasional hedgerow trees, forming a landscape of open character. There is also a solar farm located close to the A42 on the northern side.

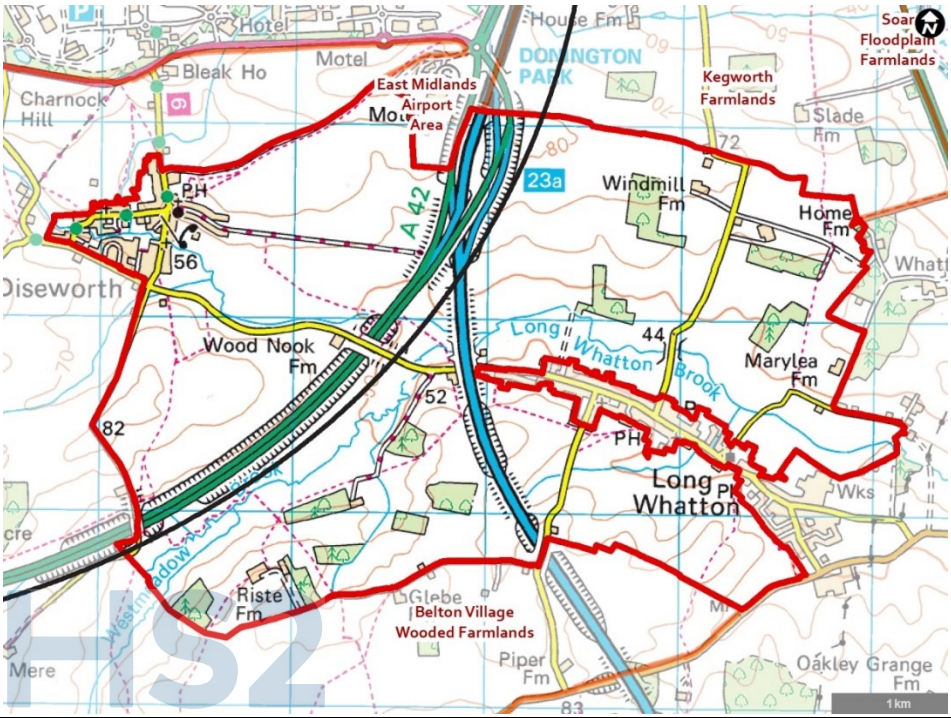
There are some small woods and plantations, mainly associated with the parkland landscape around the Grade II* listed Langley Priory. A substantial area of woodland, Pasture and Asplin Woods Ancient Woodland, lies in the south of this LCA, to the east of Cloud Hill Quarry. This woodland is also designated as a SSSI as one of the best examples of ash-hazel woodland in Leicestershire.

This LCA is sparsely settled, the main settlement being the village of Belton in the south. Belton includes several listed buildings, including the Grade II* listed Church of St. John the Baptist, whose prominent spire forms a local landmark. The A42 is a significant intrusion into the otherwise rural landscape, severing the LCA into northern and southern sectors.

There are few roads that cross this LCA. East Midlands Airport lies directly to the north of the LCA, and together with the A42, diminish the tranquillity of the strong rural landscape character. There are several PRoW, mainly running in a north-south direction through the LCA. NCN Route 15 passes through Belton and Diseworth.

The overall value of this LCA is medium derived from its predominantly open rural character enhanced by heritage features, combined with the effects of transport infrastructure.

Diseworth Village Farmlands LCA



Landscape south of Diseworth

Landscape west of Long Whatton

The Diseworth Village Farmlands LCA is underlain for the most part by mudstones with bands of siltstones, which have given rise to an undulating lowland landform. Several tributaries of the River Soar cross the LCA, in shallow valleys.

The predominant land cover is mixed farmland, with frequent blocks of deciduous woodland on the southern side of the A42 and in the vicinity of Long Whatton. In general, arable land with low trimmed hedgerow boundaries occupies the

slopes. Pasture with smaller fields, bounded by mature hedgerows with trees, occupies the less well drained land within the shallow valleys.

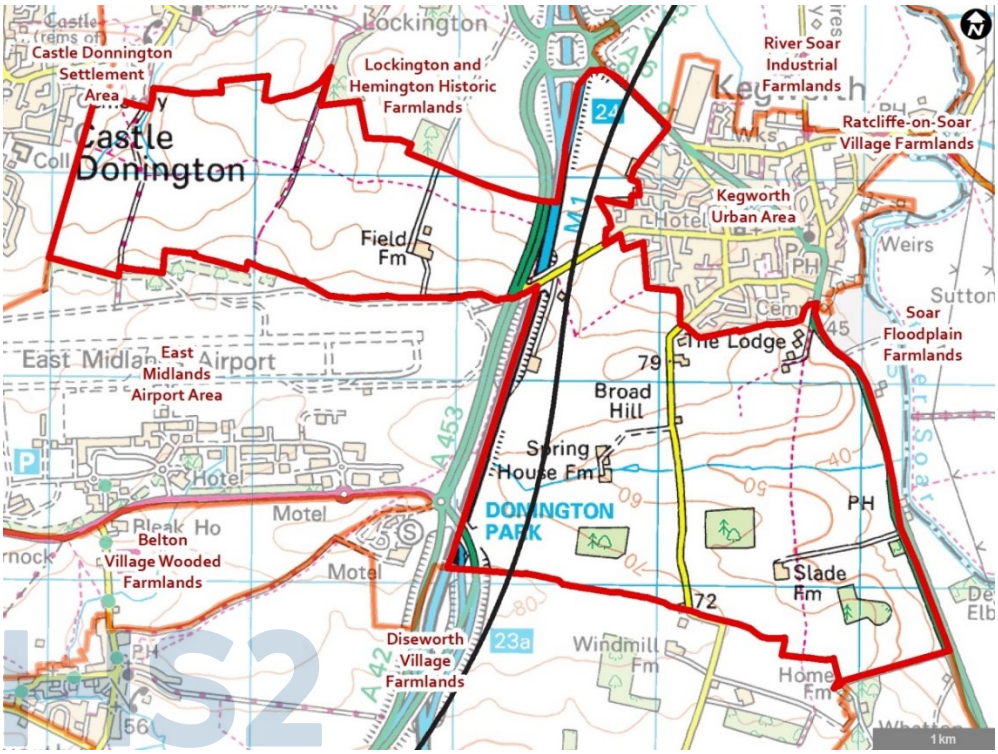
The villages of Diseworth and Long Whatton are both historic, with the cross-shaped pattern of principal streets in Diseworth dating from the 10th century. Both villages have many listed buildings (22 in Diseworth, 16 in Long Whatton), some of which are of medieval timber-framed construction with thatched roofs. The central parts of both villages are designated as conservation areas. Both have Grade II* listed churches. The spire of the St. Michael's and All Angels Church in Diseworth forms a prominent landmark in the local area. Two moated sites with fishponds designated as scheduled monuments lie near to Long Whatton Brook, on the north side of Long Whatton.

The LCA is well served by PRoW, centred on the two villages. Local roads and PRoW radiate out from the villages to the surrounding area. The two villages are connected by the local road, The Green, which also forms part of NCN Route 15 that travels on to Belton in the south and Grantham in the east.

The rural landscape is considerably disrupted by transport corridors associated with the A42 and the M1, which divide the LCA. The M1, which runs on embankment on the western side of Long Whatton Village, forms an intrusive feature and impacts on the tranquillity of the village, although traffic is generally well-screened visually by planting within the highway boundary. Away from the M1 and A42 there is relative tranquillity.

The overall value of this LCA is medium derived from its strong historic rural character impacted by transport infrastructure.

Kegworth Farmlands LCA



Open landscape south of Kegworth

Open landscape west of Kegworth

The Kegworth Farmlands LCA is underlain for the most part by mudstones, with bands of siltstones. This geology has given rise to an undulating lowland landform. The land slopes gently down to the River Soar and its floodplain farmlands, located immediately east of this LCA. In addition, several minor watercourses run across the LCA to meet the River Soar.

The predominant land cover is open arable farmland, with occasional blocks of deciduous woodland. A solar farm is located in the central part of this LCA, south of Kegworth. In general, field boundaries comprise low trimmed hedgerows with few individual trees, although some boundaries are more substantial, in particular a tree-lined stream corridor, which runs west-east across this LCA.

The character of this LCA is predominantly rural, with settlement confined to a few individual farmsteads. However, a large distribution warehousing development (SEGRO Logistics Park, East Midlands Gateway) is currently under construction on the northern side of the East Midlands Airport, which will change the character of the western part of the LCA. The boundaries with the settlements of Kegworth and Castle Donington are distinct, with arable fields extending to meet back gardens of properties on the edges of the settlements. The character of this LCA is influenced by the urban elements along its boundary, such as the airport, which is located on a plateau of higher ground and forms the horizon in views from the northern part of the LCA. The control tower is prominent, forming a local landmark. Other influences include Kegworth and Castle Donington, and the M1/A453 Ashby Road transport corridor, which cuts through this LCA. In addition, the A6 Kegworth Bypass is currently under construction around the south of Kegworth.

Areas of relative tranquillity can be found in parts of this LCA away from these influences.

Three main PRoW run through this LCA, from Springfield Kegworth linking with Diseworth and Castle Donington via Ashby road, and from London Road Kegworth to Mill Lane Long Whatton.

The overall value of this LCA is medium derived from the adverse effect of a range of different infrastructure on the rural landscape character.

Visual baseline

11.3.9 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA04 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx.**xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[114], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.10 Views from residential properties within the area are available from several settlements, including Kegworth, Diseworth, Breedon on the Hill, Worthington, Newbold, Long Whatton, Lount and Tonge and numerous individual farmsteads and properties. Elevated views from settlements are generally restricted to long distance views from Breedon on the Hill and Diseworth.

11.3.11 The A42 corridor and associated elements; junctions, side roads, lighting, signage and gantries, is present throughout LCA and visible from numerous viewpoints in the study area. East of Diseworth, the A42 merges with the M1, increasing the dominance of road transport corridors in local views. Views of the A42 and M1 from settlement edges within the Coleorton to Kegworth area are typically filtered and/or screened by intervening hedgerows and established road side planting. These combine with the gently undulating landform to restrict open views. There are numerous recreational views within the study area. The rural landscape throughout the study area has many PRoW, including the promoted long distance recreational routes of the National

[114] Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath.

Forest Way and the Ivanhoe Way, which pass through/close to the Staunton Harold Estate, Worthington and Newbold in the south of the study area. Similarly, there are some views from Cloud Trail (part of NCN Route 6), which travels through from Cloud Quarry to Tonge, and NCN Route 15, which passes across the study area between Belton and Long Whatton. The degree of visibility from these PRoW and NCN routes is varied. Many expansive open views are available from higher ground, with more enclosed views available within the undulating rural landscape, restricted by landform, woodland and hedgerows.

11.3.12 Users of rural roads and lanes generally experience mixed visibility with restricted views, due to mature roadside hedgerows and trees, giving only glimpses of the views beyond. Views from the A42 are generally restricted by its vegetated cutting slopes. More open, expansive views across the landscape are available from those rural roads, such as Top Brand to the east of Worthington, that follow local ridgelines.

11.3.13 Views from recreational areas throughout the study area are infrequent and located within Diseworth, Breedon on the Hill, Kegworth and Long Whatton. These views are generally limited in extent, due to the presence of intervening features such as built form, landform and different types of vegetation cover. Panoramic views over the surrounding landscape are available from Breedon Hill.

11.3.14 Views from employment areas located within and around East Midlands Airport are restricted by airport boundary planting, the landform of the site and existing buildings, though there could be long distance views from upper storeys of taller buildings. Similarly, there are potential views from the upper storeys of some hotels at the East Midlands Airport. There are potential views from the industrial area on the north-east edge of Kegworth.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2025 and the end of 2029. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[115] to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[116];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings; erection of viaducts; construction of embankments; the removal of existing landscape elements including trees and hedgerows; and the closure and diversion of existing public highways and PRoW. Other key changes would include the construction of overbridges and underbridges, auto-transformer stations, overhead power lines, utility diversions, the presence of transfer nodes and pre-cast yards and demolition of buildings and structures.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 25 would be significantly affected during construction of the Proposed Scheme.

Table 25: Summary description and judgement of effects on LCAs

Packington Enclosed Farmlands LCA	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, level of tranquillity and the strong rural character with some urban and infrastructure influences impart a medium susceptibility to change arising from the Proposed Scheme.	Level of effect: Major adverse (significant)

[115] Supporting document: Draft Code of Construction Practice
[116] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

The LCA would be directly affected by the construction of the Proposed Scheme through the introduction of a wide corridor of change including impact on existing landform, landscape features and pattern, and the introduction of uncharacteristic features that would detract from the rural qualities of the surrounding landscape. Construction of the deep Ashby-de-la-Zouch cutting No. 2 (up to 16m in depth within the LCA), and other smaller earthworks associated with the A512 Ashby Road realignment and A512 Ashby Road overbridge, would result in abrupt changes to the local undulating landform. Construction activity within this part of the study area would require loss of agricultural land, and removal of hedgerow boundaries, woodland and scrub. The loss of vegetation would result in a wide corridor of more open landscape. Removal of the woodland belts alongside the slip roads at junction 13 of the A42 would reduce enclosure and increase the prominence of traffic in the LCA. The scale and prominence of the works, including movement of construction traffic and activities associated with the Junction 13 main compound and the A511 and A512 overbridges satellite compound, would affect the local character of the predominantly rural landscape by the introduction of uncharacteristic features that would detract from the rural qualities of the surrounding landscape. Tranquillity would be reduced by construction vehicle movements and noise. During construction, there would therefore be a high magnitude of change and major adverse effect.	
Calke Wooded Parklands LCA	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The undulating landscape, level of tranquillity, presence of areas of ecological interest, ancient woodland, and rural qualities of the landscape impart a medium-high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by the introduction of a wide corridor of change for the construction of the Proposed Scheme, including impact on existing landform and vegetation cover, and the introduction of uncharacteristic features that would detract from the rural qualities of the landscape. The scale and prominence of construction activity would change the local character of the predominantly rural landscape; construction of the deep Ashby-de-la-Zouch cutting No. 2 (up to 20m in depth within the LCA), and the high (up to 18m in height) Lount embankment, would result in abrupt changes contrasting with the local undulating landform. The construction would require the loss of agricultural land, removal of hedgerows and a large swathe of mixed woodland. The loss of woodland would result in a wide corridor of more open landscape. The areas of ancient woodland at Birch Coppice and Rough Park would not be affected. Tranquillity would be reduced by construction vehicle movements and noise, and activities associated with the Junction 13 main compound. During construction, there would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Newbold Village Farmlands LCA	**Medium susceptibility and sensitivity**
Susceptibility to change: The open character and rural qualities, together with designated historic and ecological areas, impart a medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by the introduction of a wide corridor of change for the construction of the Proposed Scheme, including impact on existing landform and landscape pattern, and the introduction of uncharacteristic features that would detract from the rural qualities of the landscape.	Level of effect: Major adverse (significant)

The scale and prominence of construction activity would change the local character of the predominantly rural landscape, albeit already affected by the presence of the A42 corridor. Construction of the Worthington cutting (up to 15m in depth), and other smaller earthworks associated with Long Hedge Lane overbridge, Breedon Lane realignment, and Breedon Lane overbridge would result in changes to local landform. Construction activity within this part of the LCA would require the removal of agricultural land uses, hedgerow boundaries and associated vegetation, which would affect the characteristic field pattern and landcover. The scale and prominence of the works, including movement of construction traffic and activities associated with the Melbourne Road underbridge satellite compound, and the Long Hedge Lane overbridge satellite compound, would affect the local character of the predominantly rural landscape. Tranquillity would be reduced by construction vehicle movements and noise. During construction, there would therefore be a high magnitude of change and major adverse effect.	
Cloud Hill Quarry LCA	**Medium susceptibility and sensitivity**
Susceptibility to change: The working limestone quarry landscape and nationally important geological site, level of relative tranquillity (interspersed with audible quarry blasting), presence of ancient and peripheral woodland, and distinctive sense of place, have a medium susceptibility to change arising from the Proposed Scheme. The northernmost corner of the LCA would be directly affected by vegetation removal, changes to landform and the introduction of large-scale engineering features from the construction of the Proposed Scheme. The scale and prominent nature of construction activity would change some characteristics of the LCA, which is already affected to a certain extent by the limestone workings at Cloud Hill Quarry. Construction of the Boden Brook viaduct (up to 12m in height), and earthworks of Cloud Hill Quarry embankment No. 2 (up to 12m in height), would result in prominent changes to local landform. Construction activity within this part of the area would require the removal of quarry buildings and mature woodland vegetation associated with Boden Brook, which would result in a more open landscape and increased visibility of the quarry workings in the wider landscape. Tranquillity would be further reduced by construction vehicle movements and noise. During construction, there would therefore be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Belton Village Wooded Farmlands LCA	**Medium susceptibility and sensitivity**
Susceptibility to change: The open, rural characteristics of the landscape, undulating landscape, level of tranquillity, presence of areas of ecological interest and ancient woodland, have a medium susceptibility to change arising from the Proposed Scheme. The scale and prominence of construction activity would change the local character of the predominantly rural landscape, already affected by the A42. Construction would require the loss of agricultural land, removal of hedgerow boundaries and deciduous woodland. A wide corridor of more open landscape and altered landcover pattern would result. Construction of earthworks would result in changes to the local landform due to Cloud Hill Quarry embankment No.2 (up to 12m in height), Gelscoe cutting (up to 14m in depth) and Diseworth south embankment (up to 6m in height) within the LCA. Movement of construction traffic and activities associated with Top Brand main compound and Mill Lane overbridge satellite compound would further affect landscape character. Tranquillity would be reduced by construction vehicle movements and noise.	Level of effect: Major adverse (significant)

During construction, there would therefore be a high magnitude of change and major adverse effect.	
Diseworth Village Farmlands LCA	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, strong sense of place of historic villages and rural character albeit with urban influences impart a medium susceptibility to change arising from the Proposed Scheme. The scale and prominent nature of the construction activity would have an adverse effect on the character of the predominantly rural LCA, already affected by the presence of the A42 and M1 corridors. There would be changes to the local landform across the centre of the LCA due to earthworks associated with construction of the Diseworth south embankment (up to 14m in height in this LCA), Diseworth north embankment (up to 8m in height in this LCA) and from the temporary material stockpile. The landscape would be further changed by construction of the prominent Diseworth Brook viaduct. The construction of the Proposed Scheme would sever and remove agricultural land uses, hedgerow boundaries, and areas of deciduous woodland, which would change the existing pattern of landcover. The loss of woodland would result in a wide corridor of more open landscape. Tranquillity would be reduced by vehicle movements and noise, and activity associated with The Green south satellite compound and The Green north satellite compound. During construction, there would therefore be a high magnitude of change and major adverse effect	Level of effect: Major adverse (significant)
Kegworth Farmlands LCA	**Low-Medium susceptibility and sensitivity**
Susceptibility to change: The rural landscape with urban influences, including development under construction, has a low-medium susceptibility to change arising from the Proposed Scheme. Construction of earthworks for the Proposed Scheme would result in prominent changes to the local landform, due to the Kegworth embankment (up to 12m in height), Kegworth cutting (up to 14m in depth) and the A6 Kegworth embankment (up to 12m in height). A temporary earthworks stockpile located within the south-east quadrant of junction 24 of the M1 would also alter landform characteristics. The area of land required during construction of the Proposed Scheme would result in the loss of farmland, hedgerow field boundaries and some trees. There would be direct impacts on the tree-lined unnamed stream, near Spring House Farm, where it would be crossed by the Proposed Scheme. The LCA is already altered by the M1/A453 Ashby Road corridor and the large East Midlands Gateway development currently under construction; however, the scale and prominence of construction activity for the Proposed Scheme, including activities associated with Ashby Road main compound, would have an adverse effect on the landscape character of the predominantly rural part of the LCA. Tranquillity would be further reduced by construction vehicle movements and noise. During construction, there would therefore be a high magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Visual assessment

Introduction

11.4.9 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

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

11.4.11 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.12 Table 26 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA04 Map Book.

Table 26: Construction phase potentially significant visual effects

View north-west from Leicestershire M30/1 Footpath **(VP 365-03-001) (Map Number LV-03-365)**	**Medium-high sensitivity visual receptors**
Footpath users at this location would have views of construction works, which would occupy a large extent of the rising ground in the middle distance. Low hedgerow field boundaries in the foreground would provide some limited screening of views. Woodland would be removed from the skyline, and replaced by construction activities, which would be a noticeable change to the background of the view. The scale of construction works associated with the substantial earthworks for Lount embankment (up to 18m in height) would dominate and change the characteristics of middle distance views. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
View north-west from Leicestershire M56/2 Footpath (Medium-high sensitivity receptors) **(VP 366-03-004) (Map Number LV-03-366)**	**Medium-high sensitivity visual receptors**
Footpath users would have open, medium- to long-distance views of the construction works, including the earthworks associated with Worthington cutting, the site haul route and movement of construction vehicles. These would form noticeable and uncharacteristic elements across part of the view. Activities associated with the Melbourne Road underbridge satellite compound would be partially visible in oblique distant views, seen beyond the retained part of a woodland copse in the middle distance. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
View north-west from Leicestershire M36/1 Bridleway, north of Worthington **(VP 367-03-002) (Map Number LV-03-367)**	**Medium-high sensitivity visual receptors**

Bridleway users would have close and middle-distance views of the construction works located on rising ground, and of activities associated with the construction of Worthington cutting and Breedon Lane overbridge. Breedon Lane overbridge satellite compound would be noticeable in the middle distance. Construction activity for Boden Brook viaduct would be perceptible in more distant, oblique views. Vehicles using the site haul route would be visible moving across the view. The scale of construction works would dominate close to middle distance views. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
View north-west from residences and Leicestershire L31/1 Bridleway, north of Long Mere Farm **(VP 369-02-002) (Map Number LV-03-369)**	**High sensitivity visual receptors**
Residents of Long Mere Farm and users of L31/1 Bridleway would experience a substantial alteration to existing open views. There would be close and middle-distance views of construction activities associated with Diseworth south embankment, and oblique views towards the construction of Long Mere Lane overbridge. Long Mere Lane overbridge satellite compound would be prominent in the midground. Vehicles using the site haul route would be visible moving across the view. The removal of hedgerows would increase the visibility of traffic using the A42 for a part of the construction period, before the construction of the intervening Diseworth south embankment. Construction works would be visible across the majority of the view, dominating the middle distance. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
View north-west from residences, West End, west of Long Whatton **(VP 370-02-003) (Map Number LV-03-370)**	**High sensitivity visual receptors**
Residents and users of West End would have close and middle-distance views to construction activity, partially screened by sections of retained hedgerows in the foreground. The scale of construction activity associated with the high (up to 18m in height) Diseworth Brook viaduct and Diseworth south embankment would dominate the middle distance and substantially change the character of the view. The removal of existing trees and hedgerows alongside Westmeadow Brook and Diseworth Brook would remove distinctive landscape features. For part of the construction period the view would include The Green south satellite construction compound and a temporary material stockpile adjacent to the A42. However, these would be screened from view once the Diseworth south embankment earthworks are in place. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
View east from residences, The Green, near Wood Nook Farm **(VP 370-02-005) (Map Number LV-03-370)**	**High sensitivity visual receptors**
Residents and users of The Green would have middle distance views of prominent construction works associated with the high (up to 18m) Diseworth Brook viaduct and Diseworth south embankment. Views would be partially screened by foreground hedgerows and by existing belts of woodland extending along both sides of the A42 (in cutting). During winter months, filtered views would include The Green south satellite construction compound and a temporary material stockpile adjacent to the A42. The scale of construction works for the Diseworth Brook viaduct would change the skyline of views, and introduce prominent, uncharacteristic elements across part of the view. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)

View north-west from residences, West End, Long Whatton **(VP 370-02-004) (Map Number LV-03-370)**	**High sensitivity visual receptors**
Residents and users of West End would have middle distance views to construction activity, partially screened by hedgerow trees in the fore and middle ground. The removal of a section of existing trees and hedgerows alongside Long Whatton Brook would remove distinctive landscape features and open up views towards traffic on the M1. There would be views of activity at The Green north satellite construction compound, and views of construction traffic using the site haul route, alongside the M1. Construction works associated with the high (up to 18m) Diseworth Brook viaduct and Diseworth north embankment would be visible in the distance. Whilst existing vegetation would provide some screening in summer, the scale of the structures would result in a noticeable change to the skyline of views. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
View west from residences, Ashby Road and Leicestershire L45a/1 Footpath, at the western edge of Kegworth **(VPs 371-02-003 and 372-02-001) (Map Numbers LV-03-371 and LV-03-372a)**	**High sensitivity visual receptors**
Footpath users and residents would experience middle to long distance views of the construction works located on rising ground. Activities associated with the construction of the Kegworth cutting and of structures (Runway Approach Lights overbridge, A6 Kegworth Bypass overbridge and the Ashby Road North overbridge) would be prominent on the skyline, changing the characteristics of views.Activities at the A6 Kegworth Bypass overbridge satellite compound, and construction traffic using the site haul route, would be noticeable in the middle distance. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)

Other mitigation measures

11.4.13 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents and users of PRoW and main roads within the study area.

11.4.15 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to five LCAs;
- moderate adverse effects in relation to two LCAs;
- major adverse visual effects at four residential viewpoint locations;

- moderate adverse visual effects at two residential viewpoint locations;
- major adverse visual effects at two recreational viewpoint locations; and
- moderate adverse visual effects at one recreational viewpoint location.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with year 30 (2063) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments (such as A6 Kegworth embankment) and cuttings (such as Worthington cutting) into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable. Earthworks design also takes account of the relationship to surrounding land uses and management, such as agriculture;
- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the loss of existing woodland around the Lount embankment, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to visually soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; and
- compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement in the Boden, Diseworth, Westmeadow and Long Whatton Brook corridors.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the Diseworth Brook and Boden Brook viaducts, the Long Mere Lane overbridge and the presence of earthworks and auto-transformer stations. Other aspects include the presence of overhead line equipment.

Landscape assessment

11.5.4 Based on the current design, it is anticipated that the LCAs described in Table 27 would be significantly affected during the operation of the Proposed Scheme.

Table 27: Operational phase significant landscape effects

Packington Enclosed Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, tranquillity and the strong rural character despite urban and infrastructure influences impart a medium susceptibility to change arising from the Proposed Scheme. Year 1: Ashby-de-la-Zouch cutting No. 2 (up to 16m in depth within the LCA), and other smaller embankments associated with the A512 Ashby Road realignment and A512 Ashby Road overbridge, would cause abrupt changes inconsistent with the local undulating landform. These features would create permanent change largely uncharacteristic of this LCA despite the presence of smaller existing landform alterations in the LCA, associated with A42junction 13 and the railway cutting to the east. Overhead line equipment and other vertical elements would increase infrastructure in the rural landscape, albeit in an area already affected by the presence of a wind turbine and highway infrastructure. Field boundary hedgerows, and belts of trees flanking the existing A512 Ashby Road would be lost during construction creating a more open landscape. Replacement planting would not be established at year 1. An island of land would be enclosed by the Proposed Scheme and the A42, and the A512 Ashby Road realignment would bisect an arable field, with resultant changes to the land cover and field pattern. There would be changes to the PRoW network, as Leicestershire Footpath M60/3 would be realigned. The movement of trains, and associated noise, would reduce the level of tranquillity within the LCA. A relatively small part of the LCA would be affected by the Proposed Scheme. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Substantial areas of woodland habitat creation to the east of the Proposed Scheme would replace vegetation lost during construction and help to enclose the Proposed Scheme and integrate structures into the landscape. Hedgerow planting along the top of the Ashby-de-la-Zouch cutting No.2 and flanking the A512 Ashby Road realignment would create links to the surrounding network of hedges. However, the operational railway and extensive cutting would remain as uncharacteristic features of the landscape. Therefore, the medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Calke Wooded Parklands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The undulating landscape, level of tranquillity, presence of areas of ecological interest and ancient woodland, and rural qualities of the landscape impart a medium-high susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be directly affected through landscape severance, landform and vegetation changes. Ashby-de-la-Zouch cutting No. 2 (up to 20m in depth within the LCA), and the high (up to 18m) Lount embankment, would change the local landform, creating uncharacteristic elements of permanent change. in shallow cutting and on embankment Vertical elements such as overhead line equipment would be visible and add infrastructure elements to the landscape which would detract from the rural character.	Level of effect: Moderate adverse (significant)

Loss of woodland would result in a wide corridor of more open landscape through the LCA. Replacement planting would not yet be established. The level of tranquillity in the LCA would be reduced due to the movement of trains and associated noise. The new cutting and embankment would be prominent, uncharacteristic features of the landscape. However, the Proposed Scheme would be enclosed by existing woodland for much its length through the LCA, lessening its prominence in the wider LCA. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Woodland habitat creation planting proposed on both sides of the Proposed Scheme would replace vegetation lost during construction, help to enclose the Proposed Scheme, help integrate changes in landform, and assist with some integration of structures into the landscape. The operational railway, extensive Ashby-de-la-Zouch cutting No. 2 and Lount embankment would remain uncharacteristic features, thereby maintaining the medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Newbold Village Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The open character and rural qualities, together with areas designated for historic and ecological interest, impart a medium susceptibility to change arising from the Proposed Scheme. Year 1: This LCA would be directly affected by the Proposed Scheme due to landscape severance, changes to landform, and loss of landscape features and vegetation cover. The Proposed Scheme would curve through the middle of the LCA, roughly parallel to the existing A42. This would sever arable land and cause loss of hedgerow vegetation including mature trees. A strip of farmland, at its narrowest just over 100m wide, would be isolated and enclosed between the route of the Proposed Scheme and the A42 to the west, forming an uncharacteristic feature in the field pattern of the LCA. The Worthington cutting (up to 15m in depth) would create a permanent uncharacteristic feature in the undulating landform, but the operational railway would be largely screened, reducing its prominence in the wider LCA. Vertical elements of the Proposed Scheme, such as overhead line equipment, would increase the prominence of infrastructure elements within the rural landscape, where visible (for example in shallow cutting or elevated sections at Lount embankment and Boden Brook viaduct). The Proposed Scheme would have permanent impacts on local tranquillity due to noise and train movement. The loss of mature woodland vegetation associated with Boden Brook would result in a more open landscape and increased visibility of the quarry workings in the wider landscape. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Areas of woodland planting and hedgerows would be sufficiently established to provide some landscape integration with the existing network of field boundaries. However, Worthington cutting and visible parts of the operational railway, would still present an uncharacteristic feature across the LCA substantially altering the character and landscape pattern across the centre of the LCA. Therefore, the medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Cloud Hill Quarry	**Medium susceptibility and sensitivity**

Susceptibility to change: The working limestone quarry landscape and nationally important geological site, the level of relative tranquillity (interspersed with audible quarry blasting), presence of ancient woodland, peripheral woodland and distinctive sense of place, have a medium susceptibility to change arising from the Proposed Scheme. Year 1: The northernmost corner of the LCA would be directly affected by the Proposed Scheme, mainly due to landform changes and loss of woodland and other vegetation. The Boden Brook viaduct (up to 12m) and earthworks associated with the Cloud Hill Quarry embankment No. 2 (up to 12m) would introduce uncharacteristic prominent and permanent changes to local landform. On the viaduct and embankment, vertical elements of the Proposed Scheme such as overhead line equipment would be particularly visible, and add prominent infrastructure elements in the landscape, which would detract from rural character. Tranquillity would be further reduced by noise and movement of trains. There would therefore be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Ecological wetland habitat creation proposed on the northern side of the Proposed Scheme would replace some of the vegetation lost during construction and enhance habitat along the Boden Brook. Boden Brook viaduct and Cloud Hill Quarry embankment No. 2 would remain as prominent, uncharacteristic features of the landscape. Therefore, the medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Belton Village Wooded Farmlands	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The open, rural characteristics of the undulating landscape, the level of tranquillity and presence of areas of ecological interest and ancient woodland have a medium-high susceptibility to change arising from the Proposed Scheme. Year 1: This LCA would be directly affected by the Proposed Scheme due to landscape severance, changes to landform, loss of landscape features and changes to vegetation cover. The Proposed Scheme would permanently alter the local landform by introducing part of the Cloud Hill Quarry embankment No.2 (up to 12m in height), the large Gelscoe cutting (up to 14m in depth) and the Diseworth south embankment (up to 4m in height within the LCA) into an area of undulating landform, creating prominent and uncharacteristic features across the centre of the LCA. The Proposed Scheme would sever farmland and cause loss of hedgerow vegetation including mature trees. A strip of farmland, at its narrowest around 100m wide, would be isolated and enclosed between the Proposed Scheme and the A42 to the west, forming an uncharacteristic field pattern in the LCA. The loss of hedgerows, trees and woodland would result in a wide corridor of more open landscape through the LCA. Although woodland, wetland and hedgerow mitigation planting is proposed, this would not be sufficiently established to provide any landscape integration at year 1. Vertical elements of the Proposed Scheme, such as overhead line equipment, visible on embankment, would increase the prominence of infrastructure elements in the landscape and detract from rural character. Leicestershire Footpaths M17/1 and L32/1 would be severed by the Proposed Scheme and permanent diversions incorporated. The Proposed Scheme would have permanent impacts on local tranquillity due to noise and train movement. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Year 15: Woodland planting would be sufficiently established to provide some integration of landform and structures into the landscape. Proposed ecological mitigation and hedgerow planting would link with existing woodland and field boundary network, and would replace vegetation lost during construction. However, the presence of the operational railway would remain as a prominent uncharacteristic feature across the centre of the LCA, substantially altering the character and landscape pattern. Therefore, the medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Diseworth Village Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The undulating landform, strong sense of place of historic villages and rural character, albeit with urban influences, impart a medium susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be directly affected by alterations to landform, severance of the landscape, changes to landscape features and field pattern, and loss of vegetation including trees and hedgerows. The prominent engineering earthworks of Diseworth south embankment (up to 14m), Diseworth north embankment (up to 8m) and associated balancing ponds would alter the local undulating landform. There would be loss of characteristic features of the LCA, including agricultural land, woodland, hedgerows and some mature hedgerow trees. There would be changes in field patterns from severance and the isolation of a strip of farmland (at its narrowest under 75m wide) between the Proposed Scheme and the A42. Leicestershire Footpaths L50/4 and L32/1 would be severed by the Proposed Scheme, and their routes permanently realigned/diverted. Diseworth Brook viaduct (up to 18m in height) would form a prominent structure in the landscape. Other vertical elements such as overhead line equipment, would increase the presence of infrastructure features within the rural landscape. Noise and train movement would permanently impact on local tranquillity. Proposed areas of landscape mitigation planting would not provide any landscape integration at year 1. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Landscape mitigation planting and hedgerow planting would assist with some integration of earthworks and structures into the landscape by the summer of year 15. However, the presence of viaduct and embankments would remain as uncharacteristic elements across the landscape, and would alter the landscape character of the LCA. Therefore, the medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)
Kegworth Farmlands	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The predominantly rural landscape, (with urban influences including development under construction), imparts a low-medium susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be directly affected by the Proposed Scheme due to landscape severance, changes to landform and loss of landscape features and vegetation cover.	Level of effect: Moderate adverse (significant)

Kegworth embankment (up to 12m in height), Kegworth cutting (up to 14m in depth) and the A6 Kegworth embankment (up to 12m in height) would create changes in the undulating landform within the LCA. These features would introduce elements of permanent change, which are uncharacteristic features of this LCA. There would be direct impacts on the landscape because of the removal of characteristic features of agricultural land and hedgerows, some of which include mature trees. Vertical elements such as overhead line equipment would be visible on the embankments, adding to the prominence of infrastructure elements in the landscape, and detracting from rural character. Tranquillity within the LCA would be further reduced by the noise and movement of trains. The Proposed Scheme would affect the part of the LCA located to the east of the A42. The new cutting and embankment earthworks would be prominent, permanent features in the landscape. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Landscape mitigation planting and hedgerow planting would assist with some integration of earthworks and structures into the landscape by the summer of year 15. However, the presence of the embankments and cutting would remain as uncharacteristic elements across the landscape, would be uncharacteristic of the LCA and would substantially alter the landscape character. Therefore, the overall medium magnitude of change and moderate adverse effect would remain.	Level of effect: Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.

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

11.5.7 Table 28 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: LA04 Map Book.

Table 28: Operational phase significant visual effects

View north-west from Leicestershire M30/1 Footpath **(VP 365-03-001) (Map Number LV-04-365)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Footpath users would experience substantial changes to middle distance views. The high (up to 18m) Lount embankment would form a prominent feature extending across the view; overhead line equipment and train movement would appear near to the skyline, and be more open as a result of woodland loss. At the southern end of Lount embankment, Birch Coppice auto-transformer station would be a noticeable feature located on high ground, near to the skyline.	Level of effect: Major adverse (significant)

Low hedgerow field boundaries in the foreground would provide some limited screening in summer and winter views. There would therefore be a high magnitude of visual change and major adverse visual effect.	
Year 15 – summer: Habitat creation woodland on the near side of Lount embankment would partially screen views of the embankment and train movement on the lower parts of the embankment. Overhead line equipment would remain noticeable. Replacement planting between the Proposed Scheme and the A42 corridor, would re-create the wooded skyline and provide a backdrop to the visible elements. The magnitude of visual change would therefore reduce to medium, with moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
View north-west from Leicestershire M56/2 Footpath **(VP 366-03-004) (Map Number LV-04-366)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Footpath users would experience noticeable changes to middle distance views in both winter and summer of year 1. The depth of the Worthington cutting (up to 12m below ground level in this area) would be sufficient to screen most views of trains and overhead line equipment. However, views directed past the retained area of woodland in the middle ground would be towards the shallower southern end of the cutting, and towards Lount embankment, where the tops of trains and overhead line equipment would be noticeable. Parts of the far side of Worthington cutting would also be perceptible in some locations, depending on the landform, forming an uncharacteristic feature across part of the view. The loss of woodland, hedgerows and individual trees from the middle ground would also change the characteristics of views. Landscape mitigation planting and hedgerow planting would not contribute to any visual integration at this stage. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant
View north-west from Leicestershire M36/1 Bridleway, north of Worthington **(VP 367-03-002) (Map Number LV-04-367)**	**Medium-high sensitivity visual receptors**
Year 1 – winter and summer: Bridleway users would experience noticeable changes to middle distance views in both winter and summer of year 1 from this elevated viewpoint. An access road and a large balancing pond with engineered slopes would form prominent features in the middle ground. Beyond, train tops and overhead line equipment would be noticeable at the end of Worthington cutting. South of Breedon Lane overbridge (which would itself be a noticeable element in the view) Worthington cutting would be sufficiently deep to screen views of trains and overhead line equipment. In more oblique distant views to the north, Cloud Hill Quarry embankment and Boden Brook viaduct would be visible and trains would be audible. Landscape mitigation planting would not contribute to any visual integration at this stage. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer:	Level of effect:

Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	Non-significant
View north-west from residences and Leicestershire L31/1 Bridleway, north of Long Mere Farm **(VP 369-02-002) (Map Number LV-04-369)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents of Long Mere Farm and users of Leicestershire L31/1 Bridleway would have open views from a slightly elevated location towards Diseworth south embankment in the middle distance in both winter and summer of year 1. The embankment (up to 6m in height) together with overhead line equipment and the movement of trains would form a continuously highly visible feature across the view, but would screen views of A42 traffic beyond; in effect replacing the A42 transport corridor in views, at a closer distance. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant
View north-west from residences, West End, west of Long Whatton **(VP 370-02-003) (Map Number LV-04-370)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents and users of West End would have middle distance views to the Diseworth Brook viaduct and adjoining Diseworth south embankment, partially screened by sections of retained hedgerows in the foreground. The high (up to 18m in height) viaduct structure and earthworks would form a highly prominent and uncharacteristic feature, forming the skyline across the majority of the view in both winter and summer of year 1. There would therefore be a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
Year 15 – summer: The Diseworth Brook viaduct and Diseworth south embankment would remain as visually prominent features of middle-distance views. Wetland habitat creation alongside Westmeadow Brook will soften views, but not screen. The existing retained sections of hedgerows in the foreground would provide some limited screening of views. There would therefore remain a high magnitude of visual change and major adverse visual effect.	Level of effect: Major adverse (significant)
View east from residences, The Green, near Wood Nook Farm **(VP 370-02-005) (Map Number LV-04-370)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents and users of The Green would have middle distance views towards the high (up to 18m) Diseworth Brook viaduct and Diseworth south embankment. The viaduct and embankment would form a prominent feature across the skyline, partially screened (summer) or filtered (winter) by foreground hedgerow trees and by the existing belts of woodland that extend along both sides of the A42. There would therefore be a medium magnitude of visual change and moderate visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer:	Level of effect:

Although existing foreground vegetation and mitigation planting between the A42 and the Proposed Scheme would partially screen views of Diseworth Brook viaduct and Diseworth south embankment, the viaduct structure would remain as a visually prominent feature in the middle distance. There would therefore remain a medium magnitude of visual change and moderate adverse visual effect.	Moderate adverse (significant)
View north-west from residences, West End, Long Whatton **(VP 370-02-004) (Map Number LV-04-370)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents and users of West End would have middle distance views of the high (up to 18m) Diseworth Brook viaduct and adjoining Diseworth north embankment. The M1 embankment would mostly screen views of the viaduct structure, but the viaduct would be visible where it crosses over the M1 embankment. Existing hedgerow trees in the foreground and middle ground would provide some filtering of views in winter and partial screening in summer. However, the scale of the viaduct structure, together with overhead line equipment and train movement would result in a noticeable change to the skyline of views. M1 traffic would be more visible following loss of existing trees and hedgerows at Long Whatton Brook. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Mitigation planting adjacent to Diseworth north embankment would partially screen views of the embankment, but train movement and overhead line equipment, would remain noticeable. Views of the high Diseworth Brook viaduct would be unchanged, and the viaduct structure would remain as a prominent feature in the middle distance, although screened for the most part by the M1 embankment. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
View west from residences, Ashby Road and Leicestershire L45a/1 Footpath, at the western edge of Kegworth **(VPs 371-02-003 and 372-02-001) (Map Numbers LV-04-371 and LV-04-372a)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Residents and footpath users would experience noticeable changes to middle distance views as a result of the Proposed Scheme in both winter and summer of year 1. The A6 Kegworth Bypass and Ashby Road north overbridges would be visible at the top of the rising ground, interrupting the skyline, and changing the characteristics of views. The Kegworth cutting (up to 14m in depth), would screen views of trains and overhead line equipment from these viewpoints. There would therefore be a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Hedgerow planting along the top of the Kegworth cutting would provide some partial screening of views of the A6 Kegworth Bypass overbridge and Ashby Road north overbridge structures. However, the structures would remain as noticeable features on the skyline of views. There would therefore remain a medium magnitude of visual change and moderate adverse visual effect.	Level of effect: Moderate adverse (significant)

Other mitigation measures

11.5.9 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section. Effects in year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, additional planting or greenspace, including use of materials, would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.10 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse effects in relation to seven LCAs;
- major adverse visual effects at one residential viewpoint location;
- moderate adverse visual effects at four residential viewpoint locations; and
- moderate adverse visual effects at one recreational viewpoint location.

Monitoring

11.5.11 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

11.5.12 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Coleorton to Kegworth area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Coleorton to Kegworth area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with North West Leicestershire District Council (NWLDC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3: Route-wide effects (Section 12).

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1, Section 8 and the SMR[117].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Coleorton to Kegworth area. It lies within the administrative area of NWLDC. It also falls within the Leicester and Leicestershire Local Enterprise Partnership (LEP)[118] area and East Midlands region.

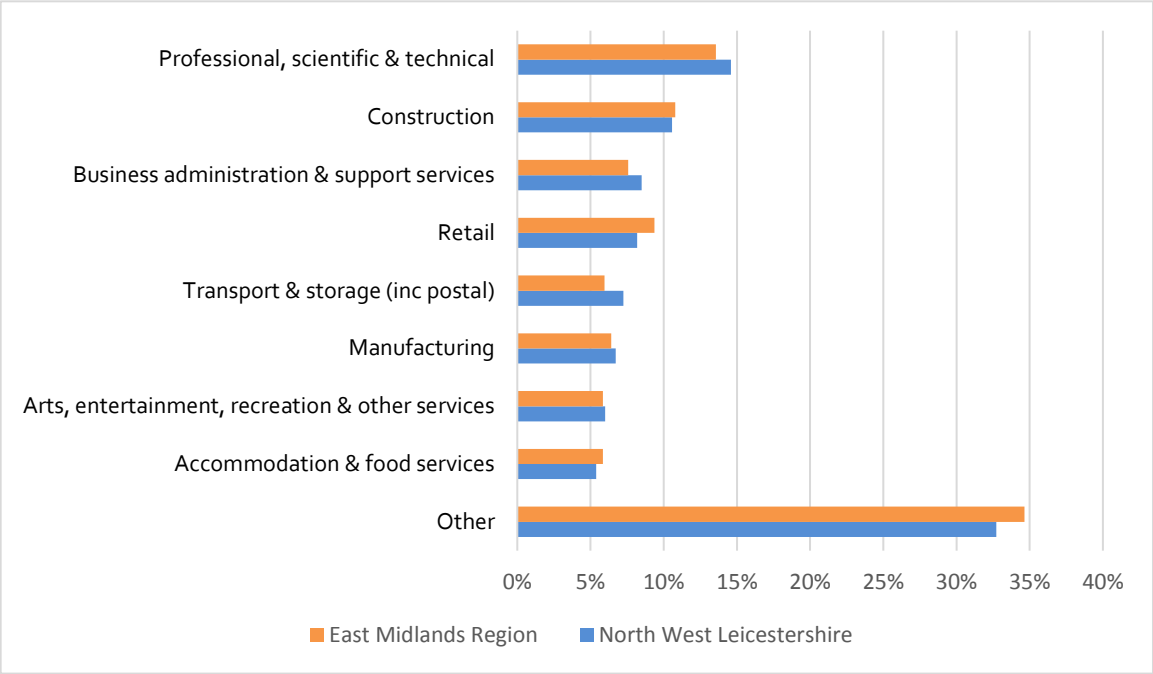
Business and labour market

12.3.2 Within the NWLDC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (15%), with construction the second

[117] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[118] Leicester and Leicestershire Enterprise Partnership (2014), Strategic Economic Plan 2014 to 2020 – Executive Summary. Available online at: https://www.llep.org.uk/wp-content/uploads/2015/03/LLEP-Strategic-Economic-Plan-Executive-Summary-without-projects.pdf

largest (11%) followed by business administration and support services (9%), as shown in Figure 8. For comparison within the East Midlands region, the largest sectors were professional, scientific and technical (14%), followed by construction (11%) and retail (9%)[119].

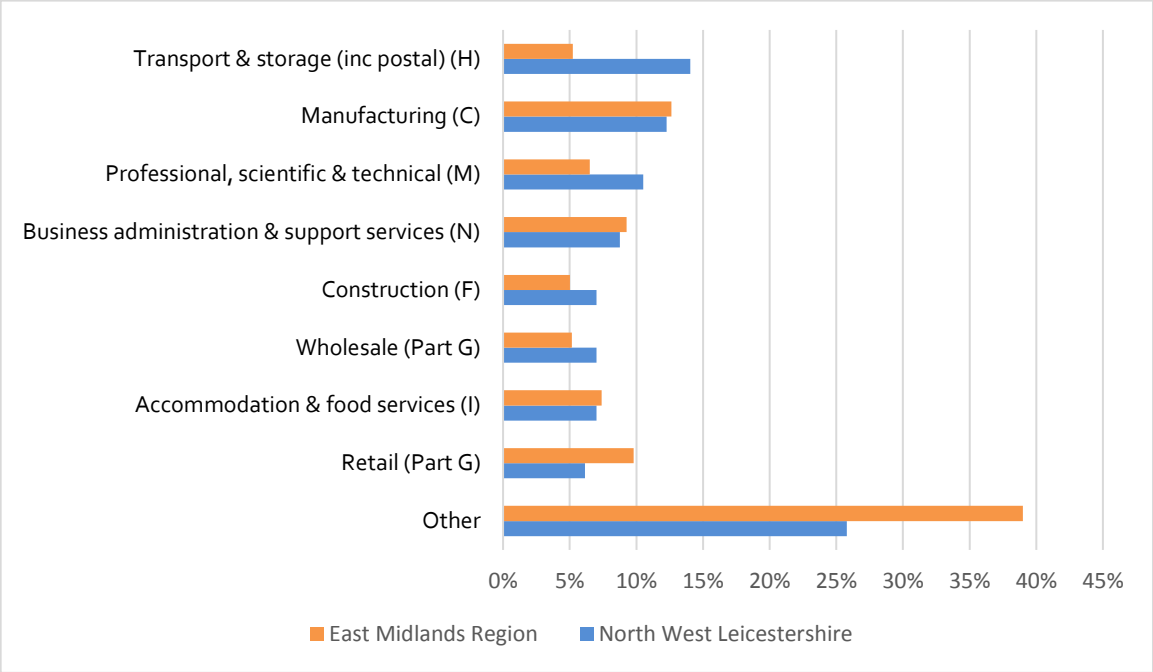
Figure 8: Business sector composition in NWLDC area and the East Midlands region [120]



12.3.3 In 2016[121], approximately 57,000 people worked in the NWLDC area. According to the Office for National Statistics (ONS) Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in NWLDC area were: transportation and storage (14%); manufacturing (12%); professional, scientific and technical activities (11%); business administration and support (9%); and accommodation and food services (7%). These compare with the top five sectors for the East Midlands region, which were: manufacturing (13%); health (13%); retail (10%); business administration and support (9%); and education (8%). This is shown in Figure 9.

[119] Office for National Statistics; UK Business count –Local Units 2015. Available online at: https://www.nomisweb.co.uk
[120] 'Other' includes: Information and communication; Manufacturing; Wholesale; Transport & storage (including postal); Motor trades; Property; Education; Financial and insurance; Public administration and defence; Mining, quarrying and utilities.
[121] Office for National Statistics; 2016; Business Register and Employment Survey. Available online at: http://www.nomisweb.co.uk, This number includes both residents and non-residents of NWLDC who work within its boundaries

Figure 9: Employment by industrial sector in the NWLDC area and the East Midlands region



12.3.4 According to the Annual Population Survey (2016)[122], the employment rate[123] within the NWLDC area was 77% (45,500 people), which is more than that recorded for both the East Midlands region (75%) and England (74%). In 2016, unemployment[124] in the NWLDC area was 4.1%, which was less than that recorded both for the East Midlands region (4.3%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[125], 39.8% of NWLDC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31.3% in the East Midlands and 38% in England, while 4.9% of residents had no qualifications, which was lower than that recorded both for the East Midlands region (7.5%) and England (8%).

Property

12.3.6 A review of employment land in 2012[126] identified a need per year to 2026 for 7.4ha of Industrial (B1c/B2[127]) land, of which 3.7ha would be new land, 20.2ha of Warehousing (B8[128]), of which 15.1ha would be new land, and 1.9ha of office floor space (B1a/b[129]),

[122] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[123] The proportion of working age (16-64 year olds) residents that is in employment.
[124] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[125] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[125] Leicester and Leicestershire HMA Employment Land Study 2012 Update, (2012), Leicester City Council.
[125] Leicester and Leicestershire HMA Employment Land Study 2012 Update, (2012), Leicester City Council.
[126] The Leicester and Leicestershire Employment Land Study, (2012), Available online at: https://www.leicester.gov.uk/media/177978/leicestershire-employment-land-review-2012.pdf
[127] B1C is Light Industrial Land Use, B2 is Industrial and Manufacturing Land Use as defined under Employment Density Guidance, HCA (2015)
[128] B8 Storage and Distribution Land Use as defined under Employment Density Guidance, HCA (2015)
[129] B1a is Office Land Use and B1b is R&D Space Land Use as defined under Employment Density Guidance, HCA (2015)

of which 1ha would be new land, in the NWLDC area. There has been an historic shortfall in the provision of employment land up until 2011[130]. East Midlands Distribution Centre and land adjacent to East Midlands Airport are the largest current proposals for employment land. A strategic employment site within Coalville Sustainable Urban Extension (SUE) has been identified as providing key opportunities for employment growth[131].

12.3.7 The average vacancy rate for industrial and warehousing property in the NWLDC area will be reported in the formal ES[132].

12.3.8 Based upon the latest available data from the Estates Gazette (October 2017 [133]) there is 33,000 m² of office space and 984,000 m² of industrial space available in the NWLDC area.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[134] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

[130] Leicester and Leicestershire HMA Employment Land Study 2012 Update, (2012), Leicester City Council.
[131] Leicester and Leicestershire HMA Employment Land Study 2012 Update, (2012), Leicester City Council.
[132] Data supplied to date gave a spuriously high percentage of stock availability due to a timing issue in so far as property offer data being based on the current offers shown on EGi system at the point that the data was interrogated, whilst stock data is historic and typically lags by a couple of years. As such if a large amount of new space is marketed it can appear as a large % in relation to the historic stock figure taken from the latest release from VOA data. The data has therefore been omitted at this stage as it is not considered representative.
[133] Based on marketed space identified from Estates Gazette data (EGi) (March 2018). Available online at: https://www.egi.co.uk/Property/Availability/
[134] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations; both will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 It is currently anticipated that there would be two main construction compounds – at Top Brand and Ashby Road – and 10 satellite compounds in the Coleorton to Kegworth area. These sites could result in the creation of up to 2,834 person years of construction employment opportunities[135], broadly equivalent to 283 full-time jobs, which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.4 Direct construction employment could also lead to opportunities for local businesses to form part of the supply chain for the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

[135] 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.

12.4.7 Overall, one business accommodation unit or site in the study area would experience direct impacts as a result of the Proposed Scheme. This is Breedon Cloud Hill Quarry and forms one defined resource, providing 26 jobs.

12.4.8 The resource, which would experience direct impacts, would be subject to potentially significant effects on business activities and employment as shown in Table 29.

Table 29: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Breedon Cloud Hill Quarry	Quarrying and processing of aggregates, asphalt and concrete – site employs 26 staff but is part of wider Breedon business

Impact magnitude

12.4.9 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.10 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.11 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently anticipated that the significance of the resultant effects would be as set out in Table 30. It should be noted that a precautionary approach has been taken in this assessment as outlined in Section 1.2 and the significance of the effects may change by the time of the formal ES.

Table 30: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Breedon Cloud Hill Quarry	Moderate	Moderate	Significant – moderate adverse – Moderate magnitude rating and medium sensitivity rating – 26 employees only due to automation at the site

12.4.12 The construction of the Proposed Scheme would require the demolition of buildings which form part of the Breedon Cloud Hill Quarry site. Due to the nature of the site, it is expected that the buildings would be relocated on the existing site and plant relocated within the site. The effect on the Breedon Cloud Hill Quarry, and its employees, is assessed to be moderate adverse and therefore significant.

12.4.13 Across all of the resources reviewed, it is currently anticipated that an estimated 26 jobs would either be displaced or possibly lost within the Coleorton to Kegworth area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the NWLDC authority area (approximately 57,000 jobs) and the scale of economic activity and opportunity in the area.

12.4.14 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

12.4.15 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.16 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the route of the Proposed Scheme in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.17 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently anticipated that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

12.5.3 In-combination effects will be assessed and reported in the formal ES.

Operational employment

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

12.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Coleorton to Kegworth area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Coleorton to Kegworth area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[136]; and
- 'non-residential receptors'[137] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[138]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[139], planning policy, planning practice guidance on noise (PPGN) [140] and EIA Regulations as described in the Scope and Methodology Report[141] (SMR).

13.1.3 Engagement has been undertaken with North West Leicestershire District Council (NWLDC) and Leicestershire County Council (LeCC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Coleorton to Kegworth area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: LA04 Map Book. Map series SV-01

[136] 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.
[137] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[138] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[139] Noise Policy Statement for England (2015) Department for Environment, Food & Rural Affairs (Defra).
[140] Planning Practice Guidance – Noise (2014) Department for Communities and Local Government (DCLG). Available online at: https://www.gov.uk/guidance/noise--2
[141] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The Coleorton to Kegworth area is predominantly rural in character, with agriculture being the primary land use. Agricultural land is interspersed with woodland, villages and a scattering of isolated dwellings and farmsteads. The sound environment is generally dominated by local and distant road traffic, overflying aircraft due to the proximity to East Midlands Airport, and local neighbourhood sources, with contributing natural and agricultural sounds.

13.3.3 There are a number of main roads that contribute to the sound environment within the Coleorton to Kegworth area: the A42, which runs through the majority of the area approximately parallel to the route of the Proposed Scheme; the M1, which runs near Long Whatton, Diseworth and Kegworth; the A511 Ashby Road from Ashby-de-la-

Zouch to Coalville; the A512 Ashby Road from Ashby-de-la-Zouch to Coleorton; the A453 near Tonge; the A453 Ashby Road near Diseworth and Kegworth; the A6 Derby Road in Kegworth; the A6 London Road in Kegworth; and the A453 Remembrance Way near Kegworth.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.

13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors would not generally be adversely affected by vibration. Further information is provided in Volume 1 (Section 8).

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[142], Roads[143] or Railways[144]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA04 Map Book) shows any noise Important Areas in the Coleorton to Kegworth area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[145]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.3 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during

[142] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra).
[143] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra).
[144] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra).
[145] Supporting document: Draft Code of Construction Practice

construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[146].

- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities.
- contractors would be required to comply with the terms of the draft CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.4 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.5 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed

[146] Including local businesses and quiet areas designated by the local authority.

Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA04 Map Book):

- Long Whatton, arising from construction and use of the access road and The Green north satellite compound; and
- Kegworth, arising from construction activities such as cutting formation, embankment formation, landscape bund construction, balancing pond construction and overbridge construction.

13.4.7 Map Series SV-01 (Volume 2: LA04 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, the CEEP (Community Education Enterprise Projects) at Hall Farm on the A511 Ashby Road is likely to experience significant effects (to be confirmed in the formal ES).

13.4.8 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.9 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- the B587 Nottingham Road in Lount;
- the B5324 Rempstone Road from Church Town, passing along Gelsmoor, and Griffydam;
- Bull Hill, continuing towards Main Street to the south, then towards Newbold Lane and Breedon Lane in Worthington; and
- The Green in Diseworth up to West End in Long Whatton.

13.4.10 The magnitude and extent of effect will depend on the level of construction traffic using the road. Residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.11 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

13.4.12 Further work is being undertaken to confirm significant construction noise and vibration effects, including temporary indirect effects from construction traffic.

13.4.13 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 and 2.4 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1 (Section 4) and as outlined below for the Coleorton to Kegworth area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to 10 trains per hour in each direction on the main lines with an operating speed of around 280kph. 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 midnight. Further information is presented in Volume 1, Section 4.

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1, Section 9.

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[147].

13.5.6 The Proposed Scheme would incorporate noise barriers to avoid or reduce significant adverse airborne noise effects. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: LA04 Map Book) and described in Section 2.2.

13.5.7 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.8 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the

[147] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014.

same mitigation as defined in 'the NI Regulations' at residential buildings where[148] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[149] or the maximum noise level criteria[150] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

Ground-borne noise and vibration

13.5.9 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.10 Map Series SV-01 (Volume 2: LA04 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or LpAeq,day) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or LpAeq,night) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

13.5.11 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

13.5.12 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.13 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.14 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.15 Mitigation, including landscape earthworks, described in Volume 1 (Section 9), Section 2.2 and presented in Map Series SV-01 (Volume 2: LA04 Map Book) and Map Series CT-06 (Volume 2: LA04 Map Book), would substantially reduce the potential

[148] Following Government's Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance.
[149] Night time Noise Guidelines for Europe (2010) World Health Organization.
[150] Dependent on the number of train passes.

airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.16 Taking account of the avoidance and mitigation measures this initial assessment has identified no airborne noise effects with the potential to be considered significant on a community basis due to increased noise levels forecast to arise from the operation of the Proposed Scheme in line with the SMR.

13.5.17 The initial assessment indicates that, the forecast noise from long-term railway operation will not exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme within the Coleorton to Kegworth area.

13.5.18 Map Series SV-01 (Volume 2: LA04 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. Of these, CEEP (Community Education Enterprise Projects) at Hall Farm on the A511 Ashby Road is likely to experience significant effects.

13.5.19 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.20 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 potentially affected receptor, its use and the benefit of the measures.

Monitoring

13.5.21 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.22 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.23 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Coleorton to Kegworth area.

14.1.2 Engagement with Highways England and Leicestershire County Council (LeCC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[151].

14.2.2 The study area for traffic and transport includes the parishes of Coleorton, Staunton Harold, Worthington, Breedon on the Hill, Isley cum Langley, Belton, Long Whatton, Diseworth and Kegworth, together with East Midlands Airport.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme in the Coleorton to Kegworth area including the strategic roads: the M1 south of junction 24 to junction 23; the A42 from junction 13 to where it joins the M1 at junction 23a; and the A453 Ashby Road south of M1 junction 24 to the A42/A453 roundabout.

14.2.4 Local roads include the A453 west of the A42/A453 roundabout which serves the East Midlands Airport; the A6 Derby Road; Melbourne Road; Long Hedge Lane; Breedon Lane; Stocking Lane; Top Brand; Mill Lane (western branch); Mill Lane (eastern branch); Long Mere Lane; The Green; and Ashby Road (west of Kegworth).

14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England and LeCC (including provision of

[151] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in November 2017. These data have been supplemented by existing traffic data from other sources, including from LeCC and Highways England. Assessment of the data indicates that the peak hours in the area are 07:45-08:45 and 16:45-17:45. However, there are only small differences (1%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, which are the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are: the M1, which would be crossed by the Proposed Scheme 1.5km to the east of Diseworth; the A42, which lies to the west and north of the route of the Proposed Scheme; and the A453, which runs west and parallel to the M1. The strategic road network in and around Kegworth is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A6 Derby Road; the A453 west of the A42/A453 roundabout; Melbourne Road; Long Hedge Lane; Breedon Lane; Stocking Lane; Top Brand; Mill Lane (western branch); Mill Lane (eastern branch); Long Mere Lane; The Green; and Ashby Road west of Kegworth. The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport[152]. Data for the three year period (2014, 2015 and 2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

14.3.7 One accident cluster was identified within the Coleorton to Kegworth area at the M1 junction 24 on the A453 Ashby Road arm; this involved 13 accidents, including two with serious causalities.

[152] Department for Transport; Crashmap.co.uk. Available online at: www.crashmap.co.uk. CrashMap provides accident data for the UK.

14.3.8 The route of the Proposed Scheme would cross two roads with footways within the Coleorton to Kegworth area. These are: Ashby Road, west of Kegworth, and the A6 Derby Road.

Parking and loading

14.3.9 There is no parking or loading identified in the Coleorton to Kegworth area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

14.3.10 Two bus routes operate on two roads that would be crossed by the route of the Proposed Scheme in the Coleorton to Kegworth area. There are also bus stops primarily located to serve the main built up areas. The bus routes that could be affected by the Proposed Scheme include:

- The Green: Skylink Route 3M/3M Island (Leicester – Loughborough – East Midlands Airport – Derby); and
- Ashby Road: Skylink TL (Nottingham – Long Eaton – East Midlands Airport – Loughborough).

14.3.11 National and local rail services are accessible via East Midlands Parkway, which is located in the Ratcliffe-of Soar to Long Eaton area, outside the Coleorton to Kegworth area, 4km north of Kegworth. East Midlands Parkway provides access to national services to London, York and Sheffield and provides access to local services to Derby, Nottingham and Leicester.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Coleorton, Staunton Harold, Worthington, Breedon on the Hill, Belton, Long Whatton, Diseworth and Kegworth. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.13 The route of the Proposed Scheme would cross the routes of eight PRoW within the Coleorton to Kegworth area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades, including for maintenance access to the Proposed Scheme. The surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded on each of the eight PRoW.

14.3.14 In the Coleorton to Kegworth area, National Cycle Network (NCN) Routes 6 and 15 would be crossed by the Proposed Scheme.

Waterways and canals

14.3.15 There are no navigable waterways in the Coleorton to Kegworth area. Consequently, this topic is not considered further in this assessment.

Air transport

14.3.16 East Midlands Airport is located in the Coleorton to Kegworth area, west of the M1. The airport is primarily accessed from the strategic road network via the M1 junction

24 and M1/A42 junction 23a and onto the A453 via the A42/A453 Ashby Road roundabout. Public transport access is provided by Skylink bus services to and from Leicester, Derby, Nottingham and Loughborough.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[153] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[154] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

Assessment of impacts and effects

Temporary effects

14.4.7 The traffic and transport impacts during the construction period within the Coleorton to Kegworth area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions; and
- alternative routes for PRoW.

14.4.8 The construction assessment has also considered any impacts in the Coleorton to Kegworth area that arise from construction of the Proposed Scheme in the adjoining community areas.

[153] Supporting document: Draft Code of Construction Practice
[154] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would 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.

14.4.9 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.10 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA04 Map Book.

Strategic and local highway network

14.4.11 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the M1, junction 23a and junction 24;
- the A42, between junction 13 of the A42 and junction 23a of the M1;
- the A453 Ashby Road from The Green to the M1 junction 24;
- the A6 Kegworth Bypass, south of Kegworth;
- the A6 Derby Road, south-east of the M1 junction 24 to Side Ley;
- the B587 Nottingham Road in Lount, between the A511 Ashby Road and Melbourne Road;
- the B5324 Rempstone Road from the A511 to Top Brand;
- Melbourne Road in Coleorton;
- Bull Hill in Worthington;
- Manor Road in Worthington;
- Main Street in Worthington;
- Newbold Lane in Worthington;
- Breedon Lane north of Worthington;
- Stocking Lane between Top Brand and the A42;
- Top Brand, south of the A42 junction 14;
- Gelscoe Lane, east of the A42 junction 14;
- Mill Lane (both western and eastern branches), south-east/east of the A42 junction 14;
- Long Mere Lane south of Diseworth; and
- The Green in Diseworth.

14.4.12 A number of these construction routes would have limited use[155] including Bull Hill, Main Street, Newbold Lane in Worthington and Breedon Lane.

14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. These are expected to include:

- the M1, east of Diseworth and south of M1 junction 23a which will be subject to temporary traffic management measures to maintain traffic flows;
- the A6 Kegworth Bypass, south-west of Kegworth;
- the A6 Derby Road south-east of the M1 junction 24;
- Stocking Lane, between Top Brand and the A42 west of the A42 junction 14; and
- The Green, between Long Whatton to the east and Diseworth to the west.

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Public transport network

14.4.18 There are no temporary road closures or diversions required in this area that would substantially affect bus services or stops although any increase in general traffic delays could affect bus services. Any consequent effects will be reported in the formal ES.

Non-motorised users

14.4.19 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme, but these would all be interim changes prior to permanent changes. Where necessary, PRoW would be re-routed around construction compounds.

[155] Limited use refers to a low level of HGV use generally over a short length of time, for example for site set up or minor works.

14.4.20 Permanently diverted PRoW are reported under operation and the likelihood is that these PRoW would also be subject to temporary closure or diversion/realignment the details of which are being determined and will be reported in the formal ES.

14.4.21 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these changes will be reported in the formal ES.

Air transport

14.4.22 It is not expected that the Proposed Scheme would have any direct effect on air transport and specifically East Midlands Airport although the Proposed Scheme would pass to the east of the airport, including through the Public Safety Zone (PSZ). However, it is currently expected that the construction of the Proposed Scheme could have an effect upon surface access for road traffic, including the Skylink bus services, and pedestrians and construction traffic using the A453 Ashby Road could cause additional congestion and delays to motorists accessing the airport. The assessment of changes in access will be reported alongside other public transport and highway changes in the formal ES.

Permanent effects

14.4.23 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.24 The implementation of the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.25 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.26 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including the M1 Junctions 23a and 24, the A42, the A453 Ashby Road, the A6 Derby Road, the B587 Nottingham Road, the B5324 Rempstone Road, Melbourne Road, Bull Hill/Manor Road/Main Street/Newbold Lane, Breedon Lane, Top Brand, Stocking Lane, Gelscoe Lane, Mill Lane (both western and eastern branches), Long Mere Lane and The Green. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.27 Construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments. These are expected to include the M1, the A6 Kegworth Bypass, the A6 Derby Road, Stocking Lane and The Green.

14.4.28 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

14.5.2 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Coleorton to Kegworth area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include:

- to the west of Newbold, Melbourne Road would be permanently realigned on an underbridge to the south-west of the current alignment;
- to the west of Worthington, Long Hedge Lane would be reinstated on its existing alignment on an overbridge to cross the route of the Proposed Scheme;
- Breedon Lane, which leads north to Breedon on the Hill, would be permanently realigned to the south-west of the existing alignment on an overbridge;
- Top Brand would be permanently reinstated on its existing alignment on an overbridge to cross the route of the Proposed Scheme immediately to the south of the A42 junction 14;
- Mill Lane (western branch) would be permanently diverted from its current connection to Gelscoe Lane to link to Top Brand, approximately 250m south of the A42 junction 14;

- Mill Lane (eastern branch) would be permanently diverted to the west via an overbridge, on to Gelscoe Lane from its current alignment south of where the road goes under the A42;
- Long Mere Lane, which connects Belton in the south to Diseworth in the north, would be permanently realigned to the north-west via an overbridge; and
- to the west of Kegworth, Ashby Road would be reinstated on its existing alignment on an overbridge.

14.5.6 The permanent highway changes are not expected to result in significant changes in travel distances. The effects of these changes, including on non-motorised users will be reported in the formal ES.

Accidents and safety

14.5.7 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Public transport network

14.5.8 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Coleorton to Kegworth area.

Non-motorised users

14.5.9 A number of PRoW that would be crossed by the Proposed Scheme would be either permanently realigned or diverted including:

- Leicestershire Footpath M56/1, diverted to join the diverted access road, leading to the realigned Melbourne Road;
- Leicestershire Footpath M35/1, realigned from Worthington Field to connect to Long Hedge Lane;
- Leicestershire Footpath M21/6, diverted from Mill House Farm to connect to Breedon Lane;
- Leicestershire Footpath M17/1, diverted from Breedon Lodge Farm to connect to Top Brand;
- Leicestershire Bridleway L31/1, realigned in line with Long Mere Lane realignment;
- Leicestershire Footpath L32/1, diverted to the realigned Long Mere Lane;
- Leicestershire Footpath L50/4, realigned to connect to the diverted Footpath L32/1; and
- Leicestershire Footpath L45a/1, diverted to tie in with the A6 Kegworth Bypass overbridge.

14.5.10 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increases in journey distance (likely to be in excess of 500m) would affect the users of PRoW Footpaths M56/1, M17/1, L32/1 and L50/4.The assessment of these changes will be reported in the formal ES.

Other mitigation measures

14.5.11 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.12 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.13 Operation of the Proposed Scheme would require the permanent diversion of Melbourne Road, Breedon Lane, Mill Lane (western and eastern branches), Long Hedge Lane, Top Brand, Ashby Road west of Kegworth, and Long Mere Lane although these are unlikely to result in permanent significant effects. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in an increase in accident risk.

14.5.14 The following PRoW would require permanent diversion or realignment: Leicestershire Footpaths M56/1, M35/1, M21/6, M17/1, L32/1, L50/4, L45a/1 and Leicestershire Bridleway L31/1.

14.5.15 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

14.5.16 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

14.5.17 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Coleorton to Kegworth area.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Coleorton to Kegworth area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Canal & River Trust (CRT), North West Leicestershire District Council (NWLDC), Leicestershire County Council (LeCC), which is the Lead Local Flood Authority (LLFA), and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA04 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework [156].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[157].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.

[156] National Planning Policy Framework, DCLG, 2015.
[157] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Trent Lower and Erewash and Soar River management catchments of the Humber river basin district (RBD).

15.3.2 The river basin management plan[158] identifies the chemical[159] and ecological[160] status of surface water bodies, and the quantitative[161] and chemical[162] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of good status, where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies,

[158] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[159] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[160] The ecological status of surface waters is determined based on the following elements:
- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in the ecology and biodiversity section;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.
[161] The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance.
[162] The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present.

other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within this study area is provided in Table 31. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 31: Surface water body receptors

Water body name and location[163]	**Designation**	**Q95 value (m3/s)[164]**	**Receptor value**	**Parent WFD water body name and identification number[165]**	**Current WFD status/Objective[166]**
Boden Brook WR-01-354-F4	Ordinary watercourse	0.02	High	Ramsley Brook from Source to Carr-New Brook GB104028047340	Poor/good by 2027
Tributary of Boden Brook WR-01-354-F4	Ordinary watercourse	≤0.002	Moderate		
Tributary 1 of Diseworth Brook WR-01-354-H5	Ordinary watercourse	≤0.002	Moderate	Long Whatton Brook GB104028047170	Moderate/good by 2027
Tributary 2 of Diseworth Brook WR-01-354-H6	Ordinary watercourse	≤0.002	Moderate		
Tributary 1 of Westmeadow Brook WR-01-354-I7	Ordinary watercourse	≤0.002	Moderate		
Tributary 2 of Westmeadow Brook WR-01-355a-C6	Ordinary watercourse	≤0.002	Moderate		
Westmeadow Brook WR-01-355a-D6	Ordinary watercourse	0.02	High		
Tributary 3 of Westmeadow Brook WR-01-355a-E7	Ordinary watercourse	≤0.002	Moderate		

[163] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA04 Map Book figure (in this case WR-01).
[164] This is the flow within the watercourse that is exceeded for 95% of the time.
[165] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[166] Status and objectives are based on those set out in the 2015 River basin management plan.

Water body name and location[163]	Designation	Q95 value (m3/s)[164]	Receptor value	Parent WFD water body name and identification number[165]	Current WFD status/Objective[166]
Tributary 4 of Westmeadow Brook WR-01-355a-E7	Ordinary watercourse	≤0.002	Moderate		
Diseworth Brook WR-01-355a-E7	Ordinary watercourse	0.009	Moderate		
Tributary 3 of Diseworth Brook WR-01-355a-E7	Ordinary watercourse	≤0.002	Moderate		
Tributary 4 of Diseworth Brook WR-01355a-F7	Ordinary watercourse	≤0.002	Moderate		
Tributary of River Soar WR-0-355a- G6	Ordinary watercourse	≤0.002	Moderate	Soar from Long Whatton Brook to Trent GB104028047212	Bad/good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There is one licensed surface water abstraction in the study area, which is not located within the land required for the construction and operation of the Proposed Scheme. This is considered a high value receptor.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m^3 per day, have been requested from the local authorities. Responses are being sought. As there is no obligation to register private water supplies, unregistered private surface supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 16[167] consented discharges to surface waters within the study area. One of these is located within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 32. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme.

[167] The number of consents quoted is different to the number quoted in Section 10, Land quality because the water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme and do not count revoked consents. The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.

Table 32 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 32: Summary of geology and hydrogeology in the study area

Geology[168]	**Distribution**	**Formation description**	**Aquifer classification**	**WFD body (ID) and current overall status**[169]	**WFD status objective**[170]	**Receptor value**
Superficial						
Made ground	Present at Cloud Hill Quarry and to the north of Long Whatton Brook, with infilled ground also present at Lount.	Variable man-made deposit including areas of worked and infilled ground.	Not classified	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Head deposits	Located around the Gilwiskaw Brook, a tributary east of the A42 junction 13, Boden Brook, Long Whatton Brook, Diseworth Brook and tributaries of the River Soar.	Composition dependent on source origin but typically gravel, sand, silt and clay.	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Alluvium	Associated with the Boden Brook, Westmeadow Brook, Long Whatton Brook and Diseworth Brook. Further localised deposits are located to the east of Staunton Lodge Farm.	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate

[168] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[169] As stated in the 2015 River basin management plan.
[170] As stated in the 2015 River basin management plan.

Geology[168]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[169]	WFD status objective[170]	Receptor value
River terrace deposits	Associated with the tributaries of the River Soar and the Trent and Derwent catchment. Further localised deposits are located to the south-east of Diseworth.	Sand and gravel, locally with silt, clay or peat.	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
			Secondary Undifferentiated (Hemington Member)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glaciofluvial deposits	Localised deposits located south of Breedon on the Hill, around Belton and in the area south of East Midlands Airport.	Sand and gravel, locally with silt, clay or organic material.	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacio-lacustrine deltaic deposits	Located across an area 60m south-west of Brandgate Farm.	Sand, gravel and clay	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glacial till[171]	Distributed throughout the study area from West Farm Woodland, Pasture Woodland and south of Kegworth.	Variable deposit typically comprising sandy, silty clay with sand and gravel.	Secondary Undifferentiated	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Bedrock						
Mercia Mudstone Group – Branscombe Mudstone Formation	Present to the north of Kegworth up to the northern limits of the study area.	Mudstone and siltstone	Secondary B	Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	Low

[171] Glacial till is sometimes called diamicton in the BGS lexicon. The term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case 'glacial till' refers to diamicton of glacial origin.

Geology[168]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[169]	WFD status objective[170]	Receptor value
Mercia Mudstone Group – Arden Sandstone Formation	Present as a narrow outcrop trending from west to east at the northern end of the study area.	Mudstones with siltstones and sandstones	Mercia Mudstone Group – Arden Sandstone Formation	Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	Moderate
Mercia Mudstone Group – Sidmouth Mudstone Formation	Present under the majority of the land required for the Proposed Scheme in the study area. It outcrops between the south of Breedon on the Hill to the south-west of Kegworth.	Mudstone and siltstone thin beds of dolomitic siltstone and sandstone.	Secondary B (mudstone and siltstone)	Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	Low
			Secondary Undifferentiated (Radcliffe Member – mudstone)	Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	Low
			Secondary A (sandstone)	Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	Moderate
Mercia Mudstone Group – Tarporley Siltstone Formation	Outcrops between Worthington and Tonge and to the west and south of Kegworth.	Sandstone, mudstone and siltstone	Secondary A (sandstone)	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	Moderate
				Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	
			Secondary B (mudstone and siltstone)	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	Low
				Soar - Secondary Combined (GB40402G990600) Good	Good by 2015	

Geology[168]	**Distribution**	**Formation description**	**Aquifer classification**	**WFD body (ID) and current overall status**[169]	**WFD status objective**[170]	**Receptor value**
Sherwood Sandstone Group – Helsby Sandstone Formation	Outcrops within the study area from north of Smoile Farm and Kegworth.	Sandstone, weathering to sand near surface	Principal	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	High
Pennine Coal Measures Group - Pennine Middle Coal Measures Formation	Outcrops in the Newbold Coleorton, Coleorton and Peggs Green areas, to the north of Farmtown.	Mudstone, siltstone and sandstone with coal seams.	Secondary A	Tame Anker Mease - Coal Measures Swadlincote GB40402G303600) Poor	Poor by 2015	Moderate
Pennine Coal Measures Group - Pennine Lower Coal Measures Formation	Outcrops across the southern end of the study area, to the south of Lount.	Mudstone, siltstone and sandstone with coal seams.	Secondary A	Tame Anker Mease - Coal Measures Swadlincote (GB40402G303600) Poor	Poor by 2015	Moderate
Craven Group – Widmerpool Formation	Present to the south of Mill House Farm.	Mudstone with limestone, siltstone and sandstone.	Secondary A	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	Moderate
Peak Limestone Group – Cloud Hill Dolostone Formation	Outcrops to the north of Worthington.	Dolostones, with mudstone or clay partings and beds.	Principal	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	High
Peak Limestone Group – Milldale Limestone Formation	This formation outcrops across a limited area adjacent to the north of Boden Brook.	Limestone	Principal	Soar - PT Sandstone (GB40401G302800) Poor	Poor by 2015	High

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 32, is outlined briefly as follows:

- alluvium, river terrace deposits and glaciofluvial sheet deposits may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. For these reasons, they have been classified as moderate value receptors;
- head glacial till deposits and glaciolacustrine deltaic deposits may supply baseflow to watercourses or store and yield limited amounts of groundwater and so have been classified as low value receptors; and
- made ground is a man-made, superficial deposit considered an unproductive stratum. It has, therefore, been classified as a low value receptor.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 32 is outlined briefly as follows:

- the Mercia Mudstone Group has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within this rock formation. Receptor values ranging from moderate to low for the various formations have been illustrated in Table 32;
- the Sherwood Sandstone Group (locally comprising sandstone of the Helsby Sandstone Formation) has been classified as a Principal aquifer by the Environment Agency. This aquifer can also provide an important component of baseflow to rivers. It has, therefore, been assessed as a high value receptor;
- the Pennine Coal Measures Group is generally described as an alternation of sandstone, siltstone and mudstone, with frequent coal seams and seat earth horizons and has been classified as a Secondary A aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within the sandstone beds of this rock formation and it has, therefore, been classified as a moderate value receptor;
- the Craven Group is generally defined by variations in abundance of mudstone and limestone and has been classified as a Secondary A aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within the sandstone beds of this rock formation and it has, therefore, been classified as a moderate value receptor;
- the Peak Limestone Group is present within the study area as the Milldale Limestone Formation and the Cloud Hill Dolostone Formation. Both formations have been classified as Principal aquifers by the Environment Agency. These aquifers can also provide an important component of baseflow to rivers. They have, therefore, been assessed as high value receptors.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 32. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licensed for public water supply in the study area. There are no Source Protection Zones (SPZs) associated with licenced public water supplies within the study area.

15.3.15 There are a total of two[172] private groundwater abstraction licences registered in the study area, as shown on Map WR-02-312. One licence is a moderate value non-potable agricultural and domestic supply, and the other is a high value industrial and commercial supply exceeding 100m^3 daily. Neither of these licensed discharges is located within the land required for the Proposed Scheme.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been requested from the local authorities. Responses are being sought. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are no consented discharges to groundwater within the study area.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 11 features within the study area that had the potential to be springs; two of these features are within the land required for the construction of the Proposed scheme. Access was not possible to inspect any of these features at this stage.

15.3.19 The 11 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis.

15.3.20 There are 16 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.21 There is one nature conservation site within the study area which is potentially groundwater dependent. New Lount Local Nature Reserve (LNR) is the 21ha site of a

[172] The number of consents quoted is different to the number quoted in Section 10, Land Quality because the Water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme and do not count revoked consents. The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.

former colliery containing ponds that are potentially groundwater fed. The LNR is north-west of Coleorton on the site of the former New Lount Colliery, and 335m east of the land required for the Proposed Scheme.

15.3.22 Further details of the ecology of this site, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.23 The Environment Agency's Flood map for planning (rivers and sea)[173] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.24 The updated Flood map for surface water[174] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[175]. The British Geological Survey's (BGS) Groundwater susceptibility dataset[176], has been used to assess the future risk of groundwater flooding.

15.3.25 The following reports were used to help determine the baseline flood risk within the study area:

- Leicestershire Local Flood Risk Management Strategy (LFRMS) (2015);
- North West Leicestershire Strategic Flood Risk Assessment (SFRA) (2015); and
- Leicestershire Preliminary Flood Risk Assessment (PFRA) (2011).

River flooding

15.3.26 The study area includes areas of floodplain (Flood Zone 2 and 3) associated with Boden Brook at Breedon on the Hill, as well as Westmeadow Brook and Diseworth Brook at Long Whatton (where these watercourses merge into Long Whatton Brook). Table 33 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 33: River flood risk sources and receptors

Source	Location description and figure/coordinate [177]	Receptor potentially affected	Receptor value / sensitivity to flooding
Boden Brook	Worthington	Dismantled railway land at Manor Drive in Worthington	Low

[173] Environment Agency (undated), *Flood map for planning.* Available online at: https://flood-map-for-planning.service.gov.uk/
[174] Environment Agency (2018), *Long term flood risk map for England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[175] Environment Agency (2018), *Long term flood risk map for England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[176] British Geological Survey (2017), BGS Groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[177] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA04 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate [177]	Receptor potentially affected	Receptor value / sensitivity to flooding
	WR-01-354-F4	Breedon Lane in Worthington	Moderate
		Rock Villas residential properties at Manor Drive in Worthington	High
		A42 at Worthington	Very high
		Stocking Lane at Worthington	Moderate
		Agricultural land to the west of Cloud Hill Quarry	Moderate
Tributary 1 of Diseworth Brook	Gelscoe Lane WR-01-354-H6	A42 at Gelscoe Lane	Very high
		Gelscoe Lane at Gelscoe	Moderate
Tributary 1 of Westmeadow Brook	Gelscoe Farm WR-01-354-I6	A42 at Gelscoe	Very high
		Gelscoe Road at Gelscoe	Moderate
		Mill Lane at Gelscoe	Moderate
Tributary 2 of Westmeadow Brook	Gelscoe Farm WR-01-355a-C6	A42 at Gelscoe	Very high
Westmeadow Brook	Westmeadow Lane WR-01-355a-E7	Agricultural land to the north of Westmeadow Lane	Moderate
Diseworth Brook	Diseworth WR-01-355aE7	A42 at Diseworth	Very high
		M1 at Long Whatton	Very high
		The Green at Long Whatton	Moderate
		Agricultural land to the east of Wood Nook Farm	Moderate
Tributary of River Soar	Kegworth WR-01-355a-G6	Whatton Road and Ashby Road in Kegworth	Moderate

Surface water flooding

15.3.27 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 34. The value of these receptors, based on Table 52 of the SMR, is also indicated.

Table 34: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[178]	Receptor potentially affected	Receptor value
Surface water flow path at Lount	A42 at Lount WR-01-354-B5	A42 at Lount	Very high
Surface water flow path at Cloud Hill Quarry south of Breedon on the Hill	Stocking Lane WR-01-354-F4	Stocking Lane south of Breedon on the Hill	Moderate
		Quarry south of Breedon on the Hill	Moderate
Surface water flow path at Breedon Brand	Breedon on the Hill WR-01-354-H5	A42 at Breedon on the Hill	Very high
Surface water flow path west of Newbold Coleorton	Melbourne Road WR-01-354-D5	Agricultural land north-west of Smoile Farm	Moderate

Artificial water bodies

15.3.28 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. Artificial water bodies with potential implications for flood risk within the study area include the East Midlands Airport Gimbro Ponds (winter and summer) and the Central East Area Balancing Pond at the East Midlands Airport, which discharge into Diseworth Brook and its unnamed tributary respectively. These are the artificial water bodies with the highest potential to affect flood risk of relevance to the Proposed Scheme within the study area. This is because they discharge upstream of a crossing and their flood outlines would be crossed by the Proposed Scheme, according to the Environment Agency's Outline Reservoir Maps[179]. However, as these are raised reservoirs, subject to the requirements of reservoir safety legislation[180], the inundation risk posed by these reservoirs is considered negligible.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the Coleorton to Kegworth area is provided within the LeCC PFRA and the North West Leicestershire SFRA. The PFRA and SFRA state that the risk of groundwater flooding is considered to be relatively low within North West Leicestershire but can exacerbate flooding from other sources.

15.3.30 The BGS Groundwater flooding susceptibility dataset indicates that there is some potential for groundwater flooding to occur to the south and east of Lount and along the floodplains of Boden Brook, Diseworth Brook and Westmeadow Brook. There is

[178] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA04 Map Book figure (in this case WR-01).
[179] Environment Agency (2018), *Long term flood risk map for England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[180] Department for Environment, Food & Rural Affairs (2014), *Reservoirs: owner and operator requirements.* Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements

also a substantial area of vulnerability to groundwater flooding along the River Soar at Kegworth.

Land drainage

15.3.31 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[181] includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would avoid passing along river or stream valleys, such as that of Boden Brook and Diseworth Brook and their associated floodplains. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will be discussed with any landowners potentially affected by the Proposed Scheme.

[181] Supporting document: Draft Code of Construction Practice

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: LA04 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 No watercourse realignments are proposed within the Coleorton to Kegworth community area.

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.8 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.9 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.10 Permanent culverts proposed on the smaller watercourse crossings within this study area include the Cloud Hill Quarry culvert on an unnamed tributary of Boden Brook and the Boden Brook culvert on Boden Brook, to the east of Breedon on the Hill. Further culverts include the Diseworth south culverts No. 1, 2 and 3 on unnamed tributaries 1 and 2 of Westmeadow Brook as well as Kegworth culvert over an unnamed tributary of the River Soar south of Kegworth. A culvert is also proposed on unnamed tributary 2 of Diseworth Brook along the realignment of Mill Lane east of Breedon on the Hill. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA)

and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced as far as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.11 The construction of Gelscoe aqueduct has been proposed for unnamed tributary 1 of Diseworth Brook to the south of Gelscoe Lane, to convey the watercourse over the route of the Proposed Scheme, which would be in cutting.

15.4.12 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.14 Measures would be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[182] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.15 The exact requirements would be refined and method of mitigation will be designed following ground investigation at foundations or cutting locations.

[182] Impermeable barrier preventing water flow

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy would ensure that the impacts on flood flows within rivers and streams, and their floodplains, would be limited to those associated with the intermediate pier structures on the viaducts of Boden Brook and Diseworth Brook, and the minor encroachment of an embankment in the floodplain of Westmeadow Brook. Depending on the location of piers, for the proposed viaducts, it may not be wholly practicable to avoid the presence of piers in the watercourse and/or flood plain. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and highway realignment;
- the temporary works shown on Map Series CT-05 in the Volume 2: LA04 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This would be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme would cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[183];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there would be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 year (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;

[183] Environment Agency (2016), *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/571572/LIT_5707.pdf

- where the Proposed Scheme would pass in cutting, drainage measures would be provided with the aim of preventing flow into the cutting. This flow would be diverted into its natural catchment. Where reasonably practicable, runoff from the cuttings would also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could otherwise increase flood risk or impact on land drainage systems; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the

design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The proposed cuttings in the study area would intersect the Pennine Coal Measures Group Secondary A Aquifer, Tarporley Siltstone Formation Secondary A Aquifer and Secondary B Aquifer, Bromsgrove Sandstone Formation Principal Aquifer, Gunthorpe Formation Secondary B Aquifer, Radcliffe Formation Secondary B Aquifer and Diseworth Sandstone Formation Secondary B Aquifer. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 There are two licensed private groundwater abstraction locations within the study area. One licence is held by Whatton Estate, located 671m northwest of the route of the Proposed Scheme and is used for general farming and domestic purposes, abstracting up to 45m^3 per day. This abstraction has been assessed as being a moderate value receptor, due to low abstraction volumes. As the abstraction is not located within the radius of influence of the Proposed Scheme, impacts are likely to be negligible, resulting in no significant effects.

15.4.24 The second licensed abstraction is located near Kegworth, approximately 700m west of the route of the Proposed Scheme, and is used for industrial purposes, extracting up to 227m^3 per day. This abstraction has been assessed as being a high value receptor, due to abstraction volume. As the abstraction is not located within the radius of influence of the Proposed Scheme, impacts on this abstraction are likely to be negligible, resulting in no significant effects.

Groundwater - surface water interactions

15.4.25 The Proposed Scheme would be likely to result in the temporary loss of two potential spring features at Long Whatton and Kegworth. These features would not be directly crossed by the route of the Proposed Scheme but are within the land required for the construction of the Proposed Scheme. For this reason, the impact on these springs has been considered to be moderate, resulting in a temporary moderate adverse effect, which is significant.

Water dependent habitats

15.4.26 The Proposed Scheme is not anticipated to temporarily impact groundwater flow or quality of New Lount LNR, therefore there is no anticipated hydrological impact on this site.

Temporary Effects - Flood risk and land drainage

15.4.27 The construction of Boden Brook viaduct, Diseworth Brook viaduct and Diseworth south embankment adjacent to Westmeadow Brook would require temporary working within flood zones. This includes a proposed site haul route which would require a crossing of Boden Brook on a temporary bridge. Method statements detailing how these works would be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – Water resources and WFD

15.4.28 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.29 Gelscoe aqueduct would have the potential to cause a moderate impact on the hydromorphology of unnamed tributary 1 of Diseworth Brook, which is a moderate value receptor. This would potentially result in a moderate adverse effect, which would be significant.

15.4.30 The location of the piers of Boden Brook viaduct are within the floodplain, avoiding the watercourse, and would have the potential to impact the hydromorphology of Boden Brook by constraining the ability of the channel to move within its floodplain. This would have the potential to cause a minor impact on Boden Brook, which is a high value receptor. With embedded mitigation, this would result in a minor adverse effect, which is not expected to be significant.

15.4.31 The location of the piers of Diseworth Brook viaduct are within the floodplain, avoiding the watercourse, and would have the potential to impact the hydromorphology of Diseworth Brook by constraining the ability of the channel to move within its floodplain. This would have the potential to cause a minor impact on Diseworth Brook, which is a moderate value receptor. This would potentially result in a minor adverse effect, which would not be significant.

15.4.32 Culverts are proposed on several watercourses, which have all been assessed as moderate value receptors. These culverts would have the potential to cause moderate impacts on the hydromorphology of the watercourses, which are: unnamed tributary of Boden Brook, unnamed tributary 1 of Diseworth Brook, three culverts on unnamed tributaries 1 and 2 of Westmeadow Brook and a culvert on an unnamed tributary of the River Soar. These would potentially result in moderate adverse effects, which would be significant.

Groundwater

Aquifers

15.4.33 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed and are described below.

Abstractions

15.4.34 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.35 The Proposed Scheme would be unlikely to result in the permanent loss of potential spring features at Long Whatton and Kegworth. These features are within the land required for the construction of the Proposed Scheme but would not be directly crossed by the route of the Proposed Scheme. For these reasons, the impact on these potential springs has been considered to be negligible, which would not be significant.

Water dependent habitats

15.4.36 The Proposed Scheme is not anticipated to permanently impact groundwater flow or quality at New Lount LNR, therefore there is no anticipated hydrological impact on this site.

Permanent effects - Flood risk and land drainage

15.4.37 Replacement floodplain storage areas would be provided along the route of the Proposed Scheme. Therefore, no permanent effects have been identified in relation to fluvial flood risk in the study area.

Other mitigation measures

15.4.38 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.39 The design of Gelscoe aqueduct on unnamed tributary 1 of Diseworth Brook will be developed further in consultation with the Environment Agency and the LLFA, with a view to further mitigation being identified. Monitoring will be undertaken to ensure successful establishment of the mitigation proposals developed.

15.4.40 Depending on the location of piers, for the proposed viaducts, it may not be wholly practicable to avoid the presence of piers in the watercourse and/or flood plain. The positioning of piers for Boden Brook and Diseworth Brook viaducts would be carefully managed to maximise the distance between the watercourse banks and the piers, and where necessary, scour protection mitigation will be developed to manage erosion.

Hydromorphological mitigation will be considered up and downstream of the pier locations to enable erosion patterns to re-stabilise as a result of any scour protection.

15.4.41 The design of the culverts on Boden Brook, an unnamed tributary of Boden Brook, an unnamed tributary 1 of Diseworth Brook, three culverts on unnamed tributaries 1 and 2 of Westmeadow Brook and a culvert on an unnamed tributary of the River Soar, will be developed further in consultation with the Environment Agency and the LLFA and include further embedded mitigation. Monitoring will be undertaken to ensure successful establishment of the mitigation proposals developed.

Groundwater – surface water interactions

15.4.42 Surveys of the potential spring features at Little Rise Farm west of Long Whatton and Spring House Farm near Kegworth will be undertaken to determine their value and to identify whether further mitigation is required due to construction effects. Measures would be implemented to re-establish these springs nearby.

15.4.43 Any such additional measures will be designed in consultation with the Environment Agency.

Summary of likely residual significant effects

15.4.44 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a moderate adverse temporary impact on two spring features near Long Whatton and Kegworth, resulting in moderate adverse effects, which are significant;
- a moderate adverse effect related to the construction of Gelscoe aqueduct on the hydromorphology of unnamed tributary 1 of Diseworth Brook, which is significant; and
- moderate adverse effects related to the construction of culverts on the hydromorphology of Boden Brook, unnamed tributary of Boden Brook, unnamed tributary 1 of Diseworth Brook, unnamed tributaries 1 and 2 of Westmeadow Brook and an unnamed tributary of the River Soar, which are significant.

15.4.45 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere.

Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase would have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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