

LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 2 | Community Forum Area report

CFA14 | Newton Purcell to Brackley

November 2013

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Department
for Transport

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Structure of the HS2 Environmental Statement

The Environmental Statement (ES) documentation comprises:

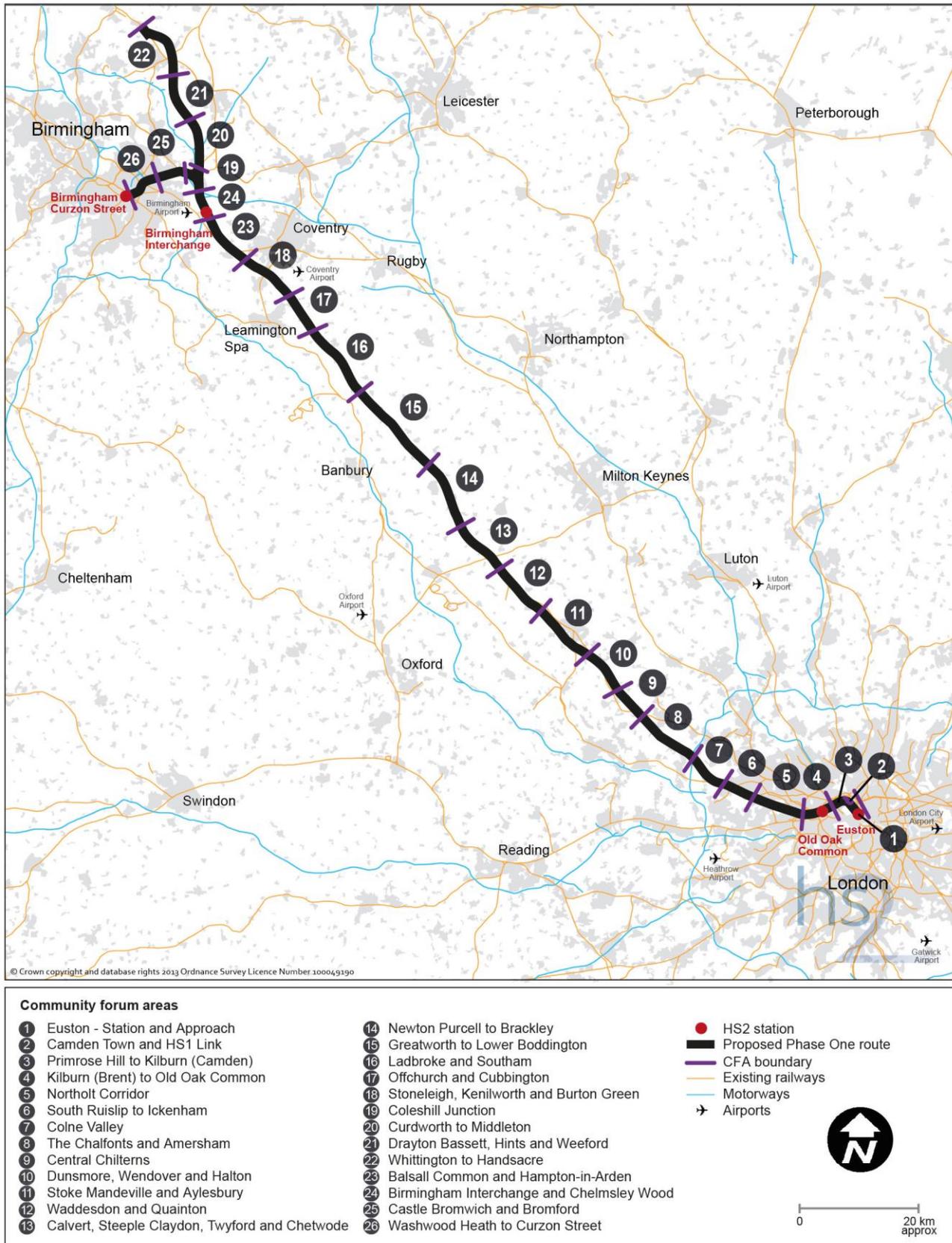
- Non-technical summary (NTS) – which provides a summary in non-technical language of the Proposed Scheme, the likely significant environmental effects of the Proposed Scheme, both beneficial and adverse, and the means to avoid or reduce the adverse effects;
- Volume 1: Introduction to the ES and the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

1 Introduction

1.1 Introduction to HS2

- 1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, South Yorkshire and the East Midlands will be served by high speed trains running at speeds of up to 360kph (225mph).
- 1.1.2 HS2 is proposed to be built in two phases. Phase One, the subject of this ES, will involve the construction of a new railway line of approximately 230km (143 miles) between London and Birmingham. Construction will begin in 2017 and the line will become operational by 2026; with a connection to the West Coast Main Line (WCML) near Lichfield and to the existing HS1 railway line in London.
- 1.1.3 During Phase One beyond the dedicated high speed track, high speed trains will connect with and run on the existing WCML to serve passengers beyond the HS2 network to destinations in the north. A connection to HS1 will also allow some services to access that high speed line through east London and Kent and connect with mainland Europe via the Channel Tunnel.
- 1.1.4 Phase Two will involve the construction of lines from Birmingham to Leeds and Manchester; with construction commencing approximately 2023, and planned to be operational by 2033.
- 1.1.5 Section 4 of Volume 1 describes the anticipated operational characteristics of HS2, including the anticipated frequency of train services. As Volume 1 shows, the frequency of trains is expected to increase over time and to increase further upon opening of Phase Two. In assessing the environmental effects of the Proposed Scheme the anticipated Phase 2 operational frequency has been used. For further detail of the anticipated operation of the Proposed Scheme in the Newton Purcell to Brackley area (CFA14), see Section 2.4.
- 1.1.6 The Government believes that the HS2 network should link to Heathrow and its preferred option is for this to be built as part of Phase Two. However, the Government has since taken the decision to pause work on the Heathrow link until after 2015 when it expects the Airports Commission to publish its final report on recommended options for maintaining the country's status as an international aviation hub.
- 1.1.7 For consultation and environmental assessment purposes, the proposed Phase One route has been divided into 26 community forum areas (CFA), as shown in Figure 1. This has enabled wider public engagement on the Proposed Scheme design and on the likely adverse and beneficial effects.

Figure 1: HS2 Phase One route and community forum areas



1.2 Purpose of this report

1.2.1 This report presents the likely significant environmental effects of the construction and operation of Phase One of HS2 (referred to throughout the ES as the 'Proposed

Scheme’) that have been identified within CFA14 (Newton Purcell to Brackley). It reports the likely significant environmental effects and proposed mitigation measures, for those significant effects that are adverse, within CFA14.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

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

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

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

1.3.4 Where appropriate, potential climate change impacts and adaptation measures are discussed in the relevant environmental topic section. Volume 1 and Section 6A of the SMR Addendum also include additional information about climate change adaptation and resilience.

1.3.5 The maps relevant to Newton Purcell to Brackley are provided in a separate corresponding document entitled Volume 2, CFA14 Map Book, which should be read in conjunction with this report.

- 1.3.6 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) (Volume 2, CFA14 Map Book) and CT-06 (operation) (Volume 2, CFA14 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the hybrid Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.4.
- 1.3.7 In addition to the environmental topics covered in Sections 3-13 of this report, electromagnetic interference is addressed in Volume 1 and climate (greenhouse gas emissions and carbon), and waste and material resources are addressed in Volume 3. An assessment of potential environmental effects beyond the CFA has also been undertaken and this 'off-route' assessment is reported in Volume 4.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

2.1.1 The Newton Purcell to Brackley area covers an approximately 12km section of the route in the council districts of Cherwell, Aylesbury Vale and South Northamptonshire, extending from the Buckinghamshire and Oxfordshire county boundary between Newton Purcell and Barley Fields in the south to a point approximately 2.5km north of the edge of Brackley. The area includes land within the parishes of Finmere, Mixbury, Westbury, Turweston, Whitfield, Radstone, and Newton Purcell with Shelswell.

2.1.2 As shown on Figure 1, the Calvert, Steeple Claydon, Twyford and Chetwode area (CFA13) lies to the south and the Greatworth to Lower Boddington area (CFA15) to the north.

Settlement, land use and topography

2.1.3 The Newton Purcell to Brackley area is predominantly rural, comprising mixed agriculture with small villages and isolated farmsteads in the south and the town of Brackley to the north (see Maps CT-10-031 to CT-10-035 in the Volume 2, CFA14 Map Book). The southern extent of the area lies within the broad valley of the River Great Ouse, whilst to the north the landform is broadly domed and gently undulating. The River Great Ouse passes around the edge of a flat plateau. The river passes to the west of Turweston, which lies on the side of the valley.

2.1.4 The villages of Newton Purcell, Westbury, Turweston, Whitfield and Radstone lie within approximately 250m of the land required for construction of the Proposed Scheme. The nearest main town is Brackley, the eastern edge of that lies approximately 900m to the west of the route.

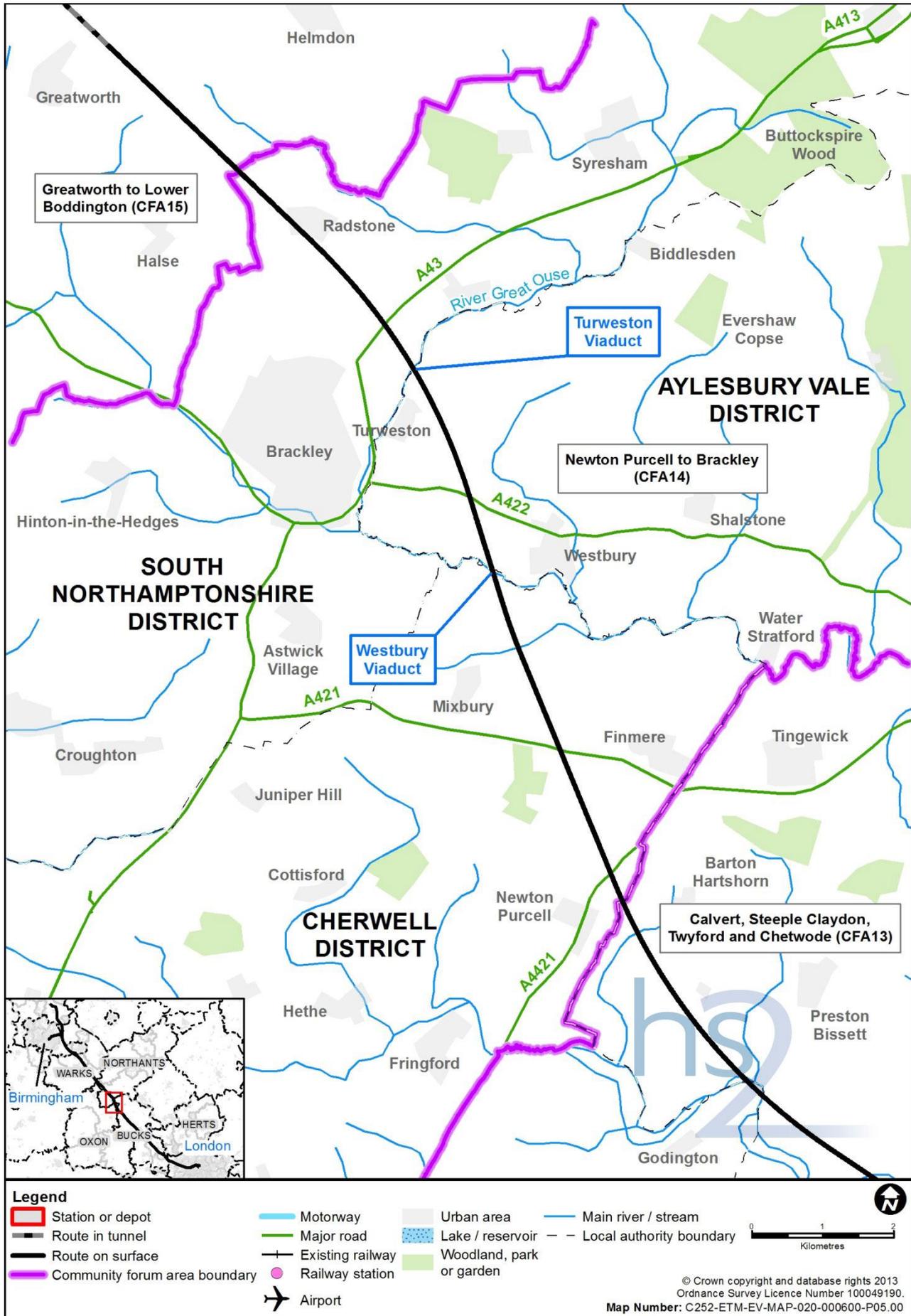
2.1.5 The route will cross the River Great Ouse at three locations – twice to the south-east of Brackley, where the river splits into two channels, and once to the north-east of Brackley. It will also cross two minor watercourses, Radstone Brook and a watercourse to the east of Mixbury, as well as several small field-drains.

Key transport infrastructure

2.1.6 The main transport routes within the area include: the A43 Oxford Road, which links the M1 and M40 via Brackley in the north; the A421 London Road, which links the A43 Oxford Road south of Brackley to Milton Keynes; and the A422 Brackley Road between Banbury and Buckingham via Brackley. All three highways will cross the route within the area.

2.1.7 The route will not cross any existing operational railway lines; however it will be partly on, and adjacent to, the former Great Central Main Line (GCML) railway, part of the former Great Central Railway network, for a section in the south. It will also cross the disused Banbury to Verney Junction Branch Line, and part of the GCML known as Helmdon Disused Railway SSSI (Site of Special Scientific Interest), both of which cross the area from east to west.

Figure 2: Area context map



- 2.1.8 The Westbury Circular Ride is a local circular walk that will cross the route at Westbury viaduct and through Turweston. Two other long distance footpaths will cross the route in this area: The Palladian Way (a 190km footpath which passes through Turweston) and the Seven Shires Way (a 372km footpath which will cross the route between Mixbury and Westbury).

Socio-economic profile

- 2.1.9 To provide a socio-economic context for the area, data for the demographic character areas (DCA) of: Newton Purcell; Finmere; Mixbury; Westbury; Turweston; Whitfield; Radstone; and East Brackley is used¹. In total, the population of the DCA is approximately 6,000. The area's labour market outperforms England's as a whole; unemployment at 2.9% is lower than the national level of 7.4%, while 75.4% of the population aged 16-74 is economically active compared to the national figure of 69.9%². There are approximately 4,400 people who work within the area³.

Notable community facilities

- 2.1.10 The main shops and services are located in Brackley, with limited services located in the small villages of Finmere, Westbury and Turweston. Brackley has an extensive range of facilities including a bank, several estate agents, a post office, opticians as well as several restaurants, cafes and public houses. There are four doctor's surgeries, three dental practices, a care home in the town and four churches in close vicinity.
- 2.1.11 Finmere, along with other smaller villages, has a small range of services including Finmere Primary School, St Michael and All Angels Church and the Red Lion public house. Westbury has limited services, including St Augustine's Church, Westbury working men's club and the Reindeer Inn public house. Similarly, Turweston has limited services, including Turweston Village Hall and the Station Arms public house.

Recreation, leisure and open space

- 2.1.12 The area is predominantly rural with an array of informal open space and woodland, and a range of recreational facilities. These include Whitfield Racecourse, a 2km racecourse for point-to-point horse racing and other events, Turweston playing fields and Aerodrome, which holds flying rallies and other events, Westbury Cricket Club, and Finmere playing fields and sports pavilion. There are also several local recreational footpaths and bridleways that cross through the area, including the Westbury Circular Ride, Turweston/Whitfield, Halse Copse and Radstone Walk.

Planning framework

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

¹ A DCA represents a community that, depending on the area, may consist of a local ward, neighbourhood or village(s).

² Data comes from the 2011 Population Census.

³ Data taken from the 2011 business register and employment survey.

2.1.14 The following plans have been considered and referred to where appropriate to the assessment:

- Aylesbury Vale District Council Local Plan Saved Policies (2007)⁴;
- Aylesbury Vale District Council Vale of Aylesbury Plan Strategy 2011-2031 (2013)⁵;
- Buckinghamshire County Council Structure Plan (1991)⁶;
- Buckinghamshire County Council Minerals and Waste Core Strategy DPD (MWCS) (2012)⁷;
- Cherwell District Council Non-Statutory Cherwell Local Plan (2011)⁸;
- Cherwell District Council Local Plan Saved Policies (2007)⁹;
- Cherwell District Council Proposed Submission Local Plan (2012)¹⁰;
- Cherwell District Council Proposed Submission Focused Consultation (2013)¹¹;
- Northamptonshire Minerals and Waste Core Strategy DPD (MWCS)¹²;
- Northamptonshire County Council Control and Management of Development DPD¹³
- Oxfordshire County Council Minerals and Waste Local Plan Saved Policies (2007)¹⁴;
- South Northamptonshire Council Local Plan Saved Policies (2007)¹⁵; and
- West Northamptonshire Joint Planning Unit, Joint Core Strategy – Significant Proposed Changes (2012)¹⁶.

2.1.15 Emerging policies are not generally considered within this report, unless a document has been submitted to the Secretary of State for approval.

2.1.16 The Joint Core Strategy (JCS) of the West Northamptonshire Joint Planning Unit (which encompasses South Northamptonshire Council), was submitted to the Secretary of State for examination in December 2012¹⁷. It should be noted that the JCS is currently undergoing examination. Additional work is now being undertaken

⁴ Aylesbury Vale District Council (2007), *Aylesbury Vale District Local Plan Written Statement 2004 Saved Policies*.

⁵ Aylesbury Vale District Council (2013), *Vale Of Aylesbury Plan Strategy 2011-2031, Submission*.

⁶ Buckinghamshire County Council (1991), *Buckinghamshire Structure Plan 1991-2011: Saved Policies*.

⁷ Buckinghamshire County Council (2012), *Minerals and Waste Core Strategy Development Plan Document, Minerals and Waste Local Development Framework*.

⁸ Cherwell District Council (2011), *Non-Statutory Cherwell Local Plan*.

⁹ Cherwell District Council (2007), *Local Plan Saved Policies*.

¹⁰ Cherwell District Council (2012), *Proposed Submission Local Plan*.

¹¹ Cherwell District Council (2013), *Proposed Submission Focused Consultation*.

¹² Northamptonshire County Council (2010), *Minerals and Waste Core Strategy Development Plan Document*.

¹³ Northamptonshire County Council (2011), *Control and Management of Development, Development Plan Document*.

¹⁴ Oxfordshire County Council (2007), *Minerals and Waste Local Plan Saved Policies*.

¹⁵ South Northamptonshire Council (2007), *Local Plan Saved Policies*.

¹⁶ West Northamptonshire Joint Planning Unit (2012), *Joint Core Strategy – Significant Proposed Changes*.

¹⁷ West Northamptonshire Joint Planning Unit (2012), *Joint Core Strategy*.

by the Joint Planning Unit and hearings on the JCS are expected to resume in December 2013.

- 2.1.17 There are a number of key planning designations in the area, which include listed buildings and parts of four conservation areas. These are shown on Maps CT-10-031 to CT-10-035 (Volume 2, CFA14 Map Book).

Committed development

- 2.1.18 Developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme, are shown on Maps CT-13-031 to CT-13-035 (Volume 5, Cross Topic Appendix 1 Map Book) and listed in Volume 5: Appendix CT-004-000. Except where noted otherwise in Volume 5: Appendix CT-004-000, it has been assumed that these developments will have been completed by 2017. These are termed 'committed developments' and have been taken into account for the purpose of assessing the likely significant environmental effects of the Proposed Scheme. Where these developments have a particular relevance to an assessment topic, this is noted in the future baseline section for that topic. The following developments are relevant to several topics assessments in this area:

- planning permission for the change of use of the materials recycling facility at Finmere Quarry, which is the subject of planning permission (Ref 10/00361/CM) to add biodrying and gasification waste treatment technologies and associated power generation together with the extension of the operational life of the materials recycling facility; and
- Ref BH1(A) and related applications (P2013/2831/S73MA and S/2010/0995/MAO) – planning permission for residential development on land to the north-west of Brackley, adjacent to Halse Road (Radstone Fields).

- 2.1.19 The planning permission for the development at Finmere Quarry states that construction has to commence by 2017 and, as such, this development may be constructed concurrent to the Proposed Scheme. The development will be approximately 160m from the route centre line.

- 2.1.20 The development adjacent to Halse Road has outline planning permission for a residential-led urban extension to the north of Brackley for the development of up to 1,000 new homes along with a new local centre, primary school, informal and formal open space, structural landscaping, new footpaths and cycleway and enhanced transport links to the existing highway network. The application site is located in the jurisdiction of South Northamptonshire Council and will be constructed in three phases over eight years¹⁸.

- 2.1.21 As such both of these major developments are likely to be constructed, in part, after 2017, i.e. at the same time as the Proposed Scheme. They are considered to be receptors for the operation of HS2, but also potentially to give rise to cumulative construction impacts with the Proposed Scheme on their neighbours. The developments are referred to in those topic sections where such a cumulative impact has been identified.

¹⁸ South Northamptonshire Council; 2010; Land at Radstone Fields, Brackley; <http://snc.planning-register.co.uk/plandisp.aspx?tab=2&recno=62840>; Accessed: October 2013.

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

2.2 Description of the Proposed Scheme

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

2.2.2 The Proposed Scheme will require some land on a permanent basis, key features of which are illustrated in the Volume 2: CT-06-060b to CT-06-068a. Land that will also be required, but only on a temporary basis for construction, is set out in Section 2.3 of this report.

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

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

- additional areas of environmental mitigation have been added throughout the area;
- a general rationalisation of drainage features, including balancing ponds (including access tracks), land drainage features, watercourse diversions and replacement floodplain storage areas;
- the landscape earthworks to the south of the A4421 Buckingham Road (Newton Purcell) and west of the Proposed Scheme have been extended slightly further northwards to improve the level of mitigation provided;
- the realignment of Footpath BD8 has been amended to take into account recent changes made to the Definitive Map by Northamptonshire County Council to Bridleway BD10; and
- the balancing pond for the Proposed Scheme and the landscape earthworks to the east of the alignment near Radstone have been rearranged to improve the level of mitigation provided.

Overview

2.2.5 The Proposed Scheme through this area will be approximately 11.85km in length. It will commence from south-east of Newton Purcell in a cutting. It will then proceed north-west, passing east of Newton Purcell. After passing to the east of Mixbury, the Proposed Scheme will cross the River Great Ouse on a viaduct to the west of Westbury.

2.2.6 The Proposed Scheme will continue north-west through a cutting passing to the east of Turweston before re-crossing the River Great Ouse on a viaduct. It will continue north-west, predominantly in cutting, crossing the A43 Oxford Road to the east of Brackley before crossing the Helmdon Disused Railway SSSI to the south of Radstone. The Proposed Scheme will leave this area south-west of Halse Copse South, near Radstone.

Barton to Mixbury cutting

2.2.7 The route of the Proposed Scheme will leave the Calvert, Steeple Claydon, Twyford and Chetwode area (CFA13) within the Barton to Mixbury cutting, which is approximately 4km long, and up to 10m deep. This section of the Proposed Scheme extends from just south-east of Newton Purcell to the east of Mixbury. Key permanent features of this section will include (see Maps CT-06-060 to CT-06-063 in Volume 2, CFA14 Map Book):

- landscape earthworks on the eastern side of the cutting, from the start of the cutting to approximately 300m south-east of the A4421 Buckingham Road, to integrate the cutting into the landscape and provide visual screening;
- landscape earthworks on the western side of the cutting, from the start of the cutting to approximately 250m south-east of the A4421 Buckingham Road, to integrate the cutting into the landscape and provide noise screening;
- an overbridge approximately 9m above existing ground level, a realignment of Footpath BHA/2;
- noise fence barriers approximately 400m long and 3m high on the western side of the Proposed Scheme, from approximately 300m south-east of the A4421 Buckingham Road to just north of the A4421 Buckingham Road;
- balancing ponds for highway drainage and associated access tracks to the east and west of the Proposed Scheme and adjacent to the A4421 Buckingham Road;
- an overbridge approximately 8m above existing ground level, a realignment of the A4421 Buckingham Road;
- landscape earthworks on the western side of the cutting, from the A4421 Buckingham Road to Bridleway 213/7, to integrate the cutting into the landscape and provide noise screening;
- replacement floodplain storage areas to the east and west of the Proposed Scheme and adjacent to the northern side of the A4421 Buckingham Road, which will be excavated to approximately 1-2m below existing ground level and regraded¹⁹;
- a land drainage area to the west of the Proposed Scheme and to the north of the A4421 Buckingham Road;

¹⁹ All replacement floodplain storage areas will be regraded to tie back into existing ground level and returned to agriculture, wherever the farming practices are compatible with the land use.

- an overbridge approximately at existing ground level, a realignment of Bridleway 213/7;
- ecological mitigation areas consisting of grassland and woodland on the west side of the Proposed Scheme, between the Bridleway 213/7 overbridge and the end of the cutting;
- an overbridge approximately 6m above existing ground level, a realignment of Bridleway 213/4 and an accommodation track;
- replacement access for Widmore Farm to the west of the Proposed Scheme, which will run parallel and to the west of the Proposed Scheme from the A421 London Road;
- an overbridge approximately 2m above existing ground level, a replacement of the A421 London Road, which will also provide accommodation access;
- a replacement private access to the east of the Proposed Scheme for Warren Farm from the A421 London Road;
- noise fence barriers approximately 3m high on the eastern side the Proposed Scheme from the A421 London Road for approximately 600m;
- realignment of Footpath 303/7 on the eastern side of the Proposed Scheme over Featherbed Lane Overbridge;
- the infilling of the dismantled railway cutting on the western side of the Proposed Scheme, immediately south of Featherbed Lane over a distance of approximately 200m;
- an overbridge approximately at existing ground level, a replacement of Featherbed Lane. The existing overhead electricity line will also be diverted through the deck of the bridge; and
- Tibbetts Farm express feeder auto-transformer station²⁰ and its associated access track from Featherbed Lane, to the east of the Proposed Scheme.

2.2.8 Construction of this section will be managed from the A4421 Buckingham Road overbridge, A421 London Road overbridge, and the Tibbetts Farm express feeder auto-transformer station satellite compounds (see Section 2.3).

Mixbury embankment and cutting

2.2.9 The route will continue into the Mixbury embankment and cutting section, which comprises an embankment approximately 250m long and up to 8m high, and a cutting approximately 500m long and up to 8m deep. Key permanent features of this section, which is approximately 750m long, will include (see Map CT-06-063 in Volume 2, CFA14 Map Book):

²⁰ HS2 trains will draw power from overhead line equipment, requiring feeder stations and connections to the 400kV National Grid network. In addition to feeder stations, smaller auto-transformer stations will be required at more frequent intervals, see Volume 1 for more information.

- a balancing pond for railway drainage and associated access track, east of the route and north of Footpath 213/1;
- a replacement floodplain storage area to the west of the Proposed Scheme, excavated to approximately 4m below existing ground level and regraded;
- an overbridge approximately 3m above existing ground level, a realignment of Bridleways 303/4 and 303/22; and
- a balancing pond access track to the west of the Proposed Scheme to provide access to balancing ponds located in the Westbury viaduct and embankments section to the south of the River Great Ouse.

2.2.10 Construction of this section will be managed from the Featherbed Lane overbridge satellite compound (see Section 2.3).

Westbury viaduct and embankments

2.2.11 The route will continue into the Westbury viaduct and embankments section. This comprises an embankment approximately 500m long and up to 11m high, a viaduct approximately 300m long and up to 12m high, and Grovehill embankment approximately 150m long and up to 10m high. Key permanent features of this section, which is approximately 950m long, will include (see Maps CT-06-063 to CT-06-064 in Volume 2, CFA14 Map Book):

- landscape earthworks on the east side of the Proposed Scheme from just north-west of Bridleway 303/4 to just north of the dismantled railway, to integrate the cutting into the landscape and provide visual screening;
- landscape earthworks on the west side of the Proposed Scheme from just north-west of Bridleway 303/4 to just south-east of the River Great Ouse, to integrate the cutting into the landscape and provide visual screening;
- a land drainage area and associated access track to the west of the Proposed Scheme, to the south of the River Great Ouse;
- an area of scattered planting to the east of the route, to the north of the River Great Ouse, to provide visual screening for local receptors in Westbury;
- a viaduct to carry the Proposed Scheme over the River Great Ouse, west of Westbury. The viaduct will be approximately 10m to 12m above ground level;
- noise fence barriers will extend along the east side of the route past Westbury, for a distance of approximately 750m, including along the eastern edge of the Westbury viaduct. The barrier will be up to 2m high, except across the viaduct which will have an approximately 1.4m high protection barrier adjacent to the tracks on each side. The protection barrier will be modified along the east side to also act as an absorptive noise fence barrier;
- realignment of Bridleway 303/5 under the viaduct;
- a balancing pond for railway drainage and associated access track to the west of the route, just south of the River Great Ouse;

- a replacement floodplain storage area, to the west of the Proposed Scheme, excavated to approximately 2m below existing ground level and regraded;
- a balancing pond for railway drainage and associated access track to the east of the route, just north of the River Great Ouse;
- land drainage areas to the east and west of the Proposed Scheme, just north of the River Great Ouse;
- landscape earthworks on both sides of the Proposed Scheme to the north of the Westbury viaduct to integrate the embankment and cutting into the landscape and provide visual screening; and
- reinforced hedgerow planting to the east of the Proposed Scheme to provide visual screening for local receptors in Westbury.

2.2.12 Construction of this section will be managed from the Westbury viaduct satellite compound (see Section 2.3).

Turweston cutting

2.2.13 The route will continue into the Turweston cutting, which is approximately 2.35km long and up to 20m deep. This section of the Proposed Scheme extends from north of the River Great Ouse near Westbury to south of the River Great Ouse near Turweston. Key permanent features of this section will include (see Maps CT-06-064 to CT-06-065 in Volume 2, CFA14 Map Book):

- hedgerow planting on both sides of the Proposed Scheme for the full length of the cutting to provide visual screening;
- an overbridge at approximately existing ground level, a realignment of Footpath WBB/17 and accommodation access;
- an overbridge approximately 2m above existing ground level, a realignment of the A422 Brackley Road;
- realignment of the private access to Oatleys Farm to the east of the Proposed Scheme;
- an area of ecological woodland mitigation on both sides of the Proposed Scheme, to the north of the A422 Brackley Road;
- realignment of Footpath TUW/3 to the east of the Proposed Scheme to the Turweston green overbridge;
- Turweston green overbridge, approximately 100m wide and broadly at existing ground level, a replacement of a private access, Bridleways TUW/4 and TUW/9 and Footpath TUW/3;
- realignment of the existing overhead powerlines to the west of the Proposed Scheme and over the Turweston playing fields;

- an access track to the east of the Proposed Scheme, leading to balancing ponds in the Turweston viaduct, adjacent earthworks and Brackley south cutting section located adjacent to the River Great Ouse;
- noise fence barriers approximately 3m high on the west side of the Proposed Scheme from approximately 250m north of Turweston green overbridge and continuing past the end of the cutting; and
- an area of ecological grassland mitigation on the eastern side of the Proposed Scheme, to the south of the River Great Ouse.

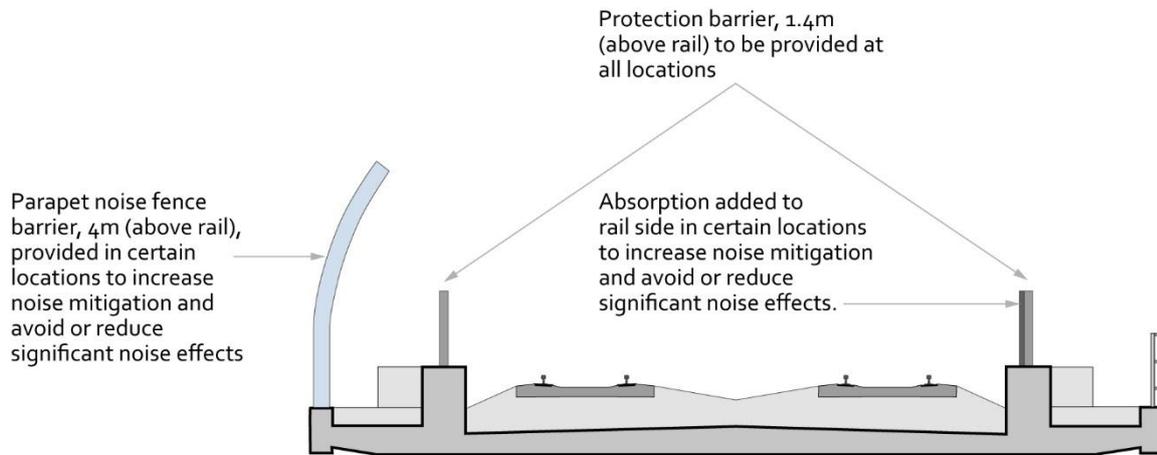
2.2.14 Construction of this section will be managed from the A422 Brackley Road overbridge satellite compound and the Turweston green overbridge satellite compound (see Section 2.3).

Turweston viaduct, adjacent earthworks and Brackley south cutting

2.2.15 The route will continue into the Turweston viaduct and adjacent earthworks and Brackley south cutting section, which extends from south of the River Great Ouse near Turweston to north of Footpath AX15. Key permanent features of this section, which is approximately 2.5km long, will include (see Maps CT-06-065 to CT-06-067 in Volume 2, CFA14 Map Book):

- an embankment approximately 200m long and up to 9m high, with planting to provide visual screening on the west side;
- noise fence barriers approximately 3m high and 450m long, on the west side the Proposed Scheme from the start of the embankment to approximately 150m north of the viaduct;
- a balancing pond for railway drainage and associated access to the east of the route, just south of the River Great Ouse;
- a viaduct over two parallel channels of the River Great Ouse up to approximately 10m above ground and approximately 80m long. The viaduct will have a 1.4m high protection barrier adjacent to the tracks on each side. The protection barrier will be modified to also act as an absorptive noise fence barrier. In addition, along the western edge of the viaduct there will be an approximately 4m high noise fence barrier (see viaduct cross-section in Figure 3 for schematic of viaduct showing noise fence barrier on western side);

Figure 3: Schematic cross-section of Turweston viaduct illustrating 4m barrier along the western edge



- realignment of Footpath TUW/7 under the viaduct;
- realignment of River Great Ouse around the viaduct approach embankments;
- a balancing pond for railway drainage and associated access track to the west of the route, just north of the River Great Ouse;
- realignment of Footpath BD8 under the viaduct;
- a replacement floodplain storage area, to the east of the Proposed Scheme, excavated to approximately 1m below existing ground level and regraded;
- an embankment approximately 600m long and up to 9m high, with landscape planting along both sides;
- an ecology grassland mitigation area on the east side of the Proposed Scheme to the north of the River Great Ouse;
- an ecology grassland mitigation area on the west side of the Proposed Scheme, south of the existing A43 Oxford Road;
- Whitfield auto-transformer station and associated access track approximately 200m south of the A43 Oxford Road on the west side of the Proposed Scheme;
- an overbridge approximately 5m above existing ground level, a realignment of the A43 Oxford Road. The overbridge is described in more detail in the subsequent A43 Oxford Road realignment and overbridge section;
- a cutting approximately 1.5km long and up to 18m deep, with hedgerows either side upto Helmdon disused railway SSSI;
- an overbridge approximately 9m above existing ground level, a replacement of Bridleway AX16 and accommodation track;

- an ecological mitigation area on the east side of the Proposed Scheme, between Bridleway AX16 and Helmdon Disused Railway SSSI, to compensate for the severance and direct loss of part of the SSSI;
- noise fence barriers approximately 3m high and 100m long, on the east side the Proposed Scheme from the Helmdon Disused Railway SSSI to the start of the landscape earthworks. A low level net / fence will be included on top of the noise fence barrier to reduce the risk of Natterer's bats that roost near Radstone being struck by passing trains. On the western side a combination of earthworks on top of the cutting, fencing/netting and planting will be used to create a similar barrier. The top of these barriers will be up to 8m above rail level;
- landscape earthworks on both sides of the cutting, from north of the Helmdon Disused Railway SSSI to Radstone Road, to integrate the cutting into the landscape and provide visual screening on the west side and to provide noise screening on the east side; and
- an overbridge approximately 5m above existing ground level, a realignment of Footpath AX15.

2.2.16 Construction of this section will be managed from the Brackley south cutting main compound and the Whitfield auto-transformer station satellite compound (see Section 2.3).

A43 Oxford Road realignment and overbridge

2.2.17 The A43 Oxford Road is a dual carriageway trunk road that will be crossed by the Proposed Scheme to the east of Brackley. It will be realigned to the north of its current alignment by up to 8m over a length of approximately 1.7km. The realignment will commence at the western tie-in with the existing roundabout with Oxford Road. It will cross over the Proposed Scheme on an overbridge at a height approximately 5m above existing ground level, and rejoin the current alignment of the A43 Oxford Road to the south-west of The Avenue. Key permanent features of this section will include (see Maps CT-06-066, CT-06-066-R1 and CT-06-066-L1 in Volume 2, CFA14 Map Book):

- two balancing ponds for highway drainage and associated access tracks to the east of the A43 Oxford Road, one on either side of the Proposed Scheme;
- downgrading of the existing A43 Oxford Road to a single lane approximately 600m long to allow access for residential properties and for the Whitfield auto-transformer station. The remaining sections of the former road will be removed on both sides of the route and the land will be treated in such a way that will be consistent with its end-use;
- a replacement floodplain storage area, to the west of the A43 Oxford Road, excavated to approximately 1m below existing ground level and regraded;
- an underpass to maintain the connectivity of Bridleways BD7 and BD10 under the A43 Oxford Road;

- an overbridge carrying the A43 Oxford Road over the Proposed Scheme approximately 5m above existing ground level; and
- a junction with Radstone Road on the western side of the Proposed Scheme.

2.2.18 Construction of this section will be managed from the Brackley south cutting main compound (see Section 2.3).

Brackley north cutting

2.2.19 The Proposed Scheme will continue into the Brackley north cutting section, which comprises an embankment approximately 200m long and 4m high, and a cutting approximately 1.3km long and 8m deep. The section extends from north of Footpath AX15 overbridge to south of Halse Copse South. Key permanent features of this section, which is approximately 1.5km long, will include (see Maps CT-06-067 to CT-06-068 in Volume 2, CFA14 Map Book):

- landscape earthworks on both sides of the Proposed Scheme from north of Helmdon Disused Railway SSSI to Radstone Road, to integrate the embankment into the landscape, and provide visual screening to the west and noise screening to the east;
- planting to provide visual screening for residents in Radstone, integrate Radstone Road overbridge into its setting and to maintain and enhance existing habitat links across the route for bats and other wildlife;
- two land drainage areas with associated access tracks to the west of the Proposed Scheme on either side of Radstone Road;
- balancing ponds for highway drainage with associated access tracks on both sides of the Proposed Scheme along Radstone Road;
- a balancing pond for railway drainage with associated access to the east of the route;
- a replacement floodplain storage area to the west of the Proposed Scheme, excavated to approximately 2m below existing ground level and regraded;
- landscape earthworks on both sides of the Proposed Scheme, from Radstone Road to the south of Halse Copse South, to integrate the cutting into the landscape, and to also provide noise screening on the east side;
- an overbridge approximately 9m above existing ground level, a realignment of Radstone Road;
- an overbridge approximately 4m above existing ground level, a replacement of Footpath AX5 and Bridleways AX18 and AX19;
- a replacement floodplain storage area to the west of the Proposed Scheme, excavated to approximately 1m below existing ground level and regraded to tie back into the existing ground level;

- a balancing pond for railway drainage with associated access track to the east of the Proposed Scheme, near Halse Copse South; and
- a land drainage area to the west of the Proposed Scheme, near Halse Copse South.

2.2.20 Construction of this section will be managed from the Radstone Road overbridge satellite compound (see Section 2.3).

2.2.21 The Proposed Scheme will then continue northward into the Greatworth to Lower Boddington area (CFA15).

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the strategy for construction of the Proposed Scheme in the Newton Purcell to Brackley area, including:

- overview of the construction process;
- description of the advance works;
- description of the engineering works to build the railway;
- construction waste and material resources;
- commissioning the railway; and
- indicative construction programme (see Section 2.3).

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

2.3.3 In addition to the land that will be required permanently by the Proposed Scheme (see Section 2.2), land will be required on a temporary basis for construction. Key temporary construction features are illustrated on the construction Map Series CT-05 (Volume 2, CFA14 Map Book). Following construction works, land required temporarily will be prepared for its eventual end use, which will include being returned to its pre-construction use wherever appropriate.

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

Overview of the construction process

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

- advance works, including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works, including: establishment of construction compounds; site preparation and enabling works; main earthworks and structure works; site restoration; and, removal of construction compounds;

- railway installation works, including: establishment of construction compounds; infrastructure installation; connections to utilities; and, removal of construction compounds; and
- system testing and commissioning.

2.3.6 General provisions relating to the construction process are set out in more detail in Volume 1, Section 6 and the draft CoCP (see Volume 5: Appendix CT-003-000/1) including:

- the approach to environmental management during construction and the role of the Code of Construction Practice (draft CoCP, Sections 1-3);
- working hours (draft CoCP, Section 5.2);
- the management of construction traffic (draft CoCP, Section 14); and
- the handling of construction materials (draft CoCP, Section 15).

Advance works

2.3.7 General information about advance works can be found in Volume 1, Section 6.5. Advance works will be required before commencing construction works and will typically include:

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

Engineering works

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

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

2.3.9 The construction of the scheme will be subdivided into sections, each of which will be managed from compounds. The compounds will act as the main interface between the construction worksites and the public highway, as well as performing other functions as described below. Compounds will either be main compounds or satellite compounds, which are generally smaller. Some compounds will be used for civil

engineering works and others for railway installation works, and in some cases for both.

2.3.10 In the Newton Purcell to Brackley area there will be one main compound and seven civil engineering satellite compounds. In addition, two compounds will be used as railway installation satellite compounds for the civil engineering works.

2.3.11 Figure 4 shows the management relationship for civil engineering works compounds and Figure 5 for the railway installation works compounds. Details about individual compounds are provided in subsequent sections of this report.

General overview of construction compounds

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

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

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

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

- railheads will connect with the existing railway network to enable loading and unloading to and from trains delivering material to the HS2 site or removing excavated material;
- roadheads will require an additional area of land adjacent to the compound for the storage and loading and unloading of bulk earthworks materials, which are moved to and from the site on public highways; and
- living accommodation for the construction workforce.

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

- 2.3.16 Further information on the function of compounds, including general provisions for their operation, including security fencing, lighting, utilities supply, site drainage, codes of worker behaviour are set out in Volume 1, Section 6.6, and the draft CoCP, Section 5.

Construction traffic routes

- 2.3.17 The movement of construction vehicles carrying materials, plant, other equipment and workforce (or moving empty) will take place both within the construction sites, on public roads and via the rail network. The construction compounds will provide the interface between the construction works and the public highway or rail network, and the likely road routes to access compounds are described in subsequent sections below.
- 2.3.18 Movements between the construction compounds and the worksites will be on designated haul roads within the site, often along the line of the Proposed Scheme or running parallel to it.

Figure 4: Schematic of construction compounds for civil engineering works

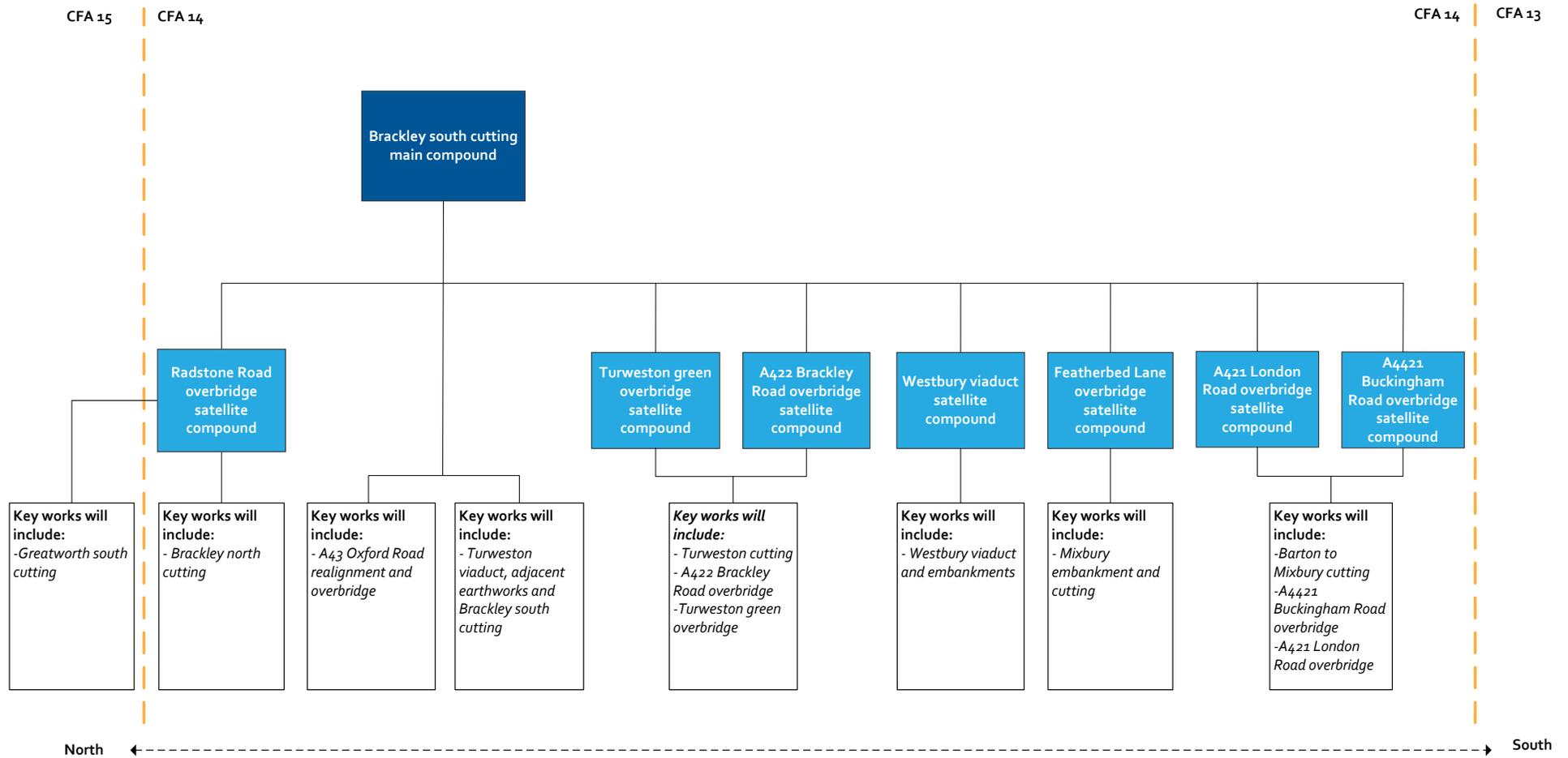
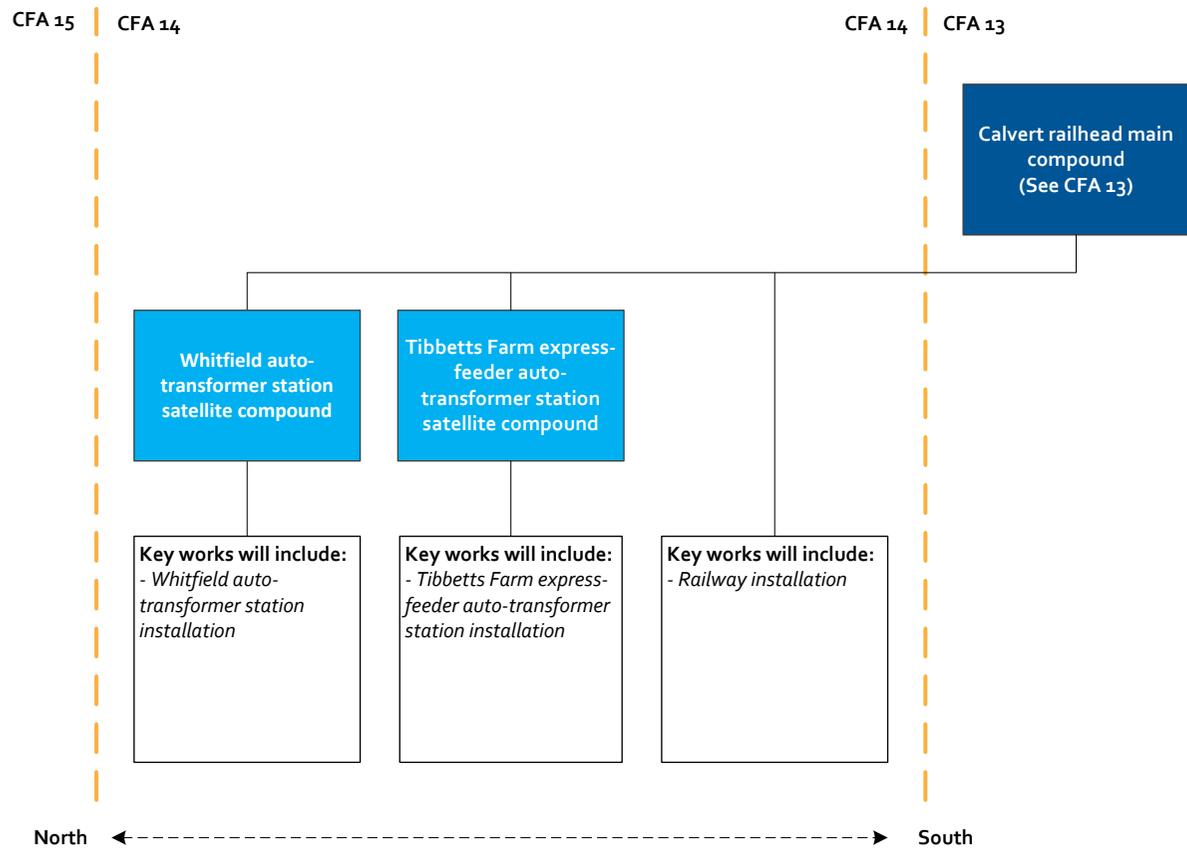


Figure 5: Schematic of construction compounds for railway installation works



Calvert railhead main compound

- 2.3.19 This compound is located within the Calvert, Steeple Claydon, Twyford and Chetwode area (CFA 13); however, it will provide support to all rail installation works satellite compounds, as illustrated in Figure 5, which provide directly for the construction of the Proposed Scheme throughout the Newton Purcell to Brackley area. See CFA Report 13 for more information about this compound.
- 2.3.20 The railway systems installation works in this area will include track, overhead line equipment, communications equipment and traction power supply. The installation of track in open areas will be of standard ballast or slab track configuration.
- 2.3.21 Works in this area will take approximately one year and six months, commencing in 2022. See Volume 1, Section 5 for descriptions of typical railway systems and Section 6 for associated construction activities.
- 2.3.22 The track will be laid in a northerly direction away from the Calvert railhead main compound in this area. Before the railway installation can commence, adequate civil engineering work will need to be completed to allow a continuous track laying sequence.
- 2.3.23 The railway systems installation will have its own mobile welfare facilities for the site staff.

A4421 Buckingham Road overbridge and A421 London Road overbridge satellite compounds

- 2.3.24 Both compounds will be used for civil engineering works only, working together on key works between Newton Purcell and Mixbury. Both compounds will be managed from the Brackley south cutting main compound and neither will provide worker accommodation facilities.
- 2.3.25 The A4421 Buckingham Road overbridge satellite compound will:
- be operational for approximately three years and three months, commencing in 2017;
 - support approximately 40 workers each day throughout much of the civil engineering works period, increasing to a maximum of 100 workers each day during the peak period of activity; and
 - be accessed via the A4421, A421 and the M1 and/or A4421, A421, A43 and the M1 from the east and via the A4421, A421, A43 and the M40 and/or A4421, A41 and the M40 from the west.
- 2.3.26 The A421 London Road overbridge satellite compound will:
- be operational for approximately one year and six months, commencing in 2018;
 - support approximately 55 workers each day throughout much of the civil engineering works period, increasing to a maximum of 90 workers each day during the peak period of activity; and

- be accessed via the A421 and the M1 and/or A421, A43 and the M1 from the east and the A421, A43 and the M40 and/or A421, A4421, A41 and the M40 from the west.

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

- site clearance and enabling works;
- building demolition;
- culverts and drainage;
- cutting and landscape earthworks;
- construction of bridges;
- highway and footpath reinstatement;
- permanent fencing; and
- landscaping and planting.

2.3.28 The compounds will be used to manage construction of the Barton to Mixbury cutting (including the A4421 Buckingham Road overbridge and A421 London Road overbridge), which will take approximately three years and three months. See Volume 1, Section 5.2 for a description of a typical cutting and Volume 1, Section 6.8 for associated construction techniques.

2.3.29 Demolition will be required at four properties and for three structures.

Table 1: Demolitions required for A4421 Buckingham Road overbridge and A421 London Road overbridge satellite compounds

Description	Location
Two rail overbridges	A4421 Buckingham Road
Residential property (Station House) and associated outbuilding	A4421 Buckingham Road
Commercial outbuilding associated with Widmore Farm	Off A421 London Road
Rail overbridge	A421 London Road
Two commercial outbuildings associated with Warren Farm	A421 London Road
Two commercial buildings and a building associated with the paddock at Oaks Farm	A421 London Road

2.3.30 Diversion of three roads will be required:

- the permanent realignment of A4421 Buckingham Road, approximately 50m to the west across the new overbridge;
- the temporary realignment of A421 London Road, for a period of approximately a year to one year and six months, with permanent reinstatement along its existing alignment; and

- the temporary closure of Featherbed Lane and diversion via the A421 London Road, for a period of approximately nine months to one year, with permanent reinstatement along its existing alignment.

2.3.31 Alternatives routes for the following five PRow will be required:

- a temporary alternative route for Footpaths 308/2 and 308/3, to the west of the temporary stockpile for a period of approximately nine months to one year, adding an additional 700m. It will then be permanently reinstated along its existing alignment, adding a negligible distance;
- a temporary alternative route for Bridleway 213/7, to the east of the Proposed Scheme for a period of approximately nine months to one year, adding an additional 100m. It will then be permanently reinstated along its existing alignment, adding a negligible distance;
- whilst Bridleway 213/4 will remain open during construction, it will then be permanently diverted 200m to the west across Bridleway 213/4 accommodation overbridge, adding an additional 150m; and
- a temporary alternative route for Footpath 303/7, to the north for a period of approximately nine months to one year, adding an additional 100m. It will then be permanently diverted 250m to the west across Featherbed Lane overbridge, adding an additional 100m.

2.3.32 Diversion of 13 utilities and the installation of two new utilities will be required, the key ones being:

- the temporary diversion of 132kV Western Power overhead electricity line across Featherbed Lane, for a period of nine months to one year, with permanent reinstatement underground along its original alignment; and
- a permanent new Western Power line, connecting electricity power to Tibbetts Farm express feeder auto-transformer station.

2.3.33 Diversion of two watercourses at Station House will be required, of 650m and 350m respectively to the south.

Featherbed Lane overbridge satellite compound and Tibbetts Farm express feeder auto-transformer station satellite compound

2.3.34 This compound, which changes name for the auto-transformer installation, will be used for civil engineering works and rail installation works, between Mixbury and Westbury. On completion of the civil engineering works, the compound will reduce in size to form the Tibbetts Farm express feeder auto-transformer station satellite compound for the railway installation works. The compound will:

- be in place for approximately five years and three months. During this period there will be civil engineering works for approximately three and three months, commencing in 2017, followed by a six month period of inactivity before the railway installation works, which will last approximately one and a half years, commencing in 2021;

- support approximately 25 workers each day throughout much of the civil engineering works period, increasing to a maximum of 90 workers each day during the peak period of activity;
- support approximately 30 workers each day throughout the rail systems installation works period increasing to a maximum of 40 workers each day during the peak period of activity;
- not provide living accommodation;
- be accessed via the A421, A43 and the M1 and/or A421 and the M1 from the east or via the A421, A43 and the M40 and/or A421, A4421, A41 and the M40 from the west; and
- be managed from Brackley south cutting main compound for the civil engineering works and from Calvert railhead main compound for the railway systems installation works.

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

- site clearance and enabling works;
- demolition of structures;
- culverts and drainage;
- cutting, embankment and landscape earthworks;
- construction of bridges;
- rail systems installation;
- permanent fencing; and
- landscaping and planting.

2.3.36 The compound will be used to manage construction of the Mixbury embankment and cutting. This will be approximately 750m long and will take approximately two years and three months to construct. See Volume 1 for descriptions of typical rail corridor (Section 5.2), embankments (Section 5.3), viaducts (Section 5.10), and for associated construction techniques (Sections 6.8 and 6.16, respectively).

2.3.37 Demolition of three structures will be required:

- a Western Power steel frame pylon, adjacent to Featherbed Lane;
- a Western Power steel frame pylon, off Featherbed Lane; and
- a Western Power steel frame pylon, along the dismantled railway line near Mossy Corner Lane (track).

2.3.38 A temporary alternative route will be required for one PRoW, Bridleway 303/4, to the south for a period of approximately nine months to one year, adding an additional 50m. The bridleway will then be permanently reinstated 30m to the west across Bridleway 303/4 overbridge, adding an additional 50m.

- 2.3.39 No road diversions, key utilities diversions, or diversion of watercourses will be required.
- 2.3.40 Key rail systems installation works in this section of the Proposed Scheme will be the installation of Tibbetts Farm express feeder auto-transformer station, which will take approximately one and a half years to construct. Volume 1, Section 5.17 describes a typical power supply and Volume 1, Section 6.23 describes the associated construction activities.

Westbury viaduct satellite compound

- 2.3.41 This compound will be used for civil engineering works only west of Westbury. The compound will:
- be operational for approximately two years, commencing in 2017;
 - support approximately 90 workers each day throughout much of this period, increasing to a maximum of approximately 125 workers each day during the peak period of activity;
 - not provide worker accommodation;
 - be accessed via a site access road from the A422, A43 and the M1 from the east and the A422 via A43 and the M40 from the west; and
 - be managed from Brackley south cutting main compound.
- 2.3.42 Works in this section of the Proposed Scheme will be carried out in the following broad phases:
- site clearance and enabling works;
 - drainage works;
 - embankment and landscaping earthworks;
 - construction of viaduct;
 - permanent fencing; and
 - landscaping and planting.
- 2.3.43 The compound will be used to manage construction of the Westbury viaduct and embankments, which will take approximately two years to construct. See Volume 1 for descriptions of embankments (Section 5.3) and viaducts (Section 5.10), and for associated construction techniques (Sections 6.8 and 6.16, respectively).
- 2.3.44 Alternative routes for the following PRow will be required: a temporary alternative route for Bridleway 303/5, to the south for a period of approximately one year and nine months to two years, adding an additional 300m. It will then be permanently diverted approximately 150m to the north under Westbury viaduct, adding an additional 100m.
- 2.3.45 There will be no demolitions, road diversions, key utility diversions or watercourse diversions required.

A422 Brackley Road overbridge and Turweston green overbridge satellite compounds

- 2.3.46 These compounds will be used for civil engineering works only, from west of Westbury to Turweston. Both compounds will be managed from the Brackley south cutting main compound. Neither will provide worker accommodation facilities.
- 2.3.47 The A422 Brackley Road overbridge satellite compound will:
- be operational for approximately three years, commencing in 2017;
 - support approximately 35 workers each day throughout much of this period, increasing to a maximum of 90 workers each day during the peak period of activity;
 - be accessed via the A422 Brackley Road, A43 Oxford Road and the M1 from the east and the A422, A43 and the M40 from the west; and
 - have an associated roadhead for the receipt, storage and transfer of earthworks material route-wide (see Map CT-05-064 in Volume 2, CFA14 Map Book).
- 2.3.48 The Turweston green overbridge compound will:
- be operational for approximately one year, starting in 2017;
 - support approximately 45 workers each day throughout this period; and
 - be accessed via Oatleys Road/private access from the A43 Oxford Road and the M1 from the east and the A43 and the A422, A43 and the M40 from the west.
- 2.3.49 Granular material gained from the Turweston cutting (and adjacent cuttings) is intended for construction purposes elsewhere along the route. The material removed from the cuttings will be put through a material processing plant to crush and sieve the material which will then be placed in temporary stockpiles between 8m and 15m in height to the east of the Turweston cutting. Subsequent transport to other parts of the route will then be via the A422 Brackley Road, or via site haul. The processing plant is mobile and will be moved to the most efficient location, either within the cutting or within the processing areas alongside the cutting. The processing operation will take place over the duration of the excavation of the Turweston (and adjacent) cuttings from late 2017 until late 2020, although the temporary stockpiles may remain in place longer, following completion of the cuttings, until such time as the material is required. This area will also operate as a roadhead as part of the overall earthworks strategy.
- 2.3.50 Works in this section of the Proposed Scheme will be carried out in the following broad phases:
- site clearance and enabling works;
 - building demolition;
 - culverts and drainage;

- cutting and landscape earthworks;
- construction of bridges;
- permanent fencing; and
- landscaping and planting.

2.3.51 The A422 Brackley Road overbridge satellite compound and the Turweston green overbridge satellite compound will be used to manage construction of the Turweston cutting (including the A422 Brackley Road overbridge and Turweston green overbridge), which will take approximately three years to construct. See Volume 1, Section 5.3 for a description of a typical cutting and Section 6.8 for associated construction techniques.

2.3.52 Demolition will be required at two properties and for six structures.

Table 2: Demolitions required for A422 Brackley Road overbridge and Turweston green overbridge satellite compounds

Description	Location
Western Power Network pylon	Across the field (off A422 Brackley Road)
Western Power Network pylon	Between Turweston green overbridge satellite compound and A422 Brackley Road
Western Power Network pylon	Adjacent to Turweston green overbridge satellite compound
Residential property (Parkside and associated outbuilding)	Turweston
Residential and commercial properties (Ballabeg Stables, one residential building and four associated commercial outbuildings)	Turweston
Western Power Network pylon	East of Ballabeg Stables
Western Power Network pylon	Turweston
Western Power Network pylon	Adjacent to Footpath TUW/7/1

2.3.53 Diversion of two roads will be required:

- temporary realignment of A422 Brackley Road for a period of approximately a year to one and a half years, with permanent realignment 30m to the south of its existing alignment; and
- temporary realignment of an unnamed road and private access leading to Oatleys Wood for a period of one year, with permanent reinstatement along its existing alignment.

2.3.54 Alternative routes for the following five PRoW will be required:

- Footpath WBB/17 will remain open during construction. It will then be permanently diverted 150m to the north, across the new Footpath WBB/17 accommodation overbridge, adding a negligible distance;

- a temporary alternative route for Footpath TUW/3, to the north for a period of approximately one year, adding an additional 550m. It will then be permanently diverted via an unnamed road and private access leading to Oatleys Wood and public bridleway TUW/9, adding an additional 300m;
- a temporary alternative route for Bridleway TUW/4, to the west for a period of approximately one year, adding an additional 100m. It will then be permanently reinstated along its existing alignment, adding a negligible distance;
- a temporary alternative route for Footpath TUW/5, to the west for a period of approximately one year, adding an additional 100m. It will then be permanently diverted along the farm access track and the Oatleys Road/ private access leading to Oatleys Wood, adding a negligible distance; and
- a temporary alternative route for Bridleway TUW/9, to the north for a period of approximately one year, adding an additional 100m. It will then be permanently reinstated along its existing alignment, adding a negligible distance.

2.3.55 Diversion of one key utility will be required: the permanent diversion of 132kV Western Power overhead electricity and pylons at Turweston to the west of the Proposed Scheme.

2.3.56 There will be no watercourse diversions required.

Brackley south cutting main compound and Whitfield auto-transformer station satellite compound

2.3.57 This compound, which changes name for the auto-transformer installation, will be used for civil engineering works and rail installation works, between Turweston and the north of Brackley. After the civil engineering works are completed, this compound will reduce in size to form the Whitfield auto-transformer station satellite compound for the railway systems installation. The compound will:

- be in place for approximately five years and six months. During this period there will be civil engineering works for approximately five years, commencing in 2017, and rail installation works for approximately one and a half years, commencing in 2021; There will be an approximately one year overlap between the civil engineering and railway installation works;
- support approximately 110 workers each day throughout much of the civil engineering works period, increasing to a maximum of 230 workers each day during the peak period of activity; support approximately 30 workers each day throughout the rail systems installation works period, increasing to a maximum of 40 workers each day during the peak period of activity;
- provide living accommodation for between 105 to 200 people for an estimated period of four and a half years;
- be accessed via the A43 Oxford Road and the M1 from the east and via the A43 and the M40 from the west;

- provide main compound support to seven satellite compounds, as illustrated in Figure 4 for the civil engineering works; and
- be managed from Calvert railhead main compound for the railway systems installation works (see CFA Report 13 for more information).

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

- site clearance and enabling works;
- building demolition;
- culverts and drainage;
- cuttings, embankments and landscaping earthworks;
- construction of bridges and viaducts;
- highway and footpath construction and reinstatement;
- rail systems installation;
- permanent fencing; and
- landscaping and planting.

2.3.59 The compound will be used to manage construction of Turweston viaduct, adjacent embankments and Brackley south cutting, which will take approximately two years and nine months to construct. It will also be used to manage construction of the A43 Oxford Road realignment and overbridge, which will take approximately one year and three months to construct. See Volume 1 for descriptions of typical cuttings and embankments (Section 5.3) and viaducts (Section 5.10), and for associated construction techniques (Sections 6.8 and 6.16, respectively).

2.3.60 Demolition will be required at one property and for one structure.

Table 3: Demolitions required for Brackley South cutting main compound and Whitfield auto-transformer station satellite compound

Description	Location
Western Power Network pylon	Turweston
Residential and commercial property (Iletts Farm, two dwellings, one commercial unit and five associated farm outbuildings)	Off A43 Oxford Road, north east of Brackley

2.3.61 Diversion of one road will be required: the permanent realignment of A43 Oxford Road, approximately 80m to the north across a new overbridge.

2.3.62 Alternative routes for the following seven PRow will be required:

- Footpath TUW/7 will remain open during construction. It will then be permanently diverted 150m to the west under the Turweston viaduct, adding an additional 300m;

- a temporary alternative route for Footpath BD8, to the east for a period of approximately six months, adding an additional 800m. It will then be permanently reinstated approximately 400m to the east under Turweston viaduct, adding an additional 700m;
- a temporary closure for Bridleways BD7 and BD10 at A43 Oxford Road crossing, for a period of approximately one year and three months to one and a half years. They will then be permanently diverted, 230m and 100m to the south respectively, to the new underpass beneath the A43 Oxford Road, adding an additional 200m;
- a temporary alternative route for Bridleway AX16, to the west for a period of approximately six to nine months. It will then be permanently diverted across the new overbridge, adding a negligible distance;
- a temporary alternative route for Bridleway AX14, to the south for a period of one year and three months to one year and six months. It will then be permanently reinstated to its original alignment; and
- Footpath AX15 will remain open during construction. It will then be permanently diverted 50m to the east across the new Footpath AX15 overbridge, adding an additional 100m.

2.3.63 Diversion of seven utilities and the installation of two new utilities will be required, the key ones being:

- permanent increase in height along existing alignment of 33kV Western Power overhead electricity and pylons across the A43 Oxford Road; and
- permanent new Western Power line, connecting electricity power to Whitfield auto-transformer feeder station.

2.3.64 Diversion of one watercourse will be required: the River Great Ouse at Turweston, which will require a diversion of approximately 170m to the south under the Turweston viaduct.

2.3.65 Key rail systems installation works in this section of the Proposed Scheme will be the installation of Whitfield auto-transformer station, which will take approximately one year and six months to construct. Volume 1, Section 5.17 describes a typical power supply and Section 6.23 describes the associated construction activities.

Radstone Road overbridge satellite compound

2.3.66 This compound will be used for civil engineering works only, between an area north of Brackley to the north of Radstone. The compound will:

- be operational for approximately two years and six months, commencing in 2017;
- support approximately 40 workers each day throughout much of this period, increasing to a maximum of approximately 90 workers each day during the peak period of activity;
- not provide worker accommodation;

- be accessed via Radstone Road, B4525 and A43 to the M1 and/or Radstone Road, B4525, A43 and A421 to the M1 from the east and via Radstone Road, B4525, A422 to the M40 and/or Radstone Road, B4525, and A43 to the M40 from the west; and
- be managed from the Brackley south cutting main compound.

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

- site clearance and enabling works;
- culverts and drainage;
- construction of bridges;
- cuttings, embankments and landscape earthworks;
- highway and footpath reinstatement;
- permanent fencing;
- rail systems installation; and
- landscaping and planting.

2.3.68 The compound will be used to manage construction of the Brackley north cutting, which will take approximately two years and six months to construct. See Volume 1, Section 5.3 for a description of a typical cutting and Section 6.8 for associated construction techniques.

2.3.69 No demolitions will be required.

2.3.70 Diversion of one road will be required: the permanent realignment of Radstone Road, 50m to the west across a new overbridge.

2.3.71 Alternative routes for the following five PRow will be required:

- Footpath AX7 will remain open during construction. It will then be permanently diverted approximately 200m to the west across the realigned Radstone Road, adding an additional 300m;
- a temporary alternative route for Bridleway AX19, to the west for a period of approximately six months, adding an additional 600m. It will then be permanently diverted approximately 100m to the west, across the new offline Bridleway AX18 accommodation overbridge, adding an additional 500m;
- a temporary alternative route for Bridleway AX18, to the west for a period of approximately six to nine months. It will then be permanently diverted approximately 20m to the east across the new Bridleway AX18 accommodation overbridge, adding an additional 50m;
- a temporary alternative route for Footpath AX5, to the west of a period of approximately six to nine months. It will then be permanently diverted

approximately 20m to the east, across the new Bridleway AX18 accommodation overbridge, adding an additional 50m; and

- Footpath AX6 will remain open during construction. It will then be permanently diverted approximately 20m to the north of its existing alignment around the new balancing pond, adding an additional 30m.

2.3.72 No key utility diversions will be required.

2.3.73 Diversion of three watercourses will be required:

- a drain beside Footpath AX5, which will require a diversion of approximately 540m to the south and connecting to the Brackley culvert;
- a dry valley at Radstone, which will require a diversion of approximately 290m to the south; and
- a river adjacent to Manor Farm at Radstone, which will require a diversion of approximately 250m to the south and connecting to the Brackley culvert.

Construction waste and material resources

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

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

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

2.3.77 The quantity of surplus excavated material originating from the Newton Purcell to Brackley area that will require off-site disposal to landfill as excavation waste is shown in Table 4. This is the forecast quantity of contaminated excavated material that is chemically unsuitable for reuse within the Proposed Scheme and which will be taken directly from the Newton Purcell to Brackley area for off-site disposal to either non-hazardous or hazardous landfill. This represents a proportion of the total quantity of surplus excavated material that will require disposal, which altogether is reported on a route-wide basis in Volume 3, Section 14.

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

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

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

Table 4: Estimated construction, demolition and excavation waste

Waste type	Estimated material quantities that will be generated (tonnes)	Estimated quantity of waste for off-site disposal to landfill (tonnes)
Excavation	8,738,183	152,627
Demolition	16,188	1,619
Construction	43,536	4,354
Worker accommodation site	551	276
TOTAL	8,798,458	158,876

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

Commissioning of the railway

- 2.3.81 Commissioning is the process of testing the infrastructure to ensure that it operates as expected, and will be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.26.

Construction programme

- 2.3.82 A construction programme that illustrates indicative periods for the construction activities in this area is provided in Figure 6.

Figure 6: Indicative construction programme

Construction activity	2017				2018				2019				2020				2021				2022				2023				2024				2025			
	quarters				quarters				quarters				quarters				quarters				quarters				quarters				quarters							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advance works																																				
Advance works	■																																			
Civil engineering works																																				
A4421 Buckingham Road overbridge satellite compound					■				■				■																							
Barton to Mixbury cutting					■				■				■																							
Footpath BHA / 2 overbridge					■																															
Newton Purcell culvert					■																															
A4421 Buckingham Road overbridge					■				■																											
Bridleway 213 / 7 overbridge									■				■																							
A421 London Road overbridge satellite compound					■				■																											
Bridleway 213 / 14 accommodation overbridge									■				■																							
A421 London Road overbridge					■				■																											
Featherbed Lane overbridge satellite compound					■				■				■																							
Featherbed Lane overbridge									■				■																							
Tibbetts Farm express feeder auto-transformer station																	■				■															
Mixbury Embankment					■												■																			
Mixbury culvert					■																															
Mixbury cutting									■				■																							
Bridleway 303 / 4 overbridge									■				■																							
Westbury viaduct satellite compound					■				■				■																							
Westbury embankment													■				■																			
Westbury viaduct					■				■				■																							
Grovehill embankment													■				■																			

A422 Brackley Road overbridge satellite compound	
<i>Turweston cutting</i>	
<i>Footpath WBB / 17 accommodation overbridge</i>	
<i>A422 Brackley Road overbridge</i>	
Turweston green overbridge satellite compound	
<i>Turweston green overbridge</i>	
Brackley south cutting main compound	
<i>Turweston embankment</i>	
<i>Turweston viaduct</i>	
<i>Helmdon embankment</i>	
<i>Whitfield auto-transformer station</i>	
<i>Brackley south cutting</i>	
<i>A43 Oxford Road overbridge</i>	
<i>Bridleway AX16 accommodation overbridge</i>	
<i>Footpath AX15 overbridge</i>	
Radstone Road overbridge satellite compound	
<i>Brackley embankment</i>	
<i>Brackley culvert</i>	
<i>Brackley north cutting</i>	
<i>Radstone Road overbridge & Footpath AX7 diversion</i>	
<i>Bridleway AX18 accommodation overbridge</i>	

2.4 Operation of the Proposed Scheme

Operational specification

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

HS2 services

- 2.4.2 It is anticipated that initially there would be 11 trains per hour each way passing through the Newton Purcell to Brackley area in the morning and evening peak hours, and fewer during other times. The first trains of the day would leave the terminus stations no earlier than 05:00 Monday to Saturday (and 08:00 on Sundays) and the last would arrive no later than midnight.
- 2.4.3 It is anticipated that with Phase One in place the frequency of services could rise to 14 trains per hour each way during peak hours, and that with Phase Two in place the frequency could rise to 18 trains per hour each way during peak hours. The assessment of sound, noise and vibration has taken into account the frequency during Phase Two.
- 2.4.4 In this area, trains will run at speeds up to 360kph (225mph). The trains will be either single 200m long trains or two 200m long trains coupled together, depending on demand and time of day.

Maintenance

- 2.4.5 Volume 1, Section 4.4 describes the maintenance regime for HS2.
- 2.4.6 The intention is that inspections of the route will take place on a regular basis, at night when the railway is not operating. There will be routine preventative maintenance, including grinding and milling of the rails to keep them in good condition, and more periodic heavy maintenance as necessary.

Operational waste and material resources

- 2.4.7 Forecasts of the amount of operational waste that will be produced annually during operation of the Proposed Scheme have been prepared and are presented in Volume 5: Appendix WM-001-000.
- 2.4.8 Railway station and train waste refers to waste that will arise at each station. It will include waste from station operations and passenger waste removed from trains at terminating stations. This has only been reported for areas along the route in which these stations will be located.
- 2.4.9 Rolling stock maintenance waste is that which will be generated by the relevant train operating company at rolling stock maintenance facilities. This has only been reported for the areas along the route in which these facilities will be located.
- 2.4.10 Track maintenance waste and ancillary infrastructure waste (for example waste from depots, signalling locations, operations and maintenance sites) has been estimated using an average waste generation rate per kilometre length of total track. For this reason, both track maintenance waste and ancillary infrastructure waste has been reported for each area along the route.

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

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

2.4.12 On this basis, approximately 176 tonnes of operational waste will be reused, recycled and recovered during each year of operation of the Proposed Scheme in the Newton Purcell to Brackley area. Approximately 36 tonnes will require disposal to landfill (see Table 5).

Table 5: Operational waste forecast for the Proposed Scheme

Waste source	Estimated quantity of waste generated per annum (tonnes)	Estimated quantity of waste for disposal to landfill per annum (tonnes)
Railway station and train	n/a	n/a
Rolling stock maintenance	0	0
Track maintenance	196	29
Ancillary infrastructure	16	7
TOTAL	212	36

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

2.5 Community forum engagement

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

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

- 26 March 2012 at Brackley Town Hall;
- 20 June 2012 at Brackley Town Hall;
- 5 September 2012 at Westbury Sports Pavilion;
- 7 November 2012 at Westbury Sports Pavilion;

- 20 February 2013 at Westbury Sports Pavilion; and
- 16 September 2013 at Westbury Sports Pavilion.

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

2.5.4 The main themes to emerge from these meetings were:

- the effects of the scheme on the adjacent settlements, including the perceived increased impact following revisions to the route, which lessen the impact on Brackley in comparison with the original proposals, (see Section 2.6 for further information);
- the effects on remains of an ancient settlement in the area (see Section 6 for further information);
- the effects on local equestrian activities (see Section 3 for further information);
- noise effects throughout the valley and particularly at Turweston (see Section 11 for further information);
- the effects on the local SSSI and wildlife site at Turweston (see Section 7 on for further information and Maps CT-10-034 and CT-10-035 (Volume 2, CFA14 Map Book);
- the visual impacts of viaducts on the local landscape and visual intrusion of overhead power lines;
- disruption of footpaths and bridleways, request for reinstatement of PRow and the need for land bridges for bridleways to avoid horses being startled;
- how HS2 Ltd will enforce the draft CoCP. Notably, how construction traffic will be managed and whether local works on roads would be required to make them suitable;
- permanent road realignment proposals, including a request for assurance that these would not increase distance / journey times;
- noise including from the viaduct at Westbury. Identification of the need to understand mitigation methods for noise including new technologies; and
- impacts of blight on the community, including queries over compensation proposals and the value of the voluntary purchase zone. The need for greater general clarity regarding the proposed new hardship scheme and queries regarding a number of specific variables associated with the hardship scheme.

2.5.5 In addition to the engagement through the community forums, the draft Environmental Statement and Design Refinement consultations were launched on 16 May 2013 for a period of eight weeks and closed on the 11 July 2013. As part of these consultations, members of local communities and other interested parties were notified, provided with information and invited to engage on issues pertinent to the

draft Environmental Statement and the development of the scheme. Details of the local consultation events were provided on HS2 Ltd website, social media, posters at local venues, national and regional advertising and to properties within 1km of the Proposed Scheme. In the Newton Purcell to Brackley area consultations on the draft Environmental Statement were held on 14 June 2013 at Brackley Town Hall.

- 2.5.6 HS2 Ltd staff attended the events, including engineers and environmental specialists, for members of the public to speak to.
- 2.5.7 Responses from the draft Environmental Statement consultation have been analysed and an overview of those received and how the Environmental Statement has taken account of responses is contained in the Draft Environmental Statement Consultation Summary Report (Volume 5: Appendix CT-008-000).

2.6 Route section main alternatives

- 2.6.1 The main strategic alternatives to the Proposed Scheme are presented in Volume 1 and in Appendix CT-002-000. The main local alternatives considered for the Proposed Scheme within this area are described in this section.
- 2.6.2 Since April 2012, as part of the design development process, a series of local alternatives have been reviewed within workshops attended by engineering, planning and environmental specialists. During these workshops, the likely significant environmental effects of each design option have been reviewed. The purpose of these reviews has been to ensure that the Proposed Scheme draws the appropriate balance between engineering requirements, cost and potential environmental impacts.

Tunnel past Turweston

- 2.6.3 The Proposed Scheme will pass Turweston in a cutting approximately 2.35km long with a depth of up to 20m. The January 2012 announced route included a similar alignment, with some minor differences to the vertical alignment. The Parish Council suggested alternative proposals for this section of the route.
- 2.6.4 Three options were evaluated:
- Option A: the Proposed Scheme, the route in cutting adjacent to Turweston;
 - Option B: a 'cut-and-cover' or green tunnel; and
 - Option C: a mined tunnel.
- 2.6.5 There would be environmental benefits from either Option B or C. In the case of Option B, land taken temporarily for construction would be reinstated and in the case of Option C, surface impacts avoided altogether. Both Options B and C would have less permanent visual effects compared with Option A.
- 2.6.6 Option C and to a lesser extent Option B would deprive the project of a source of engineering material that would need to be imported, resulting in additional construction impacts elsewhere.

- 2.6.7 Both Options B and C will require portal structures, portal buildings, rescue areas and fire fighting equipment with access tracks to both portals from the nearest highways, additional land for this purpose offsetting some of the benefits identified above.
- 2.6.8 In addition, Options B and C would result in a decrease in noise impacts for receptors in the southern half of Turweston. However, for both options there would remain noise effects due to trains crossing the Turweston viaduct after they come out of the tunnel.
- 2.6.9 Option A will involve the excavation of the cutting from the surface. Option B would have a similar construction approach and so similar construction impacts. However, the reinstatement of land over the cutting to form a green tunnel for Option B would allow for restoration of the area, including the reinstatement of agricultural land, ecological habitats and PRow.
- 2.6.10 Option C would deliver similar operational benefits to Option B, but would have a reduced environmental impact as it would avoid demolition of the properties associated with Options A and B. It would also retain existing landscape features, agricultural land, ecological features and PRow. However, for Option C there would be more intense construction activity concentrated at the tunnel portals, and for a longer duration, than for Option A and B.
- 2.6.11 In order to construct Option C, the alignment would need to be lowered to achieve an acceptable cover above the tunnel. As a consequence, the viaducts at either end of the tunnel would be lower providing some minor reduction in visual impacts.
- 2.6.12 For both Options B and C, both construction and maintenance costs would be significantly more expensive than Option A.
- 2.6.13 On balance, although there would be potential environmental benefits of Options B and C, Option A already provides mitigation in the form of a cutting and would not result in the additional structures and costs associated with Option B and C. For these reasons Option A was adopted in the Proposed Scheme.

Enclosed viaduct at Westbury

- 2.6.14 The Proposed Scheme will use a viaduct to pass over the River Great Ouse, at Westbury. The viaduct will be approximately 12m high and 300m long. The January 2012 announced route also included a viaduct of similar proportions in this location. Westbury Parish Council has proposed an alternative option that the viaduct be covered or enclosed. In order to remove views of the railway and to reduce potential noise effects. However, artificial above ground covering along the route where it is at surface or already on elevated structures (e.g. embankment or viaduct) has not been adopted into the Proposed Scheme due to the associated additional costs and environmental impacts.
- 2.6.15 In this location, the enclosure of the viaduct would require significant additional engineering works. In particular, the size of the enclosure to provide the required aerodynamic performance would require an increase in bridge width, an enclosure around 8m high over the tracks and a more substantial support structure. Enclosure of the viaduct would in effect create a tunnel on a bridge and which would require inclusion of appropriate measures to mitigate pressure waves created by trains, such

as portal structures at either end. These would further increase the size of the structure, the construction complexity and time, with increased construction and maintenance costs.

- 2.6.16 The increased size and visual appearance of an enclosed structure would be difficult to mitigate, with the result that the visual intrusion of a covered viaduct would be more significant than impacts from the viaduct that is proposed.
- 2.6.17 With regard to noise effects, a covered structure would reduce potential noise impacts for the length of the viaduct. However, the Proposed Scheme incorporates earthworks and noise fence barriers to provide noise attenuation without the permanent visual impacts and additional costs of a covered structure.
- 2.6.18 For these reasons, covering or enclosure of viaduct structures has not been included in the Proposed Scheme.

3 Agriculture, forestry and soils

3.1 Introduction

- 3.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and an assessment of the likely impacts and significant effects as a result of the construction and operation of the Proposed Scheme. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.
- 3.1.2 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC) system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of the impacts on agricultural land is the extent to which land of best and most versatile (BMV) agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.
- 3.1.3 Forestry is considered as a land use feature and the impacts have been calculated quantitatively. The qualitative effects on forestry land and woodland are addressed principally in the ecology and landscape and visual assessments (see Sections 7 and 9).
- 3.1.4 Soil attributes, other than for food and biomass production, are identified in this section but the resulting function or service provided is assessed in other sections, notably cultural heritage, ecology and landscape and visual assessment (see Sections 6, 7 and 9).
- 3.1.5 The main issue for farm holdings is the disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both its construction and operational phases. Key engagement has been undertaken with farmers and landowners affected by the Proposed Scheme to obtain factual information on the scale and nature of the farm and forestry operations and related farm-based uses.
- 3.1.6 Details of published and publicly available information used in the assessment, and the results of surveys undertaken within this study area, are contained in Volume 5: Appendix AG-001-014.

3.2 Scope, assumptions and limitations

- 3.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.
- 3.2.2 The study area for the agriculture, forestry and soils assessment covers all of the land that will be required, temporarily or permanently, for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils; together with farm and rural

holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of BMV land and forestry in the general locality, taken as a wider 4km corridor centred on the Proposed Scheme.

- 3.2.3 Common assumptions that have been applied to the Proposed Scheme, such as the restoration of agricultural land to pre-existing quality, the handing back of land used temporarily to the original landowner and the non-replacement of capital items demolished, are set out in Volume 1. There are no assumptions or limitations that are specific to the assessment in this study area.

3.3 Environmental baseline

Existing baseline

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

Soils and land resources

Topography and drainage

- 3.3.2 The main topographical features within the study area are described in the landscape and visual assessment (Section 9).
- 3.3.3 The predominantly rural landscape forms part of the broad valley of the River Great Ouse and its tributaries in the south whilst, to the north, the landform is broadly domed and gently undulating. The altitude in this area ranges from around 90m to 125m above Ordnance Datum (AOD).

Geology and soil parent materials

- 3.3.4 The main geological features are described in detail in the land quality assessment (Section 8).
- 3.3.5 The principal underlying geology is limestone and sandstone of the Great Oolite Group, with large areas of superficial glaciofluvial deposits of sand and gravel to the south. In the valleys of the River Great Ouse and its tributaries, the geology mapped is that of the Whitby Mudstone Formation, with superficial deposits of alluvium, comprising sand, silt, clay and gravel.

Description and distribution of soil types

- 3.3.6 The characteristics of the soils are described by the Soil Survey of England and Wales²¹ and shown on the National Soil Map²². The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5 and their distribution is shown on Map AG-02-014 (Volume 5, Agriculture, Forestry and Soils Map Book).

²¹ Soil Survey of England and Wales (1984), *Soils and their Use in South East England*.

²² Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*. National Soil Resources Institute, Cranfield University, UK.

- 3.3.7 The soil association map shows Elmton 3, Aberford, Ashley, Bishampton 2, Ragdale, Essendon and Fladbury 1 associations along the route. Most of the area along the route has soils of the Aberford association, which are typically well-drained, fine loamy soils overlying limestone. These soils are of Wetness Class²³ (WC) I, and are typically calcareous.
- 3.3.8 In the south and centre are soils of the Ashley, Bishampton 2, Elmton 3 and Essendon associations, which collectively consist of loamy or clayey topsoils over clayey subsoils. Moderately well-drained, fine loamy Bishampton 2 soils of WC II or III occur on the slopes, while Essendon soils occur on the higher, flatter land and are typically imperfectly drained in WC III.
- 3.3.9 Interbedded limestone and mudstone to the east of Brackley give rise to a reversal in this pattern, with the typically calcareous Ashley soils of WC II on the slopes up from the river channel, and better draining, variably stony fine sandy loam Elmton 3 soils on the flatter top (in WC I).
- 3.3.10 In the south and north of the area, soils of the Ragdale association occur where land is undulating and overlies Oolite Group limestone bedrock overlain with clayey alluvium. The floodplain of the River Great Ouse supports the Fladbury 1 association, which is wet, clayey and moderately to poorly drained (WC III or IV).

Soil and land use interactions

Agricultural land quality

- 3.3.11 The principal soil/land use interaction in the study area is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate and the site.
- 3.3.12 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage and soil workability. There are three distinct soil characteristics within the area which are the well-drained fine loamy textures overlying limestone and sandstone, loamy and clayey textures which occupy slopes and hills, and the similarly textured, poorly draining alluvial soils of the river and flood plains. Soil depth and chemical limitations are not encountered.
- 3.3.13 Climate does not in itself place any limitation upon land quality in this area but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the land. The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point data set for four points set out in Volume 5: Appendix AG-01-014. The data show average temperatures to be moderately cool, and rainfall to be moderate. The average

²³ The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six bands.

number of Field Capacity Days²⁴ is 150, which is the average for lowland England and is favourable for providing opportunities for agricultural field work.

- 3.3.14 Gradient (slope) and microrelief (landform undulations) are not considered limiting in the area. Flooding is limited to the floodplains of the River Great Ouse and its tributaries, which are present throughout the section and can limit agricultural land to Grade 4 if there are significant restrictions to the use of agricultural machinery. However, there is insufficient data accurately to assess whether flooding results in a downgrading of agricultural land quality in the study area.
- 3.3.15 Under the climatic conditions applicable to this section the fine loamy Elmton 3 and Aberford soils (WC I) are classified as Subgrades 3a and 3b, limited by soil droughtiness.
- 3.3.16 Fine loamy Ashley and Bishampton 2 soils of WC II or III will be limited by soil workability, but the severity depends upon the specific topsoil texture encountered. For example, if of WC II and a silt loam, medium silty clay loam or medium clay loam texture, the soils will be of Grade 2. If of WC II and of heavy silty clay loam or heavy clay loam, the soils will be of Subgrade 3a. The same applies if soils are of WC III, albeit the grades will also be one lower: Subgrade 3a or Subgrade 3b.
- 3.3.17 Soils of the Essendon association are seasonally waterlogged and comprise sandy silt loam topsoils overlying clay. With drainage, these soils commonly remain of WCIV, resulting in a Subgrade 3a assessment.
- 3.3.18 The Fladbury 1 and Ragdale associations both comprise clay or clay loam topsoils overlying clay subsoils. These associations will be limited by soil wetness to Subgrades 3a or 3b for WCIII, but to Subgrade 3b for WC IV.
- 3.3.19 Department for Environment, Food and Rural Affairs (Defra) mapping²⁵ shows that there is generally a low likelihood of encountering BMV land in the locality, which makes such land a resource of high sensitivity in this area.

Other soil interactions

- 3.3.20 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 England²⁶ and The Natural Choice: securing the value of nature²⁷, and include:
- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
 - support of ecological habitats, biodiversity and gene pools;
 - support for the landscape;

²⁴ Field Capacity Day 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 and opportunities for mechanised fieldwork are then possible.

²⁵ Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

²⁶ Defra (2009), *Soil Strategy for England*.

²⁷ Defra (2011), *The Natural Choice: securing the value of nature*.

- protection of cultural heritage;
- providing raw materials; and
- providing a platform for human activities, such as construction and recreation.

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

3.3.22 The floodplains of the River Great Ouse and its tributaries represent the functional flood environment, as set out in Section 12 (Water resources and flood risk assessment). Flood Zone mapping available from the Environment Agency shows there to be a significant risk of localised flooding within this area and could downgrade agricultural land to Subgrade 3b or Grade 4.

3.3.23 The presence of soil-borne cultural assets is detailed in Section 6 (cultural heritage). Human activity has largely been concentrated along the principal valley systems where there is the potential for waterlogged and other deposits of palaeoenvironmental interest.

Land use

Land use description

3.3.24 Agricultural land use is a mix of arable and pasture, with a concentration of grassland in the locality of Turweston, and extensive areas of arable land near Mixbury, Westbury and Radstone. There are also a number of equestrian units within the study area, as well as beef, sheep and one dairy unit.

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

3.3.26 Woodland is relatively sparse and represents 7% of land cover compared to the national average of 10%. There are forestry resources to the south-west of the area including Spilsmere Wood, Shelswell Plantation, Mixbury Plantation and Diggings Wood. South Ground Covert Local Wildlife Site (LWS) is to the south-east of Brackley. There are further pockets of woodland to the east of Brackley and around Radstone.

Number, type and size of holdings

3.3.27 These are a mixture of owner-occupation and tenancies. The size of the holdings range from small enterprises to large country estates. The boundaries of the holdings are shown on Maps AG-01-031 to AG-01-035 (Volume 5, Agriculture, Forestry and Soils Map Book) along with the location of the main farm buildings. Field drainage is

common throughout the study area, but no farms have been identified that undertake routine irrigation of field crops.

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

3.3.29 The holding/reference name provides a unique identifier and relates to Map Series AG-01 (Volume 5, Agriculture, Forestry and Soils Map Book) and Volume 5: Appendix AG-001-014.

Table 6: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA14/1 Manor Farm	Arable	38	None	ELS	Medium
CFA14/2* Shelswell Estate	Arable	239	Farm shop	ELS and HLS	Medium
CFA14/3 Warren Farm	Equestrian	12	None	None	Medium
CFA14/4* Oaks Farm	Grazing	5	None	None	Low
CFA14/5 Tibbetts Farm	Arable	405	None	ELS	Medium
CFA14/6 Westbury Mill Farm	Arable	405	None	ELS	Medium
CFA14/7 Grovehill Farm 1	Equestrian grazing	8	None	None	Low
CFA14/8 Grovehill Farm 2	Arable	48	None	ELS and HLS	Medium
CFA14/9 Oatleys Farm	Arable	133	Poultry bedding	ELS	Medium
CFA14/10 Glebe Farm	Arable, beef, sheep	526	Shoot	ELS	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment	Sensitivity to change
CFA14/11 * Oatleys Hall	Equestrian grazing	16	Polo pitch	None	Low
CFA14/12 Turweston Glebe	Beef, sheep	9	Bed and Breakfast	None	Low
CFA14/13 * Ballabeg	Equestrian	9	None	None	High
CFA14/14 Laing	Arable	110	None	ELS	Medium
CFA14/15 Versions Farm	Beef, sheep	52	Farm shop	OELS	Medium
CFA14/16 * Manor Farm (Whitfield)	Arable and grazing	98	Point-to-point	ELS	Medium
CFA14/17 Illetts Farm	Dairy	84	Holiday lets	ELS	High
CFA14/18 Radstone Manor	Arable	401	None	ELS and HLS	Medium
CFA14/19 Land associated with The Old Rectory, Newton Purcell	Grazing	8	Not known	None	Low
CFA14/20 * Unnamed Paddock 1	Equestrian grazing	2	None	None	Low
CFA14/21 * Unnamed Paddock 2	Equestrian grazing	1	None	None	Low
CFA14/22 * Grovehill Barn	Equestrian grazing	6	None	None	Low
CFA14/23 * Unnamed Paddock 3	Grazing	3	Not known	None	Low
CFA14/24 * Hall Farm, Radstone	Arable and grazing	8	None	None	Low
CFA14/25 * 1 Radstone Cottage	Grazing	3	None	None	Low

* No Farm Impact Assessment interview conducted; data estimated.

Future baseline

Construction (2017)

- 3.3.30 The Radstone Fields development adjacent to Halse Road, to the north of Brackley will remove approximately 69.5ha of agricultural land, of which 15.2ha is BMV. None of the holdings affected by the Proposed Scheme are also affected by this development.
- 3.3.31 The future of agri-environment schemes is uncertain at present due to on-going reform of the Common Agricultural Policy. The majority of schemes seem likely to cease over the next two to three years and replacements are uncertain. Whilst this will remove a level of support from the agricultural industry that has been used to offset some of the costs incurred in managing land in an environmentally responsible manner, it is unlikely to materially alter the way agricultural land is managed in the future. Whilst some field margins may be cropped closer to hedgerows and stocking rates may increase in some locations, the stocking and cropping baseline set out in the previous section is unlikely to change significantly.

Operation (2026)

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

3.4 Effects arising during construction

Avoidance and mitigation measures

- 3.4.1 During the development of the design, the following measures have been incorporated to avoid or mitigate impacts on agriculture, forestry or soils during construction:
- agricultural access incorporated into Bridleway AX16 accommodation overbridge to service Iletts Farm (CFA14/17) and Radstone Manor (CFA14/18);
 - agricultural access incorporated into Bridleway AX18 accommodation overbridge and Footpath AX5 overbridge to service Radstone Manor (CFA14/18);
 - new field accesses associated with realigned A421 London Road, A422 Brackley Road and Turweston green overbridge;
 - replacement private access to Warren Farm (CFA14/3); and
 - agricultural access under the Westbury and Turweston viaducts.
- 3.4.2 In addition, there is a need to avoid or reduce environmental impacts to soils during construction. It is an essential element of the construction process that the soil resources from the areas required temporarily and permanently are stripped and stored so that land required temporarily for construction purposes, which are currently in agricultural use can be returned to that use, where agreed, and to its pre-existing agricultural condition.

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

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

- the reinstatement of agricultural land which is used temporarily during construction to agriculture, where this is the agreed end use (draft CoCP, Section 6);
- the provision of a method statement for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This will include any remediation measures necessary following the completion of works (draft CoCP, Section 6);
- a requirement for contractors to pay due consideration to the impacts of extreme weather events and related conditions, which may affect agriculture, forestry and soil resources during construction (draft CoCP, Section 5);
- arrangements for the maintenance of farm and field accesses affected by construction (draft CoCP, Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (draft CoCP, Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (draft CoCP, Sections 6 and 9);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (draft CoCP, Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (draft CoCP, Section 9);
- the adoption of measures to prevent, as far as reasonably practicable, the spread of soil-borne, crop and animal diseases from the construction area (draft CoCP, Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (draft CoCP, Sections 5 and 6).

Assessment of impacts and effects

3.4.5 The cessation of existing land uses will be required in the area to construct and operate the Proposed Scheme. This includes not only the land on which permanent

works will be sited, but also that required temporarily to facilitate the delivery of those permanent works.

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

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

Temporary effects during construction

Impacts on agricultural land

3.4.8 During the construction phase, the total area of agricultural land used will be 320.8ha as shown in Table 7. Of this total, 158.1ha will be restored and available for agricultural use following construction.

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

Agricultural land quality	Area required (ha)	Percentage of agricultural land	Area to be restored (ha)
Grade 1	0	0	0
Grade 2	25.3	8	11.4
Subgrade 3a	171.9	54	81.6
BMV subtotal	197.2	62	93.0
Subgrade 3b	123.6	38	65.2
Grade 4	0	0	0
Grade 5	0	0	0
Total agricultural land	320.8		158.2

3.4.9 The disturbance during construction to 197.2ha of land of BMV quality is assessed as an impact of high magnitude, comprising over 60% of the overall agricultural land requirement. As BMV land in this local area is a receptor of high sensitivity, the effect on BMV land is assessed as a major adverse effect of the Proposed Scheme, which is significant.

3.4.10 Following construction the land required temporarily will be primarily reinstated to its pre-existing agricultural condition. It is estimated that there will not be any significant surplus of topsoil or subsoil material arising from the Proposed Scheme in the area.

Nature of the soil to be disturbed

- 3.4.11 The sensitivity of the soils is greatest in relation to those that will be disturbed by construction activity and returned to an agricultural or other rural land-based use upon completion of the Proposed Scheme. The quantum of each disturbed soil type is less important than the sensitivity of particular soils to the effects of handling during construction and reinstatement of land.
- 3.4.12 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 Soils²⁸. These principles will be followed throughout the construction period. The clayey Fladbury 1, Ragdale and Essendon soils are susceptible to compaction and smearing when moved in wet conditions or by inappropriate equipment and need particularly careful handling to avoid damage to soil structure.
- 3.4.13 Compliance with the CoCP will ensure the magnitude of impact on soil is low and significance of effect is therefore negligible.

Impacts on holdings

- 3.4.14 Land may be required from holdings both permanently and temporarily (i.e. the latter just during the construction period). In most cases the temporary and permanent land requirement will occur simultaneously at the start of the Proposed Scheme and it is the combined effect of both that will have the most impact on the holding. In due course some agricultural land will be restored and the impact on individual holdings will reduce, but the following assessment focuses on the combined effect during the construction phase. The residual permanent effects are discussed at the end of this section.
- 3.4.15 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 8. This table shows the total area of land required on a particular holding in absolute terms and as a percentage of the total area farmed. It also shows the area of land that will be returned to the holding following the construction period. The degree of impact is based on the proportion of the holding required rather than the absolute area of land. The holding/reference name provides a unique identifier and relates to Map Series AG-01 (Volume 5, Agriculture, Forestry and Soils Map Book) and Appendix AG-0001-014, Volume 5.
- 3.4.16 The effects of severance during construction are judged on the ease and availability of access to severed land. For the most part these will be same during and post construction but occasionally they will differ between the two phases. The disruptive effects, principally of construction noise and dust, are assessed according to their effects on land uses and enterprises. Full details of the nature and significance of effects are set out in Volume 5: Appendix AG-001- 014. Where the total sum of the land required by ALC grade differs from the total sum of the land required by holding,

²⁸ Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*.

the difference is because some holdings are affected in more than one CFA and some holdings include non-agricultural land. The combined impact in holdings is reported once in the CFA where the main holding is located.

Table 8: Summary of construction effects on holdings

Holding reference/name	Total area required	Construction Severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA14/1 Manor Farm	3.6ha (9%) Low	Negligible	Negligible	Minor adverse	3.1ha
CFA14/2 Shelswell Estate	22.6ha (9%) Low	Negligible	Negligible	Minor adverse	4.7ha
CFA14/3 Warren Farm	2.5ha (21%) High	Holding effectively severed by new access but aligned along field boundary. Low	Negligible	Major/moderate adverse due to proportion of holding removed	0.9ha
CFA14/4 Oaks Farm	1.1ha (21%) High	Negligible	Negligible	Moderate adverse due to the proportion of holding removed	0.4ha
CFA14/5 Tibbetts Farm	42.0ha (10%) Medium	Holding severed but accommodation structures and/or access under viaduct provided. Low impact	Negligible	Moderate adverse due to the proportion of holding removed	23.1ha
CFA14/6 Westbury Mill Farm	44.3ha (11%) Medium	Holding severed but accommodation structures and/or access under viaduct provided. Low impact	Negligible	Moderate adverse due to the proportion of holding removed	15.5ha
CFA14/7 Grovehill Farm 1	0.8ha (10%) Medium	Negligible	Negligible	Minor adverse (low sensitivity)	0ha
CFA14/8 Grovehill Farm 2	5.5ha (11%) Medium	Negligible	Negligible	Moderate adverse due to proportion of holding removed (medium sensitivity)	1.3ha

Holding reference/name	Total area required	Construction Severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA14/9 Oatleys Farm	18.8ha (14%) Medium	Small parcel severed Low	Negligible	Moderate adverse due to proportion of holding removed	14.5ha
CFA14/10 Glebe Farm	11.9ha (2%) Negligible	2ha severed to the east of the Proposed Scheme but no access provided. High impact downgraded due to size of parcel Low	Negligible	Minor adverse	5.3ha
CFA14/11 Oatleys Hall	5.6ha (36%) High	Negligible	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	3.5ha
CFA14/12 Turweston Glebe	2.4ha (28%) High	Negligible	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	1.1ha
CFA14/13 Ballabeg	2.9ha (32%) High	Negligible	Negligible	Major adverse due to proportion of holding removed and high sensitivity	0.9ha
CFA14/14 Laing	17.1ha (15%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of the holding removed and medium sensitivity	7.3ha
CFA14/15 Versions Farm	9.1ha (17%) Medium	Holding severed during viaduct construction but access to be maintained Low	Negligible	Moderate adverse due to proportion of holding removed.	5.5ha
CFA14/16 Manor Farm (Whitfield)	20.5ha (21%) High	Point-to-point severed by permanent works Medium	Negligible	Major/moderate adverse due to proportion of holding removed and severance	10ha

Holding reference/name	Total area required	Construction Severance	Disruptive effects	Scale of construction effect	Area to be restored
CFA14/17 Illetts Farm	20.7ha (25%) High	Holding severed but access maintained with accommodation structure. Low impact.	Negligible	Major adverse due to proportion of holding removed, severance and high sensitivity	7.3ha
CFA14/18 Radstone Manor	92.5ha (23%) High	Holding severed but access maintained with accommodation structure. Low impact	Negligible	Major/moderate adverse due to proportion of holding removed and severance	50ha
CFA14/19 Land associated with The Old Rectory, Newton Purcell	2.7ha (35%) High	Negligible	Negligible	Moderate adverse due to proportion of holding removed	1.5ha
CFA14/20 Unnamed Paddock 1	2.1ha (100%) High	No additional severance Negligible	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	1.4ha
CFA14/21 Unnamed Paddock 2	1ha (100%) High	No additional severance Negligible	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	0.4ha
CFA14/22 Grovehill Barn	0.2ha (3%) Negligible	Negligible	Negligible	Negligible	0.1ha
CFA14/23 Unnamed Paddock 3	1.5ha (46%) High	Negligible	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	1.3ha
CFA14/24 Hall Farm, Radstone	5.2ha (64%) High	Small parcel severed to the east of the Proposed Scheme. downgraded due to size of parcel Low	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	3.8ha
CFA14/25 1 Radstone Cottage	1.3ha (51%) High	Holding severed with no access High	Negligible	Moderate adverse due to proportion of holding removed and low sensitivity	1ha

3.4.17 Overall, it is considered that 20 holdings will experience moderate, major/moderate or major temporary adverse effects during construction, which are significant.

3.4.18 Although Ballabeg is currently located close to the route, it will not continue to operate as equestrian units once construction commences due to property and building demolition. No other holdings that are particularly sensitive to noise or vibration emitted during the construction phase have been identified near to the Proposed Scheme.

Cumulative effects

3.4.19 The development of the land at the Radstone Fields Major Development Area will involve the permanent loss of agricultural land. However, this will be a permanent impact and does not provide any cumulative temporary effects on agricultural land, forestry or soils.

Permanent effects

Impacts on agricultural and forestry land

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

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

3.4.21 Following construction and restoration, the area of agricultural land that will be permanently required will be 162.6ha, as shown in Table 9.

Table 9: Agricultural and forestry land required permanently

Agricultural land quality	Permanent works	
	Area (ha)	% agricultural land
Grade 1	0	0
Grade 2	13.9	9
Subgrade 3a	90.3	56
BMV subtotal	104.2	65
Subgrade 3b	58.4	35
Grade 4	0	0
Grade 5	0	0
Total agricultural land	162.6	
Forestry land	11.2	

- 3.4.22 The permanent loss of approximately 104.2ha of land of BMV quality is assessed as an impact of high magnitude, comprising more than 60% of the overall agricultural land requirement. As stated previously, BMV land in this area is a receptor of high sensitivity so the permanent effect on BMV land is assessed as a major permanent adverse effect of the Proposed Scheme, which is significant.
- 3.4.23 The total amount of forestry land required to implement the Proposed Scheme will be approximately 11.2ha, out of a total permanent land requirement (including non-agricultural land) of approximately 409.1ha (3%) and is an impact of low magnitude. As the proportion of forest cover as a land use in the study area is less than the national average it is assessed as a resource of medium sensitivity and the loss of this area of woodland is assessed as a minor adverse effect of the Proposed Scheme, and is not significant. Insofar as forestry land may have some non-commercial value, for example in ecological or landscape terms, the qualitative assessment of this loss is addressed in the relevant sections.
- 3.4.24 Some areas of agricultural land that are required for the construction of the Proposed Scheme will revert to land for ecological mitigation and will be removed from mainstream agricultural production. These areas include land adjacent to Widmore Farm and to the east of the Helmdon Disused Railway near Radstone. This agricultural assessment assumes that none of this land will return to agriculture. The same approach has also been applied for land proposed for scattered stands of woodland planting near Westbury. Although some of the ecological mitigation land may be available for grazing in due course, this assessment assumes the land will be removed from agriculture.
- 3.4.25 Small areas of land around the Westbury and Turweston viaducts will be regraded to provide additional flood compensation capacity and will be subject to marginal downgrading in agricultural land quality. As noted in Section 2 all replacement floodplain storage areas will be regraded to tie back into the existing ground level and returned to agriculture. This agricultural assessment assumes that this land will return to agriculture.

Impacts on holdings

- 3.4.26 The permanent residual effects from the construction of the Proposed Scheme on individual agricultural and related interests is summarised in Table 10. The land required column refers to the area of land permanently required to operate the Proposed Scheme (in absolute terms and as a percentage of the overall area farmed). The scale of effect is based on the proportion of land required. The effects of severance are judged on the ease and availability of access to severed land once construction is completed and the impact on farm infrastructure refers mainly to the loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises. Full details of the nature of effects are set out in Volume 5: Appendix AG-001-014.

Table 10: Summary of permanent effects on holdings from construction

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA14/1 Manor Farm	0.5ha (1%) Negligible	Negligible	Negligible	Negligible
CFA14/2 Shelswell Estate	17.9ha (7%) Low	Negligible	Farm building demolished High	Major/moderate adverse due to agricultural building demolition
CFA14/3 Warren Farm	1.6ha (13%) Medium	Holding nominally severed by new access, but access aligned along field boundary Low	Negligible	Moderate adverse due to proportion of holding removed
CFA14/4 Oaks Farm	0.7ha (13%) Medium	Negligible	Farm building demolished High	Moderate adverse due to property demolition and proportion of holding removed
CFA14/5 Tibbetts Farm	18.9ha (5%) Low	Holding severed but structures and/or access under viaduct provided Low impact	Negligible	Minor adverse
CFA14/6 Westbury Mill Farm	28.8ha (7%) Low	Holding severed but structures and/or access under viaduct provided Low impact	Negligible	Minor adverse
CFA14/7 Grovehill Farm 1	0.8ha (10%) Medium	Negligible	Negligible	Minor adverse (low sensitivity)
CFA14/8 Grovehill Farm 2	4.2ha (9%) Low	Negligible	Negligible	Minor adverse (medium sensitivity)
CFA14/9 Oatleys Farm	4.3ha (3%) Negligible	Small parcel severed to west of the Proposed Scheme accessed from highway, downgraded due to size (0.6ha) Low	Negligible	Minor adverse

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA14/10 Glebe Farm	6.6ha (1%) Negligible	Small parcel severed to the east of the Proposed Scheme downgraded due to size of parcel (2.0ha) Low	Negligible	Minor adverse
CFA14/11 Oatleys Hall	2.1ha (14%) Medium	Negligible	Loss of polo pitch High	Moderate adverse due to loss of polo pitch and proportion of holding removed (low sensitivity)
CFA14/12 Turweston Glebe	1.3ha (15%) Medium	Negligible	Negligible	Minor adverse
CFA14/13 Ballabeg	2.0ha (23%) High	Negligible	Residential and equestrian buildings demolished High	Major adverse due to residential property demolition and proportion of holding removed
CFA14/14 Laing	9.8ha (9%) Low	Small parcel (2.0ha) no access. Medium	Negligible	Moderate adverse
CFA14/15 Versions Farm	3.6ha (7%) Low	Although the holding is severed access fully available under Turweston viaduct Low	Negligible	Minor adverse
CFA14/16 Manor Farm (Whitfield)	10.5ha (11%) Medium	8.0ha severed to the south-west of the Proposed Scheme accessed from highway Medium	Point-to-point course compromised with the loss of part of the track. High	Major/moderate adverse due to impact on Point-to-point course, severance and proportion of holding removed
CFA14/17 Illetts Farm	13.4ha (16%) Medium	Holding severed but access maintained with accommodation structure. Low	Secondary farmstead (residential and agricultural buildings) demolished High	Major adverse due to property demolition, severance and proportion of holding removed (high sensitivity)

Holding reference/name	Land required	Severance	Infrastructure	Scale of effect
CFA14/18 Radstone Manor	42.5ha (11%) Medium	Holding severed but access maintained with accommodation structure Low	Negligible	Moderate adverse due to proportion of holding removed
CFA14/19 Land associated with The Old Rectory, Newton Purcell	1.2ha (16%) Medium	Negligible	Negligible	Minor adverse
CFA14/20 Unnamed Paddock 1	0.7ha (31%) High	Negligible	Stables demolished High	Moderate adverse due to proportion of holding removed, property demolition and low sensitivity
CFA14/21 Unnamed Paddock 2	0.6ha (60%) High	Negligible	Stables demolished High	Moderate adverse due to proportion of holding removed, property demolition and low sensitivity
CFA14/22 Grovehill Barn	< 0.1ha (1%) Negligible	Negligible	Negligible	Negligible
CFA14/23 Unnamed Paddock 3	0.2ha (6%) Low	Negligible	Negligible	Negligible
CFA14/24 Hall Farm, Radstone	1.4ha (17%) Medium	Small parcel severed to the east downgraded due to size of parcel (0.2ha) Low	Negligible	Minor adverse
CFA14/25 1 Radstone Cottage	0.3ha (11%) Medium	Negligible	Negligible	Minor adverse

- 3.4.27 Overall, it is likely that 11 holdings will experience permanent moderate, major/moderate or major adverse effects from the construction of the Proposed Scheme, which will be significant.
- 3.4.28 Illets Farm is a dairy farm that recently relocated to new buildings that will not be affected by the Proposed Scheme and the dairy farm will continue. However, the principal dwelling, holiday accommodation and farm buildings at the former operational base will be demolished and all activities at that site will cease.
- 3.4.29 Three equestrian units will also cease to operate. Ballabeg (CFA14/13) is an equestrian stud farm and the residential property and stables will be demolished. Two smaller

grassland units with stables (CFA14/20 and 14/21) will each lose the stable block along with a significant area of land.

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

Cumulative effects

- 3.4.31 The development of the Radstone Fields Major Development site will result in the loss of approximately 69.5ha of agricultural land, of which approximately 15.2ha is BMV agricultural land. The Proposed Scheme will require approximately 162ha of agricultural land, of which approximately 104.2ha is BMV. The cumulative impact of these developments in this area will be the loss of approximately 232.2ha of agricultural land, of which approximately 119.4ha is BMV and this is significant.
- 3.4.32 The development will not result in any cumulative effects on forestry resources; and provided the work is undertaken in accordance with best practice there should not be any adverse effect on soils.

Other mitigation measures

- 3.4.33 Other mitigation measures that are proposed include grassland habitat creation and woodland planting. Mitigation will incorporate climate change adaptation and resilience measures, as far as practicable.

Summary of likely significant residual effects

- 3.4.34 Once the construction process is complete and land required temporarily has been restored, the residual permanent loss of agricultural land will be approximately 162.6ha, of which approximately 104.2ha is BMV. This is assessed as a permanent major adverse effect of the Proposed Scheme, which is significant.
- 3.4.35 A total of 11 holdings have been identified that will experience permanent major or moderate adverse effects, which will be significant. Of these, eight are likely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects to not significant. For two holdings, residential demolition will occur.

3.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

- 3.5.2 Potential impacts arising from the operation of the Proposed Scheme will include:
- noise emanating from moving trains and warning signals; and
 - the propensity of operational land to harbour noxious weeds.

- 3.5.3 The potential for significant effects on sensitive livestock receptors from noise has been assessed. No likely significant effects have been identified.
- 3.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is not only a consequence of the management of the highway and railway land, but also of the readiness of weed spread onto such land from adjoining land, which could be exacerbated with the effects of climate change. The presence of noxious weeds, ragwort in particular, will be controlled adoption of an appropriate management regime which identifies and remedies areas of weed growth that might threaten adjoining agricultural interests.

Summary of likely significant residual effects

- 3.5.5 There are no significant residual effects on agriculture, forestry and soils arising from the operation of the Proposed Scheme.

4 Air quality

4.1 Introduction

- 4.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme, covering nitrogen dioxide (NO₂), fine particulate matter (PM₁₀ and PM_{2.5})²⁹ and dust.
- 4.1.2 With regard to air quality, the main potential effects are anticipated to result from the emissions of the above pollutants from construction activities and equipment and road traffic and dust emissions associated with demolition, site preparation works, construction of the infrastructure and the use of haul routes within the sites.
- 4.1.3 Detailed reports on the air quality data and assessments for this area, as well as relevant maps are contained within Volume 5. These include:
- Appendix AQ-001-014;
 - Map AQ-01-014; and
 - Maps AQ-02-014-01 to AQ-02-014-02.
- 4.1.4 Maps CT-10-031 to CT-10-035, showing the location of the environmental baseline features can be found in Volume 2, CFA14 Map Book.

4.2 Scope, assumptions and limitations

- 4.2.1 The assessment scope, key assumptions and limitations for the air quality assessment are set out in the SMR (see Volume 5: Appendix CT-001-000/1), the SMR Addendum (see Volume 5: Appendix CT-001-000/2) and appendices presented in Volume 5 (AQ-001-004). This report follows the standard assessment methodology.
- 4.2.2 The study area for the air quality assessment has been determined on the basis of where impacts on air quality might occur from construction activities, from changes in the nature of traffic during construction and operation or where road alignments have changed.
- 4.2.3 The assessment of impacts arising from construction dust emissions has been undertaken using the methodology based on that produced by the Institute of Air Quality Management (IAQM). The assessment of impacts arising from construction dust emissions has been undertaken using the methodology based on that produced by the Institute of Air Quality Management (IAQM)[1]. It is important to note that this methodology provides a means of assessing the scale and significance of effects that is partly dependent on the approximate number of receptors within close proximity to the dust-generating activities. In doing so, it assigns a lower scale of effect to cases where the number of properties is small, e.g. fewer than 10 properties within 20m of dust-generating activities. Thus, a single property very close to a construction site

²⁹PM_{2.5} and PM₁₀ describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 micrometres in diameter.

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

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

4.3 Environmental baseline

Existing baseline

- 4.3.1 The environmental baseline reported in this section represents the environmental conditions identified within the study area. The air quality within the area is typical of the generally rural nature of this part of Northamptonshire, with concentrations of airborne pollutants well within air quality standards. There are few roads and low road traffic flows (with their associated emissions). Concentrations of airborne pollutants are low.
- 4.3.2 Estimates of background air quality have been obtained from Department for Environment, Food and Rural Affairs (Defra) background maps³⁰ for 2012. These data are estimated for 1km grid squares for nitrogen oxides (NO_x), NO₂, PM₁₀ and PM_{2.5}. All average background pollutant concentrations are well within relevant air quality standards.
- 4.3.3 South Northamptonshire Council, Cherwell District Council and Aylesbury Vale District Council currently conduct routine monitoring using diffusion tubes and continuous monitors. However, these are at roadside locations or in the towns, in locations that are away from the route and are not affected by scheme-related traffic.
- 4.3.4 The available mapping data indicate that all parts of the area currently experience concentrations of PM₁₀ and PM_{2.5} that meet air quality standards, as supported by the absence of any air quality management areas (AQMAs) declared for these pollutants. Background map data are shown in Volume 5: Appendix AQ-001-014.
- 4.3.5 AQMAs have been declared for NO₂ by South Northamptonshire Council, Cherwell District Council and Aylesbury Vale District Council, in Towcester, Banbury and Aylesbury, respectively. However, none of these are considered likely to be affected by activities in or from traffic arising from the study area.

³⁰ Defra, 2010; 2010 Based Background Maps for NO_x, NO₂, PM₁₀ and PM_{2.5}; <http://laqm.defra.gov.uk/maps/maps2010.html>; Accessed September 2013.

- 4.3.6 Receptors in the area are primarily those residential properties close to construction activity and alongside roads where traffic flows will change as a consequence of construction activity or realignment of roads. Notable receptors that will be close to construction activity include residential properties on: Tibbetts Farm: Sundale; Turweston Glebe and Hall Farm. In addition, Oaks Farm will be within 50m of a haul route.
- 4.3.7 The Helmdon Disused Railway Site of Special Scientific Interest (SSSI) ecological receptor is crossed by the route at Radstone.

Future baseline

- 4.3.8 Section 2.1 and Volume 5: Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the future baseline for the assessment of effects from the construction and operation of the Proposed Scheme.
- 4.3.9 The potential cumulative impact from committed developments on air quality acting in conjunction with the effects from the construction and operation of the Proposed Scheme have been considered as part of this assessment. This has been achieved by including changes in traffic predicted as a result of the committed developments within the traffic data used for the air quality assessments for construction and operation, in which the future air quality baselines are defined as the 'without Proposed Scheme scenarios' at each stage.

Construction (2017)

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

Operation (2026)

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

4.4 Effects arising during construction

Avoidance and mitigation measures

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

- 4.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP (Volume 5: Appendix CT-003-000/1) will be implemented. These include:
- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
 - inspection and visual monitoring after engagement with the local authorities to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
 - cleaning (including watering) of haul routes and designated vehicle waiting areas to suppress dust;
 - keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
 - using enclosures to contain dust emitted from construction activities; and
 - undertaking soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

Assessment of impacts and effects

Temporary effects

- 4.4.3 Impacts from the construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for human receptors sensitive to dust and exposure to NO₂ and PM₁₀, as well as ecological receptors sensitive to dust and nitrogen deposition.
- 4.4.4 An assessment of construction traffic emissions has also been undertaken for two scenarios in the construction period: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario. The traffic data include the additional traffic from future committed developments.
- 4.4.5 In the Newton Purcell to Brackley area, potentially dust-generating activities will occur at demolition and construction sites at, and around, the route.
- 4.4.6 Given the mitigation contained within the draft CoCP, applied through a LEMP that will cover the area around Oaks Farm, the assessment of impacts arising from dust emissions has concluded that they will be negligible in magnitude and that the effect on all receptors will not be significant. The basis for this conclusion can be found in Volume 5: Appendix AQ-001-014.
- 4.4.7 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction traffic routes and changes to traffic patterns arising from temporary road realignments.
- 4.4.8 Examination of the changes in traffic flows during the construction period along the affected roads has identified four roads that meet the criteria set out in Volume 1 of the SMR (Appendix CT-001-000/1) for assessment. These are the A422 Brackley Road, the A421 London Road, the A43 north of junction 10 on the M40 and the A43 between

the A421 and the A422. This assessment concluded that impacts on air quality, in respect of NO₂, PM₁₀ and PM_{2.5}, for receptors on three of these roads will be negligible. For receptors on the A422 Brackley Road in the vicinity of Westbury, impacts will be slight adverse. Given the low background concentrations and the small increases in concentrations, the assessment concluded that there will be no significant effects on any receptors. Full details of this assessment can be found in Volume 5: Appendix AQ-001-014.

Permanent effects

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

Cumulative effects

- 4.4.10 The construction dust assessment has considered the potential cumulative air quality effects of the Proposed Scheme and other committed developments. The traffic data used for the assessment include the traffic changes expected from the committed developments and therefore their impacts have been included within the assessment.

Other mitigation measures

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

Summary of likely significant residual effects

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

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

- 4.5.2 Impacts from the operation of the Proposed Scheme relate mainly to changes in traffic flows as a consequence of road realignments. There are no direct atmospheric emissions from the operation of trains that will cause an impact on air quality. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.
- 4.5.3 The assessment of operational traffic emissions has been undertaken for two scenarios in the operation year 2026: a without the Proposed Scheme scenario and a with the Proposed Scheme scenario. The traffic data includes the additional traffic from future committed developments.
- 4.5.4 Traffic data in the Newton Purcell to Brackley area have been screened to identify roads that require a more detailed assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2026.

- 4.5.5 Three roads meet the criteria for further assessment, as a consequence of realignment. An assessment of air quality impacts for the most affected receptors on these roads concluded that they would be negligible, with concentrations decreasing for Station Cottages and Manor Farm. Therefore, no significant effect associated with the Proposed Scheme is predicted.

Cumulative effects

- 4.5.6 The traffic data used for the assessment include the traffic changes expected from the committed developments and therefore their impacts have been included within the assessment.

Other mitigation measures

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

Summary of likely significant residual effects

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

5 Community

5.1 Introduction

- 5.1.1 This section reports the impacts and likely significant effects on local communities resulting from the construction and operation of the Proposed Scheme.
- 5.1.2 Key issues concerning the community assessment for this study area comprise:
- demolition of five residential properties across the study area;
 - demolition of Ballabeg Stables in Turweston;
 - loss of use of part of Turweston playing fields, during both construction and operation;
 - permanent loss of land at Whitfield Racecourse; and
 - impacts on residential amenity for some residential properties in Radstone.
- 5.1.3 Further details of the community assessments and write-ups of open space surveys and recreational public right of way (PROW) surveys undertaken within the study area are contained in Volume 5: Appendix CM-001-025.
- 5.1.4 Significantly affected community resources are shown in Maps CM-01-043 to CM-01-047 (Volume 5, Community Map Book).
- 5.1.5 The current assessment draws upon information gathered from local and regional sources including: Buckinghamshire County Council, Turweston Parish Council and Whitfield Racecourse.

5.2 Scope, assumptions and limitations

- 5.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.
- 5.2.2 Construction worker accommodation will be located at Brackley south main compound, which is located north-east of Brackley adjacent to the A43. Construction worker impacts on community resources are considered at a route-wide level in Appendix CM-002-000. The assessment takes into account the type and location of accommodation, working hours, facilities provided on construction compounds, experience from other large projects (such as HS1) and the measures contained in the draft CoCP. On this basis, it is concluded that there will be no significant effects associated with construction worker accommodation.

5.3 Environmental baseline

Existing baseline

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

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

5.3.3 This area includes land within Newton Purcell, Mixbury, Westbury, Turweston, Whitfield, the eastern part of Brackley and Radstone. The study area is rural and is characterised by farmland interspersed with these towns and villages. Outside of these settlements, the population is mainly located in farmhouses and rural cottages.

Newton Purcell

5.3.4 The village of Newton Purcell is located south-east of Brackley, with the majority of houses clustered around St Michael and All Angels Church (Church of England) and its associated churchyard. The A4421 Buckingham Road runs through the village. There are a few houses and the Shelswell Inn public house located outside the main village along the A4421 Buckingham Road.

Mixbury

5.3.5 The village of Mixbury is located between Newton Purcell and Brackley centred along Evenley Road and Church Lane. There are a few shops in the village. All Saints Church (Church of England) and its associated churchyard are located on the junction between Evenley Road and Church Lane.

Westbury

5.3.6 The village of Westbury is located north-east of Mixbury and south-east of Brackley on the A422 Brackley Road. There are several community facilities within the village including shops, St Augustine's Church (Church of England) and associated churchyard, Westbury Cricket Club, Westbury Working Men's Club, and Beachborough School (a private school for ages two to 13) and playing fields.

Turweston

5.3.7 The village of Turweston is located to the east of Brackley on Turweston Road. There are several community facilities including shops, St Mary's Church and associated churchyard, Turweston village hall and The Stratton Arms public house. In addition, Turweston playing fields, owned by Fields in Trust, and Ballabeg Stables (which comprises a working stable yard and two residential properties) are located on the eastern edge of Turweston on Oatleys Road.

Whitfield

5.3.8 The village of Whitfield is located south and east of the A43 Oxford Road dual carriageway north-east of Brackley on Mill Road. The River Great Ouse forms the southern boundary of the village. Community facilities include St John the Evangelist Church and associated churchyard, Whitfield village hall and the Sun Inn public house

on Farrer Close. Whitfield Racecourse, which has been operating since 2009, is located to the south-west of Whitfield.

Eastern Brackley

- 5.3.9 Eastern Brackley is located west of the A43 Oxford Road next to its intersection with the A422 Brackley Road. It is bounded to the east, south and west by roads and to the north by fields. Eastern Brackley is dominated by housing estates with an industrial estate and saw mill forming the eastern boundary of the town. There are few community facilities within this area of the town including local shops, local play spaces, allotments and a cemetery. A few isolated cottages and farms are located outside the main part of the town.

Radstone

- 5.3.10 The village of Radstone is located to the north of Brackley and west of the A43 Oxford Road dual carriageway on Radstone Road. The only community facility within Radstone is the Church of St Lawrence (Roman Catholic).

Future baseline

Construction (2017)

- 5.3.11 Volume 5: Appendix CT-004-000 provides details of the developments, which are assumed to have been implemented by 2017. No committed developments have been identified in this area that will materially alter the baseline conditions in 2017 for the community.

Operation (2026)

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

5.4 Effects arising during construction

Avoidance and mitigation measures

- 5.4.1 The draft CoCP includes a range of provisions that will help mitigate community effects associated with construction within this area, including the following (see Volume 5: Appendix CT-003-000/1):
- appointment of community relations personnel (draft CoCP, Section 5);
 - community helpline to handle enquires from the public (draft CoCP, Section 5);
 - sensitive layout of construction sites to minimise nuisance (draft CoCP, Section 5);
 - where reasonably practicable, maintenance of PRow for pedestrians, cyclists and equestrians around the perimeter of construction sites and across entry and exit points (draft CoCP, Section 5);
 - a requirement for contractors to pay due consideration to the impacts of extreme weather events and related conditions, which may affect community resources during construction (draft CoCP, Section 5);

- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (draft CoCP, Sections 7 and 13); and
- where practicable, the avoidance of large goods vehicles operating adjacent to schools during drop off and pick up periods (CoCP, Section 14).

Assessment of impacts and effects

- 5.4.2 Details of all assessments of community resources are included in Volume 5: Appendix CM-001-014. Each assessment form presents information that explains the rationale for determining the rating for sensitivity of the affected community resource, magnitude of impact and the assessment of significance.

Newton Purcell

Temporary effects

- 5.4.3 No significant temporary effects have been identified in the community assessment for Newton Purcell.

Permanent effects

Residential properties

- 5.4.4 The Proposed Scheme will cross the A4421 Buckingham Road north-east of Newton Purcell. A new overbridge will be built to reroute the A4421 Buckingham Road. Construction of this offline overbridge, together with associated earthworks, will require the demolition of one residential property, Station House. The permanent loss of this property is not considered to be significant at a community level.

Cumulative effects

- 5.4.5 No significant temporary or permanent cumulative effects have been identified for the community of Newton Purcell.

Mixbury

Temporary effects

- 5.4.6 No significant temporary effects have been identified in the community assessment for Mixbury.

Permanent effects

- 5.4.7 No significant permanent effects arising from construction have been identified in the community assessment for Mixbury.

Westbury

Temporary effects

- 5.4.8 No significant temporary effects have been identified in the community assessment for Westbury.

Permanent effects

- 5.4.9 No significant permanent effects arising from construction have been identified in the community assessment for Westbury.

*Turweston***Temporary effects***Community infrastructure*

- 5.4.10 Approximately 8,400m² (approximately 40%) of land at Turweston playing fields on Oatleys Road will be required temporarily to accommodate the construction of a cutting for the Proposed Scheme and the diversion of a power line. The power line diversion will take up to one and a half years to complete. Following these utility works the majority of the land at the playing fields will be returned for use, but approximately 3,650m² (approximately 18% of the site) will be retained for construction of a cutting for the Proposed Scheme, which will take a further one and a half years to complete.
- 5.4.11 The playing fields include a children's play area, junior football goals, one adult football goal, a single basketball post and net, with an associated area of hardstanding, a cricket net and a small storage building. It is open for use by the public and is a well-used resource for residents of Turweston for playing recreational football and cricket (formal matches are not presently played here) and other informal activities. The basketball post as well as the football goals and cricket net are within the land required for construction of the Proposed Scheme. The remaining section of the field (approximately 11,500m²), which includes the children's playground, will be available for use throughout the construction period. It would be possible to relocate some of the sports facilities and equipment that are within the land required for construction into the area that remains available for use.
- 5.4.12 There are no alternative playing field facilities in Turweston. The closest alternative sites are in Brackley (on Church Road and Pebble Lane), which are both approximately 1.5km from the Turweston facility. However, as these are both outside the village they are not considered to be comparable alternatives.
- 5.4.13 The playing field is a valued local resource. Whilst some of the present informal recreational activities will be able to continue on the site throughout the construction period, 40% of the facility will be compromised for one and a half years, with approximately 20% compromised for up to three years. Given this and that no comparable local alternatives exist in the village itself, the effect is considered to be major adverse and is therefore significant.

Permanent effects*Residential properties*

- 5.4.14 The Proposed Scheme will pass east of Turweston in cutting. The cutting will require the demolition of two residential properties on Oatleys Road, namely Parkside and one residential property on the Ballabeg Stables site. The permanent loss of these two properties is not considered significant at a community level.

5.4.15 Access rights over land are also required but will not result in loss of land from any residential properties.

Community infrastructure

5.4.16 The Turweston cutting will also involve the permanent loss of four outbuildings at Ballabeg Stables. These buildings comprise a livery facility also known as Ballabeg Arabians, which includes an indoorschool, covered horse-walker and all weather canter track.

5.4.17 There are alternative similar livery facilities in Turweston, approximately 1.5km away at Ouse Valley Liveries. These provide stabling, schooling, an all-weather manège, gallops and injury paddocks.

5.4.18 Whilst there is a similar facility under 2km from Ballabeg, given that the Ballabeg site will be permanently lost, this is considered a major adverse effect and is therefore significant.

5.4.19 The Proposed Scheme will permanently require approximately 1,600m² (8%) of the land at Turweston playing fields. The basketball post and the storage unit at the site, as well as some of the area which is currently used for playing recreational football and cricket (formal adult matches currently do not take place on the site) are within the land permanently required for the Proposed Scheme. There will be overhead power lines above the playing field. The majority of activities will be able to take place without any constraints but there could be potential risks associated with kite-flying and other activities which use the airspace in the vicinity of the cables. This may necessitate some restrictions on the use of the land underneath the power lines and could, therefore, reduce the availability of land for football and cricket.

5.4.20 There are no alternative playing field facilities in Turweston. The closest alternative sites are in Brackley (on Church Road and Pebble Lane), which are both approximately 1.5km from the Turweston facility. However, as these are both outside the village they are not considered to be comparable alternatives.

5.4.21 Whilst the functionality of the playing field will only be partially compromised, as this is a highly valued local resource and there are no local alternatives, the effect is considered to be major adverse and is significant.

Whitfield

Temporary effects

5.4.22 No significant temporary effects have been identified in the community assessment for Whitfield.

Permanent effects

Community infrastructure

5.4.23 Whitfield Racecourse lies to the south-west of the village of Whitfield. The racecourse has been operating since 2009 and hosts a variety of local and national fixtures as well as horse shows. Fixtures for point-to-point racing and occasionally pony racing also take place approximately once a month throughout the year. Members of the public

are able to purchase season tickets. Whitfield is one of eight point-to-point racecourses serving the South Midlands area.

- 5.4.24 The Proposed Scheme will cross through the western section of the racecourse site. Approximately 20ha (20%) of the land will be required during construction of the Proposed Scheme, 10ha of which will be required permanently for the Helmdon embankment. As a result, this racecourse will not be able to function.
- 5.4.25 The nearest point-to-point racecourses are at Mollington near Banbury, (to the north-west, which is approximately 25km from Whitfield by road) and Brafield-on-the-Green (to the north-east, approximately 35km away by road). Given that the Whitfield Racecourse will not be able to function following the commencement of construction and there is no comparable alternative in the immediate vicinity, the effect is considered major adverse and is significant.

Eastern Brackley

Temporary effects

- 5.4.26 No significant temporary effects have been identified in the community assessment for eastern Brackley.

Permanent effects

Residential properties

- 5.4.27 The Proposed Scheme will pass north-east of Brackley in cutting, crossing the A43 Oxford Road. Iletts Farm which includes two residential properties is within the land required for the operation of the Proposed Scheme and will be demolished. The permanent loss of these properties is not significant at a community level.

Radstone

Temporary effects

- 5.4.28 No significant temporary effects have been identified in the community assessment for Radstone.

Permanent effects

- 5.4.29 No permanent significant effects arising from construction have been identified in the community assessment for Radstone.

Cumulative effects

- 5.4.30 No temporary or permanent cumulative effects have been identified for the area within the community assessment.

Other mitigation measures

- 5.4.31 To mitigate the effects associated with land required for construction and operation at Turweston playing field HS2 Ltd will continue to work with Turweston Parish Council and Fields in Trust to:
- provide temporary replacement recreational facilities, to include an area for recreational football, cricket and basketball activities, during the period of

construction on the land within the playing field which is not required for construction; and

- reinstate and reconfigure the recreation ground following construction in order to minimise the impacts associated with the permanent loss of land.

5.4.32 Ballabeg Stables and Whitfield Racecourse will be compensated within the provisions of the Compensation Code.

Summary of likely significant residual effects

5.4.33 Turweston playing fields are likely to be significantly affected due to land required for construction and operation of the Proposed Scheme. There will also be a significant permanent effects for Ballabeg Stables (Ballabeg Arabians) in Turweston resulting from the demolition of stables, and at Whitfield Racecourse, due to land required for construction of the Proposed Scheme.

5.5 Effects arising from operation

Assessment of impacts and effects

Newton Purcell

5.5.1 No significant operational effects have been identified in the community assessment for Newton Purcell.

Mixbury

5.5.2 No significant operational effects have been identified in the community assessment for Mixbury.

Westbury

5.5.3 No significant operational effects have been identified in the community assessment for Westbury.

Turweston

5.5.4 No significant operational effects have been identified in the community assessment for Turweston.

Whitfield

5.5.5 No significant operational effects have been identified in the community assessment for Whitfield.

Eastern Brackley

5.5.6 No significant operational effects have been identified in the community assessment for eastern Brackley.

Radstone

Residential properties

5.5.7 Up to ten residential properties in Radstone are predicted to experience in-combination effects associated with the operation of the Proposed Scheme. These in-combination effects are:

- significant visual effects due to views of noise fence barriers, trains, overhead line equipment, the Radstone Road diversion (Radstone Road overbridge and footpath AX7 realignment) and two footpath overbridges (Bridleway AX18 accommodation overbridge and associated Footpath AX5 Bridleway AX19 realignments; and Footpath AX15 overbridge); and
- significant daytime and night-time noise effects.

5.5.8 The combination of these effects will have a major adverse effect on residential amenity and is therefore considered to be significant.

Summary of likely significant residual effects

5.5.9 The amenity of some residential properties in Radstone will be affected permanently by the combination of noise and visual effects from the Proposed Scheme in the operational phase.

6 Cultural heritage

6.1 Introduction

- 6.1.1 This section of the report provides a description of the current baseline for heritage assets and reports the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme. Consideration is given to the extent and heritage value (significance) of assets including archaeological and palaeoenvironmental remains; historic buildings and the built environment; and historic landscapes.
- 6.1.2 With regard to heritage assets, the main issue is the extent to which designated and non-designated assets are affected by the Proposed Scheme. Impacts on assets as a result of the Proposed Scheme will occur through physical alterations to the structures and changes to setting.
- 6.1.3 Maps showing the location of the key environmental features can be found in Map Series CT-10 in the Volume 2, CFA14 Map Book. The location of all designated and non-designated heritage assets can be found in Volume 5, Cultural Heritage Map Book. Detailed reports on the cultural heritage character and surveys undertaken within the study area are contained in the Volume 5 Appendices. These include:
- Appendix CH-001-014 – Baseline report;
 - Appendix CH-002-014 – Gazetteer of heritage assets;
 - Appendix CH-003-014 – Impact assessment table; and
 - Appendix CH-004-014 – Survey reports; and
 - Throughout this section, assets within the study areas are identified with a unique reference code, NPBXXX; further detail on these assets can be found in the gazetteer in Volume 5: Appendix CH-002-014.
- 6.1.4 Engagement has been undertaken with the Buckinghamshire, Oxfordshire and Northamptonshire County Councils planning archaeologists and the conservation officers for Aylesbury Vale District Council, Cherwell District Council and South Northamptonshire District Council with regard to the nature of the cultural heritage assets within the local area.

6.2 Scope, assumptions and limitations

- 6.2.1 The assessment scope, key assumptions and limitations for the cultural heritage assessment are set out in Volume 1, the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.
- 6.2.2 The setting of all designated heritage assets the Zone of Theoretical Visibility (ZTV) of the Proposed Scheme has been considered. The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out, is defined as the land required, temporarily and permanently, to construct the Proposed Scheme plus 500m.

6.2.3 The cultural heritage methodology includes the consideration of the intra-project effects of a number of technical topic assessments, for example, landscape and visual, ecology and water resources and flood risk. Consequently, these interactions have been included in the assessment of impacts and effects.

6.2.4 In undertaking the assessment the following limitations were identified:

- the LiDAR³¹ data examined did not encompass the full extent of the study area; and
- not all areas of survey as identified in the archaeological risk model³² were available for survey.

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

6.3 Environmental baseline

Existing baseline

6.3.1 In compiling this assessment, documentary baseline data was collected from a variety of sources as set out in Volume 5: Appendix CH-001-014.

6.3.2 In addition to collation of these baseline data, the following surveys were undertaken:

- walkover and site reconnaissance from areas of public access or in locations where access was granted. This was undertaken to understand the character and form of heritage assets and the historic landscape and to review the setting of assets (incorporated into Volume 5: Appendix CH-001-014);
- desk-top review of remote sensing data including LiDAR, aerial photographs and hyperspectral data (Volume 5: Appendix CH-004-014); and
- a programme of non-intrusive surveys geophysical surveys (Volume 5: Appendix CH-004-014).

Designated assets

6.3.3 No designated assets lie partially or wholly within the land required, temporarily or permanently for construction of the Proposed Scheme.

6.3.4 The following designated heritage assets are located within the ZTV (see Maps CH-01-044 to CH-01-047 and CH-02-023 to CH-02-024 in Volume 5, Cultural Heritage Map Book):

- the scheduled monument of Beaumont Castle (NPB025), an asset of high value;

³¹Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.

³² The archaeological risk model is an approach that enables the identification of those areas of the Proposed Scheme where archaeological assets are known or suspected and provides a mechanism for the prioritisation of the programme of survey.

- two Grade I listed buildings of high value: the Church of St Peter in Brackley (within grouping NPBo56) and the Church of St Lawrence at Radstone (within grouping NPBo89);
- four Grade II* listed buildings of high value: the Church of All Saints at Mixbury (within grouping NPBo24); the Church of St Augustine at Westbury (within grouping NPBo24); the Church of St Mary at Turweston (within grouping NPBo58); and Turweston House (within grouping NPBo58);
- four conservation areas of moderate value: Mixbury (within grouping NPBo24); Brackley (within groupings NPBo56 and NPBo57); Westbury (within grouping NPBo42); and Turweston (within grouping NPBo58); and
- a total of 52 Grade II listed buildings of moderate value: the majority of which lie within the settlements of Newton Purcell (within grouping NPBoo8); Mixbury (within grouping NPBo24); Westbury (within grouping NPBo42); and Turweston (within grouping NPBo58) but also including buildings within farmsteads such as Widmore Farm (NPBo18).

Non-designated assets

6.3.5 No non-designated assets of high value lie wholly or partially within the land required, temporarily and permanently, for the construction of the Proposed Scheme.

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

- archaeological remains extending from Finmere Quarry (NPBo19) to the west of the former line of the Great Central Railway (GCR) (NPBoo3);
- earthworks and possible palaeoenvironmental remains associated with water management in the Ouse Valley floor (NPBo63) at Turweston;
- earthworks and possible palaeoenvironmental remains associated with water management in the Ouse Valley floor (NPBo66) at Turweston;
- possible prehistoric or Romano-British cemetery evidence from Brackley Bypass (NPBo72) identified during work on the A43 Oxford Road;
- Romano-British activity near Sundale (NPBo73);
- area of cropmarks indicating probable prehistoric settlement activity to the east of Fox Covert (NPBo77);
- area of Romano British and medieval cropmarks indicating former settlement activity to the north of Fox Covert (NPBo85);
- remains of medieval settlement at Radstone (NPBo89);
- area of cropmarks of probable prehistoric date to north-west of Radstone (NPBo90);

- area of ridge and furrow at Upper Radstone (NPB095); and
- six hedgerows qualifying as historically important under the Hedgerows Regulations 1997³³ (NPB001 032, 036, 064, 081 and 082).

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

- the line of the probable Roman road through Newton Purcell (NPB006);
- disused line of Great Central Railway (NPB003 and NPB075);
- former Finmere Railway Station and associated features (NPB004);
- disused line of the Banbury to Verney Branch line of the London and North - Western Railway branch (NPB030);
- area of ridge and furrow to the west of Westbury (NPB044);
- area of ridge and furrow to the east of Grovehill Farm (NPB098);
- possible outlying features of Turweston Airfield (NPB054);
- area of ridge and furrow at Turweston Glebe (NPB061);
- area of ridge and furrow to the north of Turweston (NPB062);
- area of ridge and furrow around Ballabeg (NPB099); and
- post-medieval buildings at Iletts Farm (NPB070).

6.3.8 All non-designated heritage assets within 500m of the land required, temporarily or permanently, for construction of the Proposed Scheme are listed in the gazetteer in Volume 5: Appendix CH-002-014 and identified on Maps CH-01-043 to CH-01-047 (Volume 5, Cultural Heritage Map Book). There are a number of built heritage assets, the settings of which have been considered. All are of low value and comprise:

- Barley Fields Farm (NPB005);
- Barley Fields Barn Farm (NPB009);
- Warren Farm (NPB021);
- Hollow Barn (NPB027);
- Grovehill Barn (NPB045);
- Grovehill Farm (NPB046);
- Dust Houses (NPB047);
- Grove Farm (NPB048);

³³ *Hedgerow Regulations 1997* (SI 1997 No. 1160). London, Her Majesty's Stationery Office.

- Oatleys Farm (NPBo52);
- Versions Farm (NPBo69);
- Hall Farm (NPBo84); and
- Coldharbour Farm (NPBo86).

Cultural heritage overview

- 6.3.9 The area is generally characterised by limestone plateau land. It is bisected by the valley of the River Great Ouse, which drains to the south-east.
- 6.3.10 The present settlement character is predominantly one of dispersed settlement. It comprises the nucleated villages and hamlets of Newton Purcell, Fimere, Mixbury, Westbury, Turweston and Whitfield, which overlook the Ouse Valley. There are scattered farmsteads and small hamlets on the higher plateau land to the north of Brackley.
- 6.3.11 Human activity through all periods has largely been concentrated in the principal valley systems, specifically within and immediately adjacent to the valley of the River Great Ouse. The valley of the River Great Ouse, in particular, has a high potential to contain palaeoenvironmental evidence documenting the development of the local environment from the last glaciation and throughout the succeeding Holocene; peat deposition has been recorded by the British Geological Survey (BGS) in the valley floor to the north of Turweston (NPBo63 and NPBo66). It is unlikely that any Palaeolithic (circa 500,000 – 10,000 BC) activity would be represented within the study area.
- 6.3.12 Evidence for Mesolithic (circa 10,000 – 4,000 BC) and Neolithic (circa 4,000 – 2,400 BC) activity can be expected to be concentrated on lighter well drained soils over permeable geologies, such as the limestones that form the bedrock within the study area. Mesolithic sites are often found in areas that have commanding views close to reliable water sources; the upper slopes of the valley of the River Great Ouse would therefore be a typical location to find evidence for Mesolithic activity.
- 6.3.13 Finds of Mesolithic stone tools indicate that a concentration of Mesolithic activity may be represented within the watershed between the headwaters of the Rivers Cherwell and Great Ouse, possibly as this area was a natural routeway to exploit the resources available in each of these river systems.
- 6.3.14 The Bronze Age (circa 2,400 – 700 BC) through to Late Iron Age (circa 100 BC – AD 43) is the period during which settlement evidence and the associated evidence for agricultural practices and land division becomes more visible in the archaeological record. From the Middle Bronze Age (circa 1,500 BC) settlement becomes more permanent, usually as single farmsteads accommodating a single family unit. Early Bronze Age round barrows may reasonably be expected to be present on the crest of slopes overlooking valley systems. Examples have been identified near Barley Fields (NPBo14); to the west of the Great Central Railway near Fimere Quarry (NPBo19); near Stonepit Spinney (NPBo31); and overlooking the River Great Ouse to the south of Turweston (NPBo51).

- 6.3.15 Activity of later Bronze Age (circa 1,100 – 700 BC) to Early Iron Age (circa 700 – 400 BC) date will typically be located on the lighter free-draining soils over the permeable limestones where these outcrop on the higher ground between the Rivers Cherwell and Great Ouse and on the valley sides of the River Great Ouse. It is likely that activity of these periods will not be as well represented in areas where the limestone is overlain by the less well drained and less easily worked clayey soils associated with superficial drift deposits of Till. By the Late Iron Age, the area may have lain in a border area between three tribal groupings: the Catuvellauni to the south and south-east, Corieltauvi to the north and north-east and the Dobunni to the south-west.
- 6.3.16 From the Middle Iron Age onwards it is possible that more marginal land over clayey soils was brought into agricultural use. Evidence for this is still largely absent, however, from the south-western districts of Northamptonshire and northern Oxfordshire and Buckinghamshire. A rare example of Middle Iron Age settlement has been identified to the north of Brackley Fields (NPBo76). Excavated evidence for settlement activity of later prehistoric date is also clearly represented at Finmere Quarry (NPBo19); at Brackley Town Field (NPBo74); and near Sundale (NPBo73). Cropmarks suggestive of late prehistoric and/or Romano-British settlement are also evident on the margins of the Ouse Valley to the south of Turweston (NPBo59); near Versions Farm (NPBo68); east of Fox Covert (NPBo77); north of Fox Covert (NPBo85); at Lower Radstone (NPBo87); at Radstone (NPBo88 and 089); and to the north-west of Radstone (NPBo90). A number of isolated enclosures (NPBo14, 015, 016 and 020) are also visible as cropmarks on the dip slope between Newton Purcell and the valley of the River Great Ouse.
- 6.3.17 Settlement of Roman date (AD 43 – 410) is usually more extensive in scale than that of later prehistoric date, with a far greater amount of material culture in the form of pottery, bone and glass artefacts. There is also more widespread use of stone, brick and tile for building. Generally, there appears to be an increase in population and settlement density between the 1st century BC and 1st century AD, although even here there is evidence for some abandonment and dislocation. It is, however, likely that settlements of Roman date, where present, will have an Iron Age precursor. It is clear that major re-organisation of the countryside was occurring through the 1st century BC to the 2nd century AD, possibly as a re-orientation on new road networks and the location of towns.
- 6.3.18 Newton Purcell lies on the line of the Roman road (NPBo06) that links the Roman Conquest period fort and later town at Alchester (near Bicester to the south) with the town at Towcester (Lactodurum) to the north, where there was an intersection with another Roman road (Watling Street). The Roman road would have been a major focus for settlement activity. There may have been a small Romano-British town at Brackley overlooking a crossing of the River Great Ouse. Much Romano-British material has been recovered from within Brackley and to the south around Evenley. Excavated evidence for Romano-British activity has been identified at Finmere Quarry (NPBo19); to the south of Turweston (NPBo59); near Sundale on the A43 Oxford Road (NPBo73); and at Brackley Old Town Field (NPBo74).
- 6.3.19 Material culture surviving from 5th to 7th centuries AD is scant, since handmade Anglo-Saxon pottery does not survive well in plough soils and coinage is only present

reliably from circa AD 700 onwards. Many early medieval settlements have also been built over by later and existing settlements.

- 6.3.20 The early medieval period apparently sees the abandonment of potentially more marginal soils over clays, such as those found over the Till that masks much of the Limestone upland in the area and the clay vale of Aylesbury to the south. Settlement activity of this date is, therefore, most likely to be identified on the lighter soils over the limestones where they are not covered in Till. Activity may also be identified within the valley of the River Great Ouse.
- 6.3.21 The social, monetary, economic and political organisation of the Romano-British period broke down to be replaced by a system of smaller tribal entities. The period appears to have been unsettled and warlike as these entities strove for power until the principal Anglo-Saxon kingdoms of East Anglia, Mercia and Wessex became established. From the 7th century onwards the archaeological record becomes clearer as documentary sources become available and the evidence from buried artefactual and structural remains is more robust.
- 6.3.22 By the 8th century, a significant settlement had developed at Brackley, which was an important Middle Saxon royal estate with an associated ecclesiastical grant of a Minster church. It is unlikely that Saxon Brackley existed in isolation and it is likely that the medieval villages of the area had early medieval origins.
- 6.3.23 This period also saw the establishment of the open field agricultural system with its characteristic ridge and furrow, which would remain in use throughout the medieval period. These open fields were worked communally with farmers owning and/or renting individual portions/strips within each of the open fields.
- 6.3.24 Before AD 873 the area became part of the Anglian Kingdom of Mercia until its collapse during the Danish invasions of the 9th century. Thereafter, until circa AD 1016, it lay within a border area between Wessex, with its territory expanding from the Thames Valley to the south and south-west, and the Danelaw to the north and east. Artefacts dating between circa AD 750 – 950 have been recovered from within or close to modern settlements within the area where Northamptonshire meets Buckinghamshire and Oxfordshire. This suggests that the modern settlement pattern has its origins between the 9th and 11th centuries.
- 6.3.25 By time of the Norman Conquest (AD 1066) the present settlement pattern had probably developed, focused on the settlements at Newton Purcell (NPB007 and 008); Shelswell (NPB013); Finmere (NPB011); Mixbury (NPB024); Westbury (NPB042); Turweston (NPB058); Whitfield (NPB071); and the small town at Brackley. Medieval activity is also clearly represented at Mixbury by the scheduled monument of the Norman motte and bailey castle of Beaumont Castle (NPB025) and the deserted or shrunken settlements at Shelswell (NPB013); Fulwell (NPB029); Lower Radstone (NPB087); and Upper Radstone (NPB089). Relatively well preserved ridge and furrow is present to the west of Westbury (NPB044) and around Turweston (NPB060, NPB061 and NPB062).
- 6.3.26 It is likely that the pattern of settlement established in the medieval period forms the basis for the pattern that continued through the post-medieval period (AD 1539 –

1900) to the present day. The post-medieval period also witnessed the widespread abandonment of the medieval agricultural organisation based on open fields with its ridge and furrow strips divided by headlands. This was replaced by enclosed fields, both for arable production and to provide enclosed pasture. The enclosure of the landscape commenced in the later medieval period and accelerated after the final dissolution of the monasteries under Henry VIII between 1536 and 1539, which brought more land into private ownership and the commensurate rise of a gentrified class.

- 6.3.27 Much of the area is now characterised by a fieldscape formed in the past by parliamentary enclosure, with scattered farmsteads necessitated by the change from scattered communal holdings within an open field system to concentrated private holdings. Many of the farmhouses and associated agricultural buildings in the area were built between the 17th and 19th centuries as a response to this agricultural change. There is some evidence in the form of earthworks to indicate that management of water for meadows was occurring within the floodplain of the River Great Ouse (NPBo63 and NPBo66). At Mixbury (NPBo24) a new estate village with common housing stock was created in the 1870s.
- 6.3.28 Re-organisation of the countryside was accompanied by an associated change in labour division. A lower proportion of the rapidly expanding population could be employed on the land while the demands of industry and commerce led to a burgeoning urban population. Brackley continued to be a relatively important market centre. New markets for the agricultural produce of the Brackley area were opened up by the improvement of roads in the late 18th and 19th centuries and the construction of the railways providing a fast link to both London and the industrial heartland of the Midlands. The late 19th and early 20th centuries saw the construction of the London and North Western Railway (LNWR) (NPBo03) and Great Central Railway (GCR) (NPBo03 and NPBo75) through the study area. The latter had a station (NPBo04) at Newton Purcell called Finmere for Buckingham. These railways were closed in the 1950s – 60s.
- 6.3.29 During World War II the airfield at Turweston (NPBo54) was established on the higher ground overlooking the valley of the River Great Ouse.
- 6.3.30 Modern residential development has occurred in and around all of the villages within the study area as well as at Brackley. Many of the farmsteads shown on the 1st Edition Ordnance Survey (OS) mapping such as Widmore Farm (NPBo18) have also expanded with the building of large agricultural barns, sheds and other outbuildings.

Future baseline

Construction (2017)

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

Operation (2026)

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

6.4 Effects arising during construction**Avoidance and mitigation measures**

- 6.4.1 The draft CoCP sets out the provisions that will be adopted to control effects on cultural heritage assets. The provisions include the following (see Volume 5: Appendix CT-003-000/1):
- management measures that will be implemented for assets that are to be retained within the land required for the construction of the Proposed Scheme (draft CoCP, Section 8);
 - the preparation of project wide principles, standards and techniques for works affecting heritage assets (draft CoCP, Section 8);
 - a programme of archaeological investigation and recording to be undertaken prior to/or during construction works affecting the assets (draft CoCP, Section 8); and
 - a programme of historic building investigation and recording to be undertaken prior to modification or demolition of the assets (draft CoCP, Section 8).

Assessment of impacts and effects*Temporary effects*

- 6.4.2 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts will occur to assets both within the land required, temporarily or permanently, for the construction of the Proposed Scheme and assets in the wider study area due to the visibility of plant, cranes and equipment and other construction factors.
- 6.4.3 The historic settlement at Turweston (NPBo58), an asset grouping of high value that includes a conservation area containing listed buildings, will be subject to changes to its setting. These changes will be due to changes in its sound environment and the visibility of construction of the Turweston viaduct over a period of approximately one and a half years. This lies within a key view identified in the Turweston Conservation Area Appraisal³⁴ towards the settlement from the north along the Valley of the Great Ouse. This will constitute a medium adverse impact and a major adverse effect.
- 6.4.4 The historic settlement at Radstone (NPBo89), an asset grouping of high value, that includes the Grade I listed Church of St Lawrence, will be subject to considerable changes to its setting. These will be derived from changes to the local sound environment and high visibility of construction of the Brackley north cutting over a

³⁴ Aylesbury Vale District Council (2008), *Turweston Conservation Area*.

period of approximately two years. The agricultural hinterland which adds time depth and coherence to any understanding of the settlement in its historic setting will effectively be removed immediately adjacent to the western edge of the settlement. This will constitute a high adverse impact and a major adverse effect.

6.4.5 Widmore Farm (NPBo18), a Grade II listed building of moderate value, will be subject to changes to its setting derived principally from the visual presence of construction of the Barton to Mixbury cutting and changes to its sound environment for a period of approximately one year. No key views will be affected but views to and from its east will be noticeably different and will noticeably change the agricultural context immediately adjacent to the farm, which helps to define its historical character. This will constitute a medium adverse impact and a moderate adverse effect.

6.4.6 The historic settlement at Westbury (NPBo42), an asset grouping of high value that includes a conservation area containing listed buildings, will be subject to changes to its setting derived principally from changes to its sound environment. These changes will be linked to construction of the Westbury embankment and Westbury viaduct over a period of approximately one and a half years. This will constitute a low adverse impact and a moderate adverse effect.

Cumulative effects

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

Permanent effects

6.4.8 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required, temporarily or permanently, for construction of the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme. The following significant effects will occur.

Permanent impacts

6.4.9 Archaeological remains of moderate value to the west of the former Great Central Railway that are associated with the excavated remains from Finmere Quarry (NPBo19) will be removed. This impact is due to the establishment of haul routes, construction of the route, temporary excavated material storage, balancing ponds, landscaping and of new plantings. This will constitute a high adverse impact and a major adverse effect.

6.4.10 The remains of a water management system (NPBo63 and NPBo66), assets of moderate value within the Ouse Valley to the north of Turweston, will be removed. There will be an impact on palaeoenvironmental evidence within the valley floor. This impact is due to the establishment of haul routes, construction of the Turweston viaduct, balancing ponds and replacement floodplain storage areas within the valley floor. These will constitute a high adverse impact and a major adverse effect.

6.4.11 The remains of a water management system (NPBo66), an asset of moderate value within the Ouse Valley to the north of Turweston, will be removed. There will also be an impact on palaeoenvironmental evidence within the valley floor. This will be due to the establishment of haul routes, construction of the Turweston viaduct, balancing

ponds and replacement floodplain storage areas within the valley floor. This will constitute a high adverse impact and a major adverse effect.

- 6.4.12 Archaeological remains including a possible Romano-British temple and associated features of high value near Sundale and Iletts Farm (NPBo73) will be removed. These remains will be removed through establishment of haul routes, Brackley south cutting main compound, construction of the route with landscaping and new planting. This will constitute a high adverse impact and a major adverse effect.
- 6.4.13 Archaeological remains of moderate value including part of the deserted settlement earthworks and associated ridge and furrow immediately to the west of Radstone (NPBo89) will be removed. This will not only remove archaeological remains but will also remove remains that form part of the immediate historical landscape context of the settlement and Grade I listed Church of St Lawrence. This will be caused by the establishment of haul routes, construction of the route within cutting, temporary excavated material storage, balancing ponds, landscaping and of new plantings. This will constitute a high adverse impact and a major adverse effect.
- 6.4.14 Construction of the Radstone cutting and associated landscaping will entail removal of approximately 60% of the ridge and furrow (NPBo95) to the south of Upper Radstone, an asset of moderate value. This will comprehensively change this asset's contribution to the value of the Upper Radstone landscape (NPBo97) and the settlement of Upper Radstone (NPBo89). This will constitute a high adverse impact resulting in a major adverse effect.
- 6.4.15 The Upper Radstone landscape (NPBo97), an asset of moderate value, will effectively be removed as a coherent and legible historical landscape and will largely cease to be a contributing part of the setting of Upper Radstone (NPBo89). This will constitute a high adverse impact resulting in a major adverse effect.
- 6.4.16 Archaeological remains associated with cropmarks of enclosures to the north-west of Radstone (NPBo90), an asset of moderate value, will be removed. This will be caused by the establishment of haul routes, construction of the route in cutting, landscaping, temporary excavated material storage and of new plantings. This will constitute a high adverse impact and a major adverse effect.
- 6.4.17 The non-designated Station House and two railway bridges over the A4421 Buckingham Road at Newton Purcell will be demolished and any surviving remains of the Great Central Railway (GCR) station at Newton Purcell (called Finmere) and related features (NPBo04) will be removed. This will be due to the construction of the route with associated landscaping, new railway bridge, of balancing pond and re-alignment of the A4421 Buckingham Road, These features are of low value and will be subject to a high adverse impact resulting in a moderate adverse effect.
- 6.4.18 The remains of the ridge and furrow (NPBo61) near Turweston Glebe, an asset of low value, will be removed. These are a fragmentary remnant of the medieval open field system associated with Turweston. These remains will be removed by establishment of haul routes, construction of the route in cutting, temporary excavated material storage and new plantings. This will constitute a high adverse impact and a moderate adverse effect.

- 6.4.19 The remains of the ridge and furrow (NPBo62) to the north of Turweston, an asset of low value, will be removed. These are a fragmentary remnant of the medieval open field system associated with Turweston. These remains will be removed by establishment of haul routes, construction of the route in cutting, temporary excavated material storage and new plantings. This will constitute a high adverse impact and a moderate adverse effect.
- 6.4.20 The remains of the ridge and furrow around Ballabeg (NPBo99), an asset of low value, will be removed. These are a fragmentary remnant of the medieval open field system associated with Turweston. These remains will be removed by establishment of haul routes, construction of the route in cutting, temporary excavated material storage and new plantings. This will constitute a high adverse impact and a moderate adverse effect.
- 6.4.21 Undesignated buildings at Iletts Farm (NPBo70), an asset of low value, will be demolished. This will constitute a high adverse impact and a moderate adverse effect.
- 6.4.22 The removal of a section of six hedgerows identified as historically important under the Hedgerow Regulations 1997 (NPBo01, NPBo32, NPBo36, NPBo64, NPBo81 and NPBo82) will result in a medium adverse impact and a moderate adverse effect.
- 6.4.23 The following significant effects will occur as a result of permanent impacts on the setting of heritage assets.

Impacts on the setting of heritage assets

- 6.4.24 The historic settlement at Radstone (NPBo89), an asset grouping of high value that includes the Grade I listed Church of St Lawrence, will be subject to changes to its setting. Most of the historical landscape context in which it lies (NPBo97) including the remains of ridge and furrow (NPBo95) and part of the medieval settlement earthworks (part of NPBo89) will be entirely removed during construction of the route, effectively removing part of the settlement's setting. This will constitute a high adverse impact and a major adverse effect.
- 6.4.25 The historic settlement at Turweston (NPBo58), an asset grouping of high value that includes a conservation area containing listed buildings, will be subject to changes to its setting derived principally from the insertion of Turweston Viaduct into its northern setting and within a key view towards the settlement identified in the Turweston Conservation Area Appraisal³⁵. This will constitute a medium adverse impact and a major adverse effect.

Permanent cumulative effects

- 6.4.26 There are no cumulative effects considered to be of specific relevance to the cultural heritage topic.

Other mitigation measures

- 6.4.27 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed design to

³⁵ Aylesbury Vale District Council (2008), *Turweston Conservation Area*.

reduce further the significant effects described above. These refinements will include the identification of:

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

Summary of likely residual significant effects

- 6.4.28 A range of archaeological assets will be permanently lost due to the construction of the Proposed Scheme. These assets include Romano-British remains (notably near Sundale) and surviving remains of the Great Central Railway station at Newton Purcell (called Finmere). A programme of archaeological works will be prepared to investigate, analyse, report and archive these assets.
- 6.4.29 The Proposed Scheme will result in the demolition of a number of non-designated built heritage assets including Iletts Farm and the Station House and bridges associated with the Great Central Railway. A programme of built heritage works will be prepared to investigate, analyse, report and archive these assets.
- 6.4.30 The Proposed Scheme will sever elements of the historic landscape, for example hedgerows and ridge and furrow. Some six lengths of historic hedgerow will be permanently removed. In addition, there will be changes to the setting of the historic settlements at Westbury, Upper Radstone and Turweston.

6.5 Effects arising from operation

Avoidance and mitigation measures

- 6.5.1 The following measures have been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on assets:
- sound mitigation measures to reduce potential impacts derived from changes to the setting of identified assets; and
 - landscape planting to reduce the potential impacts derived from changes to the setting of identified assets.

Assessment of impacts and effects

- 6.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent. There will be no physical impacts on buried archaeological remains or other heritage assets arising from the operation of the Proposed Scheme. Impacts on the setting of heritage assets arising from the physical presence of the Proposed Scheme are described as permanent occurring within the construction phase and are not repeated in detail here, albeit that they will endure through the operation of the Proposed Scheme. Where there is a combined effect on the setting of an asset from the presence of the constructed scheme and its operation, this is reported in the assessment of operation.
- 6.5.3 Significant environmental effects will occur as a result of permanent changes to the setting of the following assets arising from the impacts of railway operation.

6.5.4 The historic settlement at Radstone (NPBo89), an asset grouping of high value that includes the Grade I listed Church of St Lawrence, will be subject to changes to its setting. This isolated and rural location is a key aspect of the settlement's value and will subsequently be lost. These changes will particularly affect the appreciation and understanding of the Grade I listed Church of St Lawrence within its historical landscape context. The setting will be changed by the movement of trains and the associated increase in noise. In combination with the presence of the constructed scheme, this will result in a high adverse effect resulting in a major adverse effect.

6.5.5 The historic settlement at Turweston (NPBo58), an asset grouping of high value that includes a conservation area and listed buildings, will be subject to changes to its setting derived from the change in the key view along the Ouse Valley towards the village identified in the Turweston conservation area appraisal. The setting will be changed by the movement of trains and the associated increase in noise. In combination with the presence of the constructed scheme, this will result in a high adverse effect resulting in a major adverse effect.

Cumulative effects

6.5.6 Assessment of inter-project effects on cultural heritage assets arising from the interaction of the Proposed Scheme with cumulative development projects has been undertaken. These developments are listed in Volume 5: Appendix CT-004-000 and shown in Maps CT-13-031 to CT-13-035 (Volume 5, Cross Topic Appendix 1 Map Book). No significant cumulative effects have been identified in relation to cultural heritage.

Other mitigation measures

6.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified.

Summary of likely significant residual effects

6.5.8 The setting of Upper Radstone and Turweston will be affected by noise once the Proposed Scheme becomes operational.

7 Ecology

7.1 Introduction

- 7.1.1 This section describes the ecological baseline and identifies likely impacts and significant ecological effects that will arise from the construction and operation of the Proposed Scheme. These include impacts on species, habitats and sites designated for their importance for nature conservation.
- 7.1.2 The principal ecological issues in this area are the loss of grassland and scrub from Helmdon Disused Railway Site of Special Scientific Interest (SSSI), woodland from Fox Covert (Whitfield) Local Wildlife Site (LWS) and grassland from Turweston Manor Grassland LWS and Radstone Road Verge LWS; and a risk to bats colliding with trains near Radstone during the operation of the Proposed Scheme.
- 7.1.3 Volume 5 of the ES contains supporting information to the ecological assessment reported in this section, including:
- ecological baseline data (Appendices EC-001-002, EC-002-002, EC-003-002, and EC-004-002); and
 - a register of local/parish level effects, which are not reported individually in Volume 2 (Appendix EC-005-002).
- 7.1.4 As well as survey data, the assessment draws on existing information gathered from national organisations and from regional and local sources including: Environment Agency; Buckinghamshire and Milton Keynes Environmental Records Centre; Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust; Buckinghamshire Bird Club; Cherwell District Council; Thames Valley Environmental Records Centre; Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust; Northamptonshire Biodiversity Records Centre; Northamptonshire Bat Group; Northamptonshire Bird Club; Banbury Ornithological Society; Oxfordshire Bat Group, Oxfordshire Badger Group; Northamptonshire County Recorder for Diptera and Spiders; and Northamptonshire Moth Group.

7.2 Scope, assumptions and limitations

- 7.2.1 The scope and methodology of the ecological assessment are introduced in the SMR (Volume 5: Appendix CT-001-000/1) and SMR Addendum (Volume 5: Appendix CT-001-000/2). Further detail, including the study area for individual surveys, is provided within the SMR Addendum (Volume 5: Appendix CT-001-000/2). The assessment methodology is summarised in Section 8 of Volume 1, along with route-wide assumptions and limitations. Limitations associated with particular surveys are reported in Volume 5: Appendices EC-001-002, EC-002-002, EC-003-002 and EC-004-002.
- 7.2.2 A Water Framework Directive assessment has been undertaken in conjunction with the environmental assessment. Details of this assessment are presented in Volume 5: Appendix WR-001-000.

- 7.2.3 Access was not obtained to all of the land area where general habitat survey (Phase 1 habitat survey) was proposed. Locations with the potential to support key ecological receptors where access could not be gained for survey include farmland to the north and west of Newton Purcell and land to the east of Brackley next to the A43 Oxford Road, north of Turweston. In addition, access was not secured to land near Radstone, north of Brackley until June 2013 thus limiting survey work between Newton Purcell and Brackley. Further details are provided in Volume 5: Appendices EC-001-002, EC-002-002, EC-003-002 and EC-004-002.
- 7.2.4 Where data are limited, a precautionary baseline has been built up according to the guidance provided in Volume 5: Appendix CT-001-000/2. This constitutes a 'reasonable worst case' basis for the subsequent assessment.
- 7.2.5 The precautionary approach to the assessment has been adopted to identify the likely significant ecological effects of the Proposed Scheme.

7.3 Environmental baseline

Existing baseline

- 7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports and maps presented in Volume 5 (Appendices EC-001-002, EC-002-002, EC-003-002 and EC-004-002 and the Ecology Map Series EC-01 to EC-12, Volume 5 Ecology Map Book CFA14). Statutory and non-statutory designated sites are shown on Maps EC-01-031 to EC-01-035 (Volume 5, Ecology Map Book).
- 7.3.2 Land required for the construction of the Proposed Scheme and that adjacent to it consists of arable land and pasture with intact hedgerows and several woods. Between Newton Purcell and Mixbury the route of the Proposed Scheme will be on or beside the old London and North Eastern Railway (LNER) part of which is designated as the Old LNER Railway District Wildlife Site (DWS)³⁶. To the north of Brackley the route of the Proposed Scheme will cross part of the LNER disused railway that is designated as the Helmdon Disused Railway SSSI and the former Banbury to Verney Junction disused railway (which is not covered by any nature conservation designations) at Westbury. The largest woodlands in this area are Mixbury Plantation, Widmore Plantation and Diggings Wood, all of which are located west of the land required for the construction of the Proposed Scheme, near Finmere. The largest watercourse in this area is the River Great Ouse. Standing water is most abundant near Finmere where previous mineral extraction has led to the formation of a number of ponds.

Designated sites

- 7.3.3 There is one statutory designated site within 500m of the land required for the construction of the Proposed Scheme, Helmdon Disused Railway SSSI, which is 16.6ha in area and approximately 4km long. It will be crossed by the route of the

³⁶ The Old London and North Eastern railway (LNER) is the name provided to a series of former connected railway lines and includes the Former Greater Central Main Line, which is discussed in the Waddesdon and Quatinton area (CFA12) and the Calvert, Steeple Claydon, Twyford and Chetwode area (CFA13).

Proposed Scheme south of Radstone. It is designated for lowland calcareous grassland, a habitat of principal importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)³⁷ and a local Biodiversity Action Plan (BAP) habitat³⁸. It supports scarce plant species and invertebrates, especially butterflies including the small blue (a species of principal importance), the wood white (nationally scarce)³⁹ and five other species that are declining nationally. The condition status⁴⁰ of this SSSI is classified as unfavourable recovering as of August 2013⁴¹. The site entered the High Level Stewardship (HLS) in 2012 and management to achieve favourable condition is now underway⁴². The site is of national value.

7.3.4 There are four non-statutory designated sites relevant to the assessment area, three LWS and one DWS. The LWS are of county/metropolitan value, and the DWS is of district/borough value. These sites are:

- Fox Covert (Whitfield) LWS (1.6ha) – is designated for its semi-natural broadleaved woodland. It includes a raised boundary embankment, old hazel coppice and several species of ancient woodland indicator plant (although it is not listed on the ancient woodland inventory). The southern part of the site lies within the land required for the construction of the Proposed Scheme, south of Radstone village;
- Turweston Manor Grassland LWS (14.8ha) – is designated for species-rich fen, of which parts qualify as a habitat of principal importance (lowland fen) and a local BAP habitat, and calcareous grassland, which may qualify as a habitat of principal importance (lowland calcareous grassland). It has several plant species that are scarce in Buckinghamshire (blunt-flowered rush, sharp-flowered rush and fen bedstraw) and uncommon of animal species such as brown hare, grey partridge (both species of principal importance), kingfisher and several damselflies. The southern part of the site lies within the extent of the land required for the construction of the Proposed Scheme, north of Turweston;
- Radstone Road Verge LWS (0.5ha) – is designated for neutral grassland and plant species such as common centaury and common spotted orchid. A section of the road verge will be within the land required for the construction of the Proposed Scheme. Radstone Road Verge LWS is partly within this area and partly in the Greatworth to Lower Boddington area (CFA15); and
- Old LNER Railway DWS (5.8ha) – is designated for species-rich grassland, tall herb vegetation, rough grassland and small wooded areas. It is also of interest

³⁷ *Natural Environment and Rural Communities Act 2006* (Chapter 16). London, Her Majesty's Stationery Office.

³⁸ Northamptonshire Biodiversity Partnership; http://www.northamptonshirebiodiversity.org/default.asp_PageID=36.html; Accessed September 2013.

³⁹ Taxa which are recorded in 16-100 hectads (10km squares) but not necessarily included in one of the Red List Categories.

⁴⁰ The condition of the SSSI land in England is assessed by Natural England, using categories agreed across England, Scotland, Wales, and Northern Ireland through the Joint Nature Conservation Committee. There are six reportable condition categories: favourable; unfavourable recovering; unfavourable no change; unfavourable declining; part destroyed and destroyed.

⁴¹ Natural England; Sites of Special Scientific Interest Condition Summary;

<http://www.sssi.naturalengland.org.uk/Special/sssi/reportAction.cfm?report=sdrta8&category=5&reference=1005994>; Accessed: September 2013.

⁴² Some agricultural land is subject to management prescriptions associated with the Environmental Stewardship Scheme which seeks either generally (the Entry Level Scheme – ELS) or specifically (the Higher Level Scheme – HLS) to retain and enhance the landscape and biodiversity qualities and features of farm land.

for butterflies and other invertebrates. The site includes some small stands of lowland calcareous grassland, a habitat of principal importance and a local BAP habitat. The route of the Proposed Scheme will cross this site south-west of Westbury. The DWS was previously of LWS value but has been downgraded to district/borough level due to loss of ecological interest⁴³.

Habitats

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

Watercourses

7.3.6 The River Great Ouse, which is crossed by the route three times (twice north of Turweston and once west of Westbury), is an important habitat corridor in a largely arable landscape. To the west of Westbury, the river is narrow (the channel is 3-4m wide) and meandering, running through arable fields and pasture. The river banks support scattered trees (alder, willow, white poplar, sycamore) and are dominated by coarse grassland and tall herbs. Water-margin vegetation is scattered and comprises canary reed-grass, water forget-me-not, water cress, branched bur-reed, and greater pond sedge. Aquatic vegetation includes water starwort, water forget-me-not, unbranched bur-reed, fennel-leaved pondweed, watercress and Canadian pondweed⁴⁴. Due to its extent and variety it is of county/metropolitan value.

7.3.7 The tributaries of the River Great Ouse (the Radstone Brook, crossed by the route south of Radstone and the Mixbury Brook, crossed by the route north-east of Mixbury) have been over-deepened and contain shallow, slow flowing water over silt substrate. In addition, an unnamed tributary of the Padbury Brook (west of Newton Purcell), and several unnamed drains are crossed by the land required for the construction of the Proposed Scheme. Each of these watercourses is of local/parish value.

Woodland

7.3.8 Woodland at Fox Covert (Whitfield) LWS has a canopy dominated by ash, pedunculate oak, field maple and wild cherry. The understorey comprises hazel and English elm, and the ground flora has a total of five ancient woodland indicator species including bluebell (although the wood is not listed on the ancient woodland inventory). As woodland is the principal reason for the designation of the site, this habitat is of county/metropolitan value.

7.3.9 There are three other woods that support lowland mixed deciduous woodland, a habitat of principal importance and a local BAP habitat, within or partly within the land required for the construction of the Proposed Scheme. They are Mixbury Plantation, Grassy Plantation, and an unnamed wood immediately south of Grassy Plantation. Each of these woodlands is of district/borough value.

7.3.10 Several other blocks of semi-natural broadleaved woodland that do not qualify as habitats of principal importance or as local BAP habitat are present within the land required for the construction of the Proposed Scheme. These include line-side

⁴³ Cherwell District Council; Response to Department for Transport Consultation on High Speed Rail; <http://modgov.cherwell.gov.uk/mgConvert2PDF.aspx?ID=10211>; Accessed: September 2013.

⁴⁴ Environment Agency (2006), *River Great Ouse River Corridor Survey*.

woodland on the former railway near Finmere Quarry, two woodland blocks at Mossycorner Spinney (east of Mixbury), an unnamed wood south of Radstone and six small plantation woodlands east and south-east of Turweston. Due to their small size and recent origin, each of these woodlands is of local/parish value.

Grassland

- 7.3.11 Botanical surveys undertaken show that Helmdon Disused Railway SSSI currently contains a small area of lowland calcareous grassland on the slopes of the railway cutting. Parts qualify as the National Vegetation Classification (NVC)⁴⁵ habitat calcareous grassland community CG3b *Bromus erectus* grassland, *Centaurea nigra* sub-community. Characteristic species of this community include the grasses downy oat grass, yellow oat grass and quaking grass. A high diversity of broadleaved species is also present including wild carrot, wild basil and greater knapweed. Parts of the site have been recently colonised by hawthorn and ivy scrub community W21a *Crataegus monogyna*-*Hedera helix* scrub, *Hedera helix*-*Urtica dioica* sub-community that forms a habitat mosaic with calcareous/limestone grassland. Towards the base of the cutting there are small areas of a tall neutral grassland community MG1e *Arrhenatherum elatius* grassland, *Centaurea nigra* sub-community, which reflects the gradation to stands of neutral grassland that are found in the bottom of the cutting. No nationally or county scarce species were recorded within the site. Lowland calcareous grassland is a habitat of principal importance and is rare in Northamptonshire. Parts of the grassland are subject to scrub encroachment but as grassland is the principal reason for the designation of the site, these habitats are of national value.
- 7.3.12 Semi-improved neutral grassland on damp soils were recorded in the base of the Helmdon Disused Railway cutting. These were identified as a neutral grassland community MG9a *Holcus lanatus*-*Deschampsia cespitosa* grassland, *Poa trivialis* sub-community, and a tall neutral grassland community MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community. These communities are not a special interest feature of the SSSI, and similar grassland is likely to be widespread on damp or nutrient-rich soils respectively. They are therefore of local/parish value.
- 7.3.13 Lowland calcareous grassland is present at Turweston Manor Grassland LWS and includes lady's bedstraw, salad burnet and bird's-foot trefoil. As grassland is one of the principal reasons for the designation of the site, this habitat is of county/metropolitan value.
- 7.3.14 Neutral grassland is present in Radstone Road Verge LWS. The site consists of grassland either side of the road. The site is partly within this area and partly within the Greatworth to Lower Boddington area (CFA15). It includes strawberry clover, bee orchids and spotted orchids and the southern section of the site is affected by scrub encroachment. As grassland is the principal reason for the designation of the site, this habitat is of county/metropolitan value.
- 7.3.15 The Old LNER Railway DWS includes small areas of lowland calcareous grassland; species include upright brome, greater knapweed and field scabious. The southern

⁴⁵ The NVC a common standard developed with the purpose of producing a comprehensive classification and description of the plant communities of Britain.

section of the site is shaded and the species-richness is limited to more shade-tolerant grasses. As grassland is the principal reason for the designation of the site, this habitat is of district/borough value.

- 7.3.16 There are small areas of semi-improved neutral grassland to the north-east of Newton Purcell, west of Westbury and south of Radstone. Each of these areas is of local/parish value.

Swamp

- 7.3.17 The wettest parts of the cutting at Helmdon Disused Railway SSSI contains a small area of wetland vegetation with floating sweetgrass *S5 Glyceria fluitans* swamp community and great willowherb community OV26 *Epilobium hirsutum* community. These communities are not a special interest feature of the SSSI, and are of local/parish value.

- 7.3.18 A field immediately south of the SSSI has a partially wet area with abundant plicate sweet grass, Yorkshire fog, marsh foxtail and fool's watercress. The area of wetland vegetation in this field is also of local/parish value.

Fen

- 7.3.19 Fen qualifying as a habitat of principal importance is present within Turweston Manor Grassland LWS. The predominant species include brown and bottle sedge, and marsh valerian. As species-rich fen is one of the principal reasons for the designation of the site, this habitat is of county/metropolitan value.

Hedgerows

- 7.3.20 Hedgerows occur throughout the area, with the majority towards the north close to Brackley and Turweston. The hedgerows are predominantly well connected and consist of common shrub and tree species. Of the 67 hedgerows recorded during field surveys (a total of approximately 15.2km), 36 meet the wildlife and landscape criteria to qualify as important hedgerows (under the Hedgerows Regulations 1997)⁴⁶ and all qualify as a habitat of principal importance. With a high diversity of woody plant species such as hawthorn, blackthorn and field maple, 34 of the important hedgerows are also species-rich⁴⁷. Of the 36 important hedgerows, six are within the land required for the construction of the Proposed Scheme (1.3km), and 13 are partially intersected (of which 4.4km are within the land required for the construction of the Proposed Scheme). Due to the proportion of long-established hedgerows with good connections to other habitats the network is of district/borough value.

Scrub

- 7.3.21 Mature scrub dominated by hawthorn and ash saplings is present at the top of the Helmdon Disused Railway SSSI cuttings. It comprises the hawthorn and ivy scrub community W21a *Crataegus monogyna-Hedera helix* scrub, *Hedera helix-Urtica dioica* sub-community. On the northern side of the cutting, an area of scrub appears to have

⁴⁶ *The Hedgerows Regulations 1997* (SI 1997 No. 1160). London, Her Majesty's Stationery Office. The Hedgerows Regulations 1997 comprise two criteria for determining whether a hedgerow is important or unimportant: Wildlife and Landscape, and Archaeology and History. The Ecology Chapter and the Technical Appendix for hedgerows refer to the Wildlife and Landscape criteria. Therefore it is likely that there will be differences between the total number of important hedgerows in the Ecology and the Cultural Heritage chapters of the ES.

⁴⁷ Rural Development Service (2005), *Condition Assessment Fo1 – Hedgerow and Fo2 – Ancient and/or Species Rich Hedgerow*.

been disturbed and a more open community has developed, dominated by bramble and common nettle, which may be attributed to the OV24a *Urtica dioica-Galium aparine* community. Both communities are common and widespread, and are of local/parish value. Patches of scrub were also recorded elsewhere, mainly along the disused railways and are also of local/parish value.

Ponds

- 7.3.22 A total of eight ponds are within the land required for construction of the Proposed Scheme, most of which are near Finmere. A single pond within land required for the construction of the Proposed Scheme north of Newton Purcell (in grassland on the disused railway) is known to support great crested newts and therefore qualifies as a habitat of principal importance. Field surveys identified the same pond had seven marginal and emergent plant species and the invertebrate species recorded indicate a relatively good water quality. Surveys of a pond at Glebe Farm recorded limited plant diversity and few aquatic invertebrates were present. No notable species of plants, aquatic invertebrates, or invasive plant species were recorded. Based on habitat alone, each of the surveyed water bodies is considered to be of local/parish value. Those that were not surveyed due to access restrictions are considered likely to have up to local/parish value.

Open mosaic habitat on formerly developed land

- 7.3.23 Open mosaic habitat on formerly developed land (minerals extraction) is present at Finmere Quarry and includes water bodies (that for safety reasons were not surveyed), willow and young birch, bare ground, ephemeral/short perennial and ruderal⁴⁸ communities. The most abundant species included ragwort, black medick, creeping buttercup, field forget-me-not, and various species of clover and willowherb, as well as extensive areas of mosses. No nationally or locally scarce plant species were recorded. However, the juxtaposition and extent of these habitats and the variation in topography indicates that it is likely to qualify as a habitat of principal importance, open mosaic habitat on formerly developed land, and is of district/borough value.
- 7.3.24 At land between Newton Purcell to Finmere adjoining the Old LNER Railway DWS, similar habitats (although less diverse) are present with ruderal and ephemeral/short perennial species dominated by perforate St John's wort. These areas are of local/parish value.

Other habitats

- 7.3.25 Other habitat recorded included extensive arable and cultivated land, improved and amenity grasslands, and small patches of ephemeral/short perennial and ruderal vegetation and fern along disused railways. None of the other habitats recorded are of greater than local/parish value.

Protected and/or notable species

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

⁴⁸ Ephemeral here refers to short, patchy plant communities typical of derelict urban sites, quarries and railway ballast such as common plantain and ruderal refers to stands of tall perennial or biennial plants, such as common nettle.

Table 11: Protected and/or notable species

Species	Value	Receptor	Baseline and rationale for valuation
Bats	Regional	Natterer's bat population associated with habitat around the Church of St Lawrence and an adjacent residential property in Radstone	<p>Field surveys recorded two large Natterer's maternity roosts. Up to 250 bats were recorded emerging from the church and approximately 60 individuals emerging from an adjacent property. Desk study records indicate the Natterer's roosts have been established for many years. Large and long-established Natterer's maternity roosts are rare and important in maintaining the population. Consequently both Natterer's maternity roosts meet the threshold for being regionally important⁴⁹.</p> <p>Static monitoring and activity transect surveys around Radstone recorded moderate numbers of <i>Myotis</i> species (including Natterer's bats). The surveys showed this colony principally uses commuting and foraging routes leading north and north-east away from the Proposed Scheme (most likely around Shortgrove Wood and Whistley Wood). Surveys confirmed that the majority of bats fly east to Helmdon Disused Railway and then north, with low numbers flying south. It is likely that the bats that fly south will be foraging within and around the 7ha of scattered trees and scrub at the southern end of Helmdon Disused Railway and the 1ha of immature plantation woodland with mature hedgerows to the south-west of Radstone. The linear nature of the disused railway is important to this population.</p>
	County/metropolitan	Common pipistrelle bat population associated with habitat at Radstone	<p>A common pipistrelle roost was recorded in the Church of St Lawrence, with approximately 20 individuals emerging. The numbers of bats indicate the church could be a maternity roost for this species. A second likely common pipistrelle maternity roost north-west of Radstone village was recorded during field surveys. In addition a common pipistrelle roost (non-maternity) was located in an oak tree in Radstone. Common pipistrelles are widespread and have high population numbers in Northamptonshire. However, maternity roosts are relatively uncommon and provide shelter and protection allowing bats to raise their young.</p> <p>Static monitoring and activity transect surveys around Radstone recorded moderate numbers of common pipistrelles along Helmdon Disused Railway and the adjacent watercourses that cross this feature.</p>
	County/metropolitan	Brown long-eared population associated with habitat at Radstone	<p>Field surveys recorded a brown long-eared roost (approximately 30 bats) in a building along Radstone Road. A maternity roost was also recorded at the Church of St Lawrence (approximately 25 bats). Brown long-eared bats are widespread and have high population numbers in Northamptonshire. However, maternity roosts are relatively uncommon and provide shelter and protection allowing bats to raise their young. It is likely that this population commutes north along the same features used by other species of bat towards the extensive woodland; optimal foraging habitat for this species. Brown long-eared bats are a species of principal</p>

⁴⁹ Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010), *Valuing bats in ecological impact assessment. In Practice: December issue*. CIEEM.

Species	Value	Receptor	Baseline and rationale for valuation
			importance.
	County/metropolitan	Daubenton's bat population associated with habitat around the Church of St Lawrence, Radstone	A Daubenton's roost was recorded at the church (approximately 10 bats). It is not likely to be a maternity roost. Daubenton's bats are rare in Northamptonshire. Static monitoring and activity transect surveys around Radstone recorded moderate numbers of <i>Myotis</i> including Daubenton's bats along Helmdon Disused Railway and the adjacent watercourses that cross this feature.
	County/metropolitan	Bat assemblage commuting along Helmdon Disused Railway (SSSI), adjacent watercourses and hedgerows (and likely foraging habitat)	Static monitoring and activity transect surveys around Radstone recorded moderate numbers of soprano pipistrelles, noctules and serotines along Helmdon Disused Railway, and the adjacent watercourses that cross this feature. Soprano pipistrelle bats are a species of principal importance.
	County/metropolitan	Bat assemblage using the Old LNER Railway for commuting and foraging between Finmere Quarry and Mixbury	Areas of woodland, such as the Mixbury Plantation, established hedgerows, disused railways, tree-lined roads and sections of the River Great Ouse that cross the area provide foraging habitat for moderate to high numbers of common pipistrelles and soprano pipistrelles. The presence of uncommon species, mostly <i>Myotis</i> in low-moderate numbers indicate the habitat is important for foraging and commuting.
	Up to county/metropolitan	Bat assemblages associated with the Banbury to Verney Junction disused railway and the parallel River Great Ouse	Both linear features provide optimal foraging habitat for many bat species and link with the Old LNER Railway. Together they provide the most significant east-west connectivity in the landscape and have the potential to support large numbers of bats of a range of species and provide connectivity to a potential roost site and foraging opportunities.
	Up to county/metropolitan	Bat assemblage likely to be associated with the farmland south-east of Turweston	The network of intact, established hedgerows provides connectivity between several large farms and scattered woodland. Together this area has the potential to support large numbers of bats of a range of species and provide connectivity between roosts and foraging sites.
	Up to county/metropolitan	Bat assemblage likely to be associated with the River Great Ouse at and near Turweston	The river is an important landscape feature extending for several kilometres and linking several towns, villages and farms. This habitat corridor has potential to support large numbers of bats of a range of species.
	District/borough	Brown long-eared bat population associated with habitat at Newton Purcell	Internal and emergence surveys indicate a brown long-eared maternity roost was used by between five and ten brown long-eared bats. Brown long-eared bats are widespread and have high population numbers in Buckinghamshire. However, maternity roosts are uncommon and provide shelter and protection allowing bats to raise their young; they are therefore important in maintaining the populations of these species.
	Local/parish	Brown long-eared bat populations at Warren Farm.	Two summer/transient roosts with low numbers of bats, estimated from the bat droppings recorded, to be between one and five individuals. Brown long-eared bats are widespread and have high population numbers in Buckinghamshire
Fish	County/metropolitan	Fish assemblage at the	Field surveys recorded good quality fish habitat and moderate

Species	Value	Receptor	Baseline and rationale for valuation
		River Great Ouse	to high densities of cyprinid and salmonid species. Brown trout (a species of principal importance) was present in moderate densities with a range of year classes in the two sections surveyed. In addition to brown trout, eleven fish species were recorded. These include three-spined stickleback, bullhead, dace, pike and gudgeon.
	Local/parish	Fish assemblage at the tributary of River Great Ouse	Field surveys at a tributary of the River Great Ouse showed that suitable vegetation is limited and there has been a large build-up of sediment. Two species of fish were recorded in low numbers: bullhead and three-spined stickleback, indicating water quality was moderate.
	Up to local/parish	Fish assemblage at the Padbury Brook	Habitats are likely to be similar to the tributary of the River Great Ouse. It is unlikely that rare species or large numbers of fish will be present.
Birds	County/metropolitan	Breeding raven population associated with habitat south-east of Brackley	Field surveys recorded breeding raven (one territory). This population is of county importance as it represents more than 1% of the county population.
	County/metropolitan	Breeding barn owl population associated with habitats south-east of Brackley	Four barn owl nest locations were recorded within 1.5km of the Proposed Scheme. This population represents more than 1% of the county population. ^{50,51,52}
	District/borough	Bird assemblage associated with habitats north of Brackley	Field surveys recorded 57 bird species. Notable species include marsh tit (a species of principal importance), red kite and spotted flycatcher but they were not confirmed to be breeding. One confirmed yellow wagtail territory was recorded (a species of principal importance). Desk study records also include cuckoo, tree sparrow (a species of principal importance) and grasshopper warbler. Yellow wagtail is BoCC ⁵³ red list ⁵⁴ due to a recent decline in its numbers.
	Local/parish	Breeding bird assemblage associated with habitats south-east of Brackley	Field surveys recorded 56 bird species within this area including marsh tit and spotted flycatcher (a species of principal importance) but they were not confirmed to be breeding. Desk study records also include lesser-spotted woodpecker and turtle dove (both species of principal importance). Other species recorded were mainly common and widespread species typical of open countryside and woodland.
	Local/parish	Breeding bird assemblage associated with habitats north-west of Finmere and south-west of Finmere	Field surveys recorded 60 bird species. Notable species recorded included little grebe (one territory), kestrel (one territory) and marsh tit (one territory). Desk study records also include kingfisher, little ringed plover and shelduck. Other records were for common and widespread breeding bird species typical of open countryside and woodland.
	Local/parish	Assemblage of wintering	Field surveys recorded 54 wintering bird species. Notable

⁵⁰ Jackson, P. (2012), *The Barn Owl in Northamptonshire 2012*. Stoke Bruerne.

⁵¹ David Ferguson (1993), *The Birds of Buckinghamshire*. Buckinghamshire Bird Club.

⁵² Ian Lewington *et al* (2008), *Birds of Oxfordshire*. Oxford Ornithological Society.

⁵³ Eaton *et al.*; 2009; Bird of Conservation Concern – 3; <http://www.britishtbirds.co.uk/wp-content/uploads/2010/10/Birds-of-Conservation-Concern3.pdf>; Accessed: October 2013.

⁵⁴ Red listed refers to bird species whose population or range has declined rapidly in recent years, or that have declined historically and not shown a substantial recent recovery.

Species	Value	Receptor	Baseline and rationale for valuation
		birds between Newton Purcell and Brackley	species recorded were lesser black-backed gulls, marsh tit, teal, woodcock, red kite, raven and peregrine. Desk study records include green sandpiper, merlin and a single whooper swan. These species are not dependant on any specific habitat present in this area. Other records were for common and widespread wintering bird species typical of open countryside and woodland.
Amphibians	County/metropolitan	Great crested newt metapopulations ⁵⁵ at Finmere Quarry	Field surveys recorded a medium population size class, spread across 12 breeding ponds each with a small population. Areas of suitable terrestrial habitat for this species including scrub and woodland are present within and around the quarry. The peak nightly count (for all 12 ponds) exceeds 20 individuals, which together form a metapopulation that meets the criteria for a site of county importance ⁵⁶ . Great crested newts are a species of principal importance.
	County/metropolitan	Great crested newt metapopulation south of Widmore Farm	Field surveys recorded a medium population size class, spread across two ponds each with medium sized populations. The peak nightly count of 21 adult great crested newts was recorded, which together form a metapopulation that meets the criteria for a site of county importance.
	County/metropolitan	Great crested newt metapopulation south-west of Widmore Farm	Field surveys recorded a medium population size class, spread across two breeding ponds each with a small population. The surrounding terrestrial habitats include a disused railway, woodland patches and a network of hedgerows, which are suitable foraging and refuge habitats for this species. The peak nightly count (for the two ponds) is 14 individuals, which together form a metapopulation that meets the criteria for a site of county importance.
	Up to county/metropolitan	Potential great crested newt populations north-east of Newton Purcell	Ten ponds are close to and connected with terrestrial habitat suitable for great crested newt. In view of this and as part of the precautionary assessment, it is assumed that all of these un-surveyed ponds support a medium breeding population size class, which could form a metapopulation, and could qualify as being of county importance.
	Up to county/metropolitan	Potential great crested newt populations in ponds north of Turweston	Approximately ten ponds are close to and connected with terrestrial habitat suitable for great crested newt. In view of this and as part of the precautionary assessment, it is assumed that all of these un-surveyed ponds support a medium breeding population size class, which could form a metapopulation, and could qualify as being of county importance.
	District/borough	Great crested newt population in a pond at land on the north-west side of a road leading from Newton Purcell to Finmere	Field survey results identified a medium-sized population with a peak count of 13 great crested newts.
	Local/parish	Great crested newt	Field survey results indicate a low population size class

⁵⁵ A set of local populations within some larger area, where typically migration from one local population to at least some other patches is possible.

⁵⁶ Buckinghamshire & Milton Keynes Environmental Records Centre (2009), *Criteria for the Selection of Local Wildlife Sites in Berkshire, Buckinghamshire and Oxfordshire*.

Species	Value	Receptor	Baseline and rationale for valuation
		population in a pond at Warren Farm	with a peak count of one great crested newt. The pond is isolated from the nearby metapopulation at Finmere Quarry.
Reptiles	County/metropolitan	Assemblage of common reptile species associated with habitat along the non-designated part of the Old LNER Railway, east of Newton Purcell	A high population size class of grass snake and low population size class of common lizard and slow-worm were recorded during field surveys within the land required for the construction of the Proposed Scheme. This site contained three of the common reptile species and is therefore likely to be of county importance. All common reptile species are species of principal importance.
	Up to county/metropolitan	Potential reptile populations associated with habitat along the non-designated part of the Old LNER Railway, near Westbury	The desk study indicates that grass snakes and common lizard are present in low numbers. Habitat suitable for foraging and hibernating reptiles is present in hedgerows, scrub, woodland edges and rough grassland habitats. As part of the precautionary assessment it is assumed that common reptiles are present in numbers that would qualify as being of county importance.
	Up to county/metropolitan	Potential reptile populations in suitable habitat near Radstone	Habitat suitable for foraging and hibernating reptiles is present in hedgerows, scrub, woodland edges and rough grassland habitats. As part of the precautionary assessment it is assumed that common reptiles are present in numbers that would qualify as being of county importance.
	District/borough	Population of grass snake at Finmere Quarry	During field surveys a high population size class of grass snake was recorded in open mosaic habitat that is uncommon in the wider landscape.
	Local/parish	Population of grass snake at Warren Farm	A low population size class of grass snake was recorded during field surveys.
Flora	County/metropolitan	Population of red hemp nettle near Westbury.	Desk study results indicate red hemp nettle near Westbury along the LNER near the Old LNER Railway DWS. Red hemp nettle is a species of principal importance and nationally scarce.
	Local/parish	Notable plant species near Westbury	No rare or notable species were recorded during field surveys. Desk study results indicate there is a high diversity of species along disused railways near Westbury. Two records for the individual native black poplar, a locally important ⁵⁷ species, have been recorded near Westbury along with silver hair grass, which is county scarce. As part of the precautionary assessment it is assumed that individual records of rare or notable plant species are also present in small quantity in the areas not surveyed. However, rare plants are unlikely to be found in high numbers given the habitats present.
	Local/parish	Notable plant species near Finmere	Field surveys recorded an individual record of native black poplar, common whitebeam and squirreltail fescue, all of which are locally important. As part of the precautionary assessment it is assumed that individual records of rare or notable plant species are also present in small quantity in

⁵⁷ Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC).

Species	Value	Receptor	Baseline and rationale for valuation
			the areas not surveyed.
	Local/parish	Notable plant species near Turweston	No rare or notable species were recorded during field surveys. Desk study results include individual records for the county rare night-flowering catchfly, upright goosefoot, a species of principal importance, blunt-flowered rush, sharp-flowered rush, fen bedstraw and the red listed ⁵⁸ stinking chamomile and dwarf spurge. As part of the precautionary assessment it is assumed that individual records of rare or notable plant species are also present in small quantity in the areas not surveyed. Surrounding areas are predominantly arable and farmland.
Water vole	Up to county/metropolitan	Potential presence along the River Great Ouse	Field surveys recorded no evidence but habitat suitable for water voles is present. Water voles have been recorded in low numbers in the wider area (the closest 2.9km from the land required for the construction of the Proposed Scheme). If present, a sustainable water vole breeding population would qualify as being of county importance. Water vole is a species of principal importance.
Otter	Up to county/metropolitan	Otter population using the River Great Ouse and tributaries	Evidence of otter was recorded at six locations along the River Great Ouse during field surveys and at two locations along its tributaries. Terrestrial habitat that provides opportunities for breeding holts are present in woodland near Finmere, Mixbury and Westbury but no breeding holts were recorded. If there are any such holts in land that was not accessible for survey, the site may be of county importance. Otter are a species of principal importance.
Terrestrial invertebrates	District/borough	Invertebrate assemblage at Finmere Quarry	Field surveys recorded three nationally scarce ⁵⁹ beetles, one associated with grassland and scrub (<i>Pterostichus oblongopunctatus</i>) and two associated with marsh and open water (<i>Bembidion clarkia</i> and <i>Notaris scirpi</i>). A single nationally scarce fly (<i>Pipizella virens</i>) was also recorded. This exceeds the threshold for local importance but does not meet the threshold for county importance ⁶⁰ .
	District/borough	Population of notable beetles at Helmdon Disused Railway SSSI	Field surveys recorded two nationally scarce beetles, one associated with grassland with scrub (<i>Rhinocyllus conicus</i>) and one associated with wood decay (<i>Scaphidema metallicum</i>). This exceeds the threshold for local importance but does not meet the threshold for county importance.
Aquatic macro-invertebrates	Local/parish	Aquatic macro-invertebrate population associated with River Great Ouse and the tributary	A broad variety of taxa are present in the River Great Ouse, including water beetles, mayfly larvae, caddis larvae and freshwater shrimp. Several families that are highly sensitive to organic pollution are present. Although there is a diverse assemblage no notable species or large numbers of individuals were present.

⁵⁸ Cheffings, C. M. and Farrell, L. (2005), *Species Status No. 7. The Vascular Plant Red Data List for Great Britain*.

⁵⁹ Nationally scarce is relevant for invertebrates that are recorded in 16-100 hectads (10km squares) but are not included in one of the Red List Categories.

⁶⁰ Colin Plant Associates (2006), *Invertebrates and Ecological Assessment*. Unpublished Report to the Institute of Ecology and Environmental Management.

Species	Value	Receptor	Baseline and rationale for valuation
Badgers	Local/parish	Badger populations throughout the area	Two active main setts, one annexe, three subsidiary and two outlier setts were identified during field surveys. Six of these setts are likely to be associated with the same badger territory. Desk study records indicate the species is present across this area. Badgers are common and widespread animals in lowland habitats within UK, and populations are not threatened or thought to be vulnerable.
Hazel dormouse	Negligible	Potential populations throughout the area	Field surveys recorded no evidence and there are no historical records in this area. Dormice are therefore unlikely to be present within the land required for the construction of the Proposed Scheme.
White-clawed crayfish	Negligible	Potential populations in the River Great Ouse and its tributaries	White-clawed crayfish are not known to be present in the area and the desk study indicates the presence of signal crayfish ⁶¹ . White-clawed crayfish are therefore unlikely to be present.

Future baseline

Construction (2017)

7-3-27

A summary of the known developments which are assumed to be mostly built and occupied prior to construction of the Proposed Scheme is provided in Section 2.1 of this report, with further details provided in Volume 5: Appendix CT-004-000. These developments will affect the character and value of ecological resources as follows:

- A bio-drying and gasification waste treatment technology development is proposed at Finmere Quarry⁶². The great crested newt metapopulation that is present here is being moved as part of a mitigation programme involving the creation of new habitat to the west of Finmere Quarry. The impact assessment therefore assumes, on a precautionary basis, that great crested newt is present in both areas.
- Helmdon Disused Railway SSSI entered High Level Stewardship (HLS) in 2012 and the management process to achieve favourable condition is now underway. Future management of the SSSI will not change the value of the site above the national level.
- An urban extension (Radstone Fields) is proposed to the north of Brackley⁶³. The dismantled railway to the south of Helmdon Disused Railway SSSI will be retained within the proposed development and adequate buffers will be provided to maintain its function as a corridor for wildlife. It is therefore likely that the value of the Natterer's bat population at Radstone would not change.

⁶¹ A non-native invasive species that out-competes native white-clawed crayfish and also carries crayfish plague.

⁶² Premier Aggregates Limited (2009), *Finmere Quarry Landfill. Environmental Statement.*

⁶³ Barton Willmore (2010), *Land at Radstone Fields, Brackley. Environmental Statement.*

Operation (2026)

- 7.3.28 There are no known committed developments or changes to management in this area that will affect the operational baseline, beyond those described above in relation to the construction baseline.
- 7.3.29 Otter populations are known to have expanded in the recent years and this trend is likely to continue. The operational baseline will therefore include wider occurrence and greater populations of otters along the River Great Ouse and its tributaries⁶⁴.

7.4 Effects arising during construction

Avoidance and mitigation measures

- 7.4.1 The following measures have been included as part of the design of the Proposed Scheme and avoid or reduce impacts to features of ecological value:
- the narrowing of the land required for construction of the Proposed Scheme at Helmdon Disused Railway SSSI reduces the loss of habitat from this site.
 - reducing the extent of land required for the construction of the Proposed Scheme from Turweston Manor Grassland LWS;
 - the vertical alignment of the River Great Ouse at Westbury viaduct and Turweston viaduct avoids the need for a pier to be constructed in the channel. This reduces the loss of habitat from the River Great Ouse;
 - the narrowing of the extent of the land required for the construction of the Proposed Scheme at Fox Covert (Whitfield) LWS, to reduce the loss of woodland; and
 - all culverts will be suitably designed, to allow passage for mammals such as badger, otter and water vole, taking into account flood events, or an alternative dry tunnel will be installed.
- 7.4.2 The assessment also assumes implementation of the measures set out within the draft CoCP (CT-003-000), which includes translocation of protected species where appropriate.

7.5 Assessment of impacts and effects

Designated sites

- 7.5.1 The southern end of the approximately 4km long Helmdon Disused Railway SSSI will be affected. The integrity of the SSSI depends on the extent and continuity of calcareous grassland and scrub. Construction of the Brackley south cutting will remove approximately 0.8ha (4.8%) of the SSSI, of which 0.1ha is lowland calcareous grassland. This will sever the site isolating the southernmost 16% of the SSSI from the remainder. The fragmentation of the SSSI (gom at its narrowest point) is likely to restrict the movement of species such as the wood white butterfly. Together these

⁶⁴ Tracking Mammals Partnership (2009), *UK Mammals: Update 2009*. JNCC. Peterborough.

impacts will result in a permanent adverse effect on the integrity of the SSSI that is significant at national level.

- 7.5.2 Woodland in the south-western section of Fox Covert (Whitfield) LWS will be affected. Maintaining the extent of the semi-natural broadleaved woodland is important to its integrity. Construction of the Brackley south cutting will remove 0.6ha (39%) of the LWS. Habitat loss of this extent will result in a permanent adverse effect on site integrity that is significant at the county/metropolitan level.
- 7.5.3 The southern section of Turweston Manor Grassland LWS will be affected. Retaining the extent of the fen and calcareous grassland and its plant assemblage is important to the integrity of the site. The construction of the Turweston embankment and an abutment of Turweston viaduct will result in the permanent loss of 4.3ha (29%) of the site. Of this 0.8ha (5% of the LWS) will be permanently occupied by Turweston embankment and an abutment of Turweston viaduct. The remaining area will be occupied by the construction jetty and associated access for up to 18 months. The retained sections of the LWS will be separated from one another for the duration of construction. Habitat loss of this extent will result in a permanent adverse effect on the integrity of the site that will be significant at the county/metropolitan level. Although groundwater flow will be disturbed by the Turweston cutting, there are unlikely to be significant hydrological effects on the LWS (see Section 13 Water Resources).
- 7.5.4 Species-rich neutral grassland at Radstone Road Verge LWS will be affected. Retaining the extent of the habitat and its plant assemblage is important to the integrity of the site. The construction of an access track that will provide access to a balancing pond for drainage will cause the loss of approximately 0.04ha (9%) of the LWS. Of this loss 0.03ha (6% of the LWS) is in this area and 0.01ha (3% of the LWS) is in the Greatworth to Lower Boddington area (CFA15), to the north. Habitat loss of this extent, including the likely removal of plant species for which this site is designated, will result in a permanent adverse effect on the integrity of the site that will be significant at the county/metropolitan level.
- 7.5.5 Habitats, including species-rich grassland and wooded areas, within the Old LNER Railway DWS will be affected. The integrity of this site depends on maintaining the extent of these habitats, which have value as a wildlife corridor, particularly for invertebrates. Construction of the Barton to Mixbury cutting will result in the loss of approximately 1km (36%) of the site. The infilling of part of the northern section to restrict the drainage of water towards the route will result in the loss of an additional 0.5km (18%) of the site. The remaining 1.3km of the DWS is within the land required for the temporary installation of powerline conductors and associated towers for the duration of the construction period. As part of the precautionary assessment, it has been assumed that all land identified as being required for the temporary installation of powerline conductors and towers will be cleared of vegetation. The function of the DWS as a wildlife corridor will be affected and habitats for which it is designated will be lost. Together these impacts will result in a permanent adverse effect on the integrity of the site that is significant at the district/borough level.

Habitats

- 7.5.6 As described in the assessment of impacts and effects on designated sites, 0.6ha (39%) of the woodland from Fox Covert (Whitfield) LWS will be lost due to the construction of the Brackley south cutting. As semi-natural broadleaved woodland is uncommon in this area, a loss of this extent will result in a permanent adverse effect on the conservation status of woodland at Fox Covert (Whitfield) LWS that will be significant at county/metropolitan level.
- 7.5.7 Three blocks of woodland that qualify as a habitat of principal importance (lowland mixed deciduous woodland) and a local BAP habitat, will be affected. As woodland is not common in the arable landscape, its extent is important to its conservation status. Construction of the Barton to Mixbury cutting will cause the loss of approximately 2ha (36%) of the Grassy Plantation and 2.8ha (90%) of the unnamed wood south of Grassy Plantation. These losses will greatly reduce the extent of lowland mixed deciduous woodland in this area and result in a permanent adverse impact on the conservation status of each wood that is significant at the district/borough level.
- 7.5.8 Grassland will be affected within Helmdon Disused Railway SSSI, Turweston Manor Grassland LWS, Radstone Road Verge LWS and the Old LNER Railway DWS. Habitat loss of the extent described in the assessment of impacts and effects designated sites section above will result in a permanent adverse effect on the conservation status of grassland that will be significant at the national level for Helmdon Disused Railway SSSI, county/metropolitan level for Turweston Manor Grassland LWS and Radstone Road Verge LWS and district/borough level for the Old LNER Railway DWS.
- 7.5.9 Hedgerows will be affected during construction. The extent of hedgerows and the high proportion of important hedgerows are key to the conservation status of this habitat, as is the continuity of the network as a wildlife corridor. This will be particularly important close to Turweston and Brackley where hedgerows provide the main connectivity across the arable landscape. Approximately 5.7km of important hedgerows will be removed. As part of the precautionary assessment it is also assumed that further important and species-rich hedgerows will be lost from land that was not surveyed. These losses will result in the fragmentation of the network. Habitat loss and fragmentation of this extent will result in a permanent adverse effect on the conservation status of hedgerow that will be significant at the district/borough level.
- 7.5.10 No significant effects on the conservation status of fen at Turweston Manor Grassland LWS are expected as it is adjacent but outside the land required for the construction of the Proposed Scheme and will not be subject to significant changes in hydrology.
- 7.5.11 No significant effects on the conservation status of open mosaic habitat on formerly developed land at Finmere Quarry are expected as only a small section of this habitat will be removed (approximately 2%).
- 7.5.12 No significant effects on the conservation status of lowland deciduous woodland at Mixbury Plantation are expected as only a small area of this habitat will be removed (approximately 2%).

7.5.13 It is considered unlikely that any other effects on habitat receptors at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-002.

Species

7.5.14 A large maternity colony of Natterer's bats is present within two buildings in Radstone, approximately 200m north of the land required for the construction of the Brackley south cutting and the Brackley north cutting. The availability of roosts that are connected to nearby foraging sites is important to the conservation status of bats.

7.5.15 The loss of habitat at Helmdon Disused Railway SSSI, where the construction corridor will be approximately 60m wide, and the hedgerows south of Radstone, where the corridor will be approximately 380m wide is likely to reduce the frequency with which the Natterer's bat population forage at the southern end of the SSSI and the nearby plantation woodland. However, the maternity roosts, the known important commuting routes and the main foraging habitats to the north and north-east will remain unaffected. The extent and diversity of the retained habitat to the north is likely to be sufficient to maintain the conservation status of the Natterer's bat population. Therefore no significant effect on the conservation status of this population is expected.

7.5.16 The other bat populations present near Radstone have different behavioural patterns and may utilise different foraging sites but given the proximity and suitability of the Helmdon Disused Railway SSSI as a north-south commuting route they are all likely to use it. The loss of habitat from the SSSI and nearby hedgerows is likely to reduce the frequency with which other bat populations utilise the foraging sites to the south. The populations and assemblages that are likely to be affected include:

- the brown long-eared bat populations associated with the maternity roost in buildings along Radstone road and the Church of St Lawrence;
- the common pipistrelle population associated with the maternity roost at the Church of St Lawrence and the roost at Radstone Village that is also likely to be a maternity roost;
- the Daubenton's bat population associated with the roost at the Church of St Lawrence; and
- the assemblage of noctule, soprano pipistrelle and serotine bats at Radstone.

7.5.17 The loss of this habitat will result in the temporary disturbance of these assemblages. However, it is likely that all component species will disperse to, and forage within the abundant surrounding habitat including areas of woodland, grassland, watercourses and hedgerows to the north. Therefore, it is unlikely that these impacts will have an adverse effect on the conservation status of the populations of brown long-eared bat, common pipistrelle and Daubenton's bat populations, and the assemblage of other bats at Radstone.

7.5.18 No significant effects are expected on the brown long-eared bat population associated with the maternity roost at Newton Purcell. The maternity roost will not be

removed and it is likely that the brown long-eared bats will disperse to, and forage in the abundant habitat to the west towards Spilsmere Wood.

- 7.5.19 No significant effects are expected on the assemblages of bats that use the Old LNER Railway between Finmere Quarry and Mixbury, the Banbury to Verney Junction disused railway and River Great Ouse near Westbury, woodland and farmland south-east of Turweston and the River Great Ouse at and near Turweston. The loss of these habitats will result in the loss of foraging and community habitat but no roosts will be removed and all component species are likely to disperse to, and forage within the abundant surrounding habitat including areas of woodland, grassland, and hedgerows. Therefore, it is unlikely that construction will affect the conservation status of the bat assemblages at these sites.
- 7.5.20 A barn owl breeding site could be affected by the construction of the Proposed Scheme to the south-east of Brackley. Nesting sites are re-used annually and are therefore important to the conservation status of this species. One nest is situated within land required for the construction along the Old LNER Railway DWS and as part of the precautionary assessment it is assumed that it will be removed during construction. Much of the surrounding habitat suitable for foraging will also be removed. These impacts will result in a permanent adverse effect on the conservation status of the species that is significant at the county/metropolitan level.
- 7.5.21 The Proposed Scheme will affect three metapopulations of great crested newt; at Finmere Quarry, Widmore Farm and land south-west of Widmore Farm. Maintaining a network of suitable grassland and scrub for foraging and hibernating close to ponds for breeding is important to the conservation status of this species. No ponds will be lost during construction of the Barton to Mixbury cutting and fragmentation of these metapopulations is unlikely because of the great crested newt population translocation works associated with the bio-drying and gasification of waste treatment development at Finmere Quarry. Before construction of the Proposed Scheme this metapopulation will have been moved to a new site adjacent to the two Widmore metapopulations, and new ponds, wet woodland and grassland will be created. However, construction will result in the loss of approximately 6ha of optimum terrestrial habitat for this species from along the Old LNER Railway, habitat that is likely to be used by all three metapopulations. This loss represents a large proportion of the terrestrial habitat available in the wider area and although access to the woodland and grassland to the west will remain unaffected this loss is likely to reduce the extent of habitat below that which is required to maintain any of the three metapopulations. Loss of habitat will therefore result in a permanent adverse effect on the conservation status of each of these great crested newt metapopulations that will be significant at the county/metropolitan level.
- 7.5.22 A number of ponds north-east of Newton Purcell (ten) and north of Turweston (ten) were not surveyed. As part of the precautionary assessment it is likely that ponds used for breeding and the associated terrestrial habitat will be removed. This would reduce the resources available to the population and therefore their range, possibly below that which is needed to sustain a viable population. It is therefore assumed these impacts could result in a permanent adverse effect on the conservation status on

other great crested newt metapopulations that would be significant at up to the county/metropolitan level.

- 7.5.23 A pond with a medium population of great crested newt will be removed at land on the north-western side of the road between Newton Purcell and Finmere (during the construction of the Barton to Mixbury cutting). This pond represents the only breeding habitat for this population and will therefore result in a permanent adverse effect on the conservation status of this great crested newt population that will be significant at the district/borough level.
- 7.5.24 Land required for the construction of the Proposed Scheme will affect an assemblage of grass snake, common lizard and slow worm associated with habitat along the non-designated part of the Old LNER Railway, east of Newton Purcell. The extent and continuity of habitat for foraging and sheltering with areas of bare ground for basking is important to the conservation status of common reptiles. Construction of the Barton to Mixbury cutting, a temporary stockpile area to the east of cutting, and the A4421 Buckingham Road overbridge satellite compound will remove approximately 2ha of habitat that is suitable for reptiles, which in an agricultural landscape represents a large proportion of the locally available habitat. A loss of this extent is likely to result in a permanent adverse effect on the conservation status of this assemblage of reptiles that will be significant at the county/metropolitan level.
- 7.5.25 If present, reptiles associated with habitat along the non-designated part of the Old LNER Railway, east of Newton Purcell and near Radstone could be affected. The extensive loss of grassland, field margins and hedgerows at these locations could remove reptiles or reduce the extent of habitat available below that which is required to maintain a viable population. As part of the precautionary assessment it is assumed these impacts will result in a permanent adverse effect on conservation status of these reptile populations that would be significant up to the county/metropolitan level.
- 7.5.26 Land required for the construction of the Proposed Scheme will affect populations of grass snake at Finmere Quarry. Construction of the Barton to Mixbury cutting will remove approximately 6ha of the Old LNER Railway near Finmere Quarry, which largely consists of scrub, grassland and open mosaic habitat, which together provide suitable habitat for basking, foraging and sheltering. In a landscape that is predominantly agricultural this is likely to represent a large proportion of the locally available habitat for grass snake. A loss of this extent will result in a permanent adverse effect on the conservation status of the population that will be significant at the district/borough level.
- 7.5.27 The red hemp nettle population along sections of the disused LNER railway will be affected. Maintaining the extent of open stony ground, an uncommon habitat within the arable landscape and a habitat on which this species depends is important to its conservation status. As part of the precautionary assessment, it is been assumed that the sections of the LNER railway within the land required for the installation of temporary pylons and powerlines will be completely cleared of vegetation. Red hemp nettle and the uncommon habitat that it requires are therefore likely to be removed. Loss of this habitat would result in a permanent adverse effect on the conservation status of this species that will be significant at the county/metropolitan level.

- 7.5.28 The Westbury viaduct and the culverts will cross habitat that may be used by water vole. Vegetation clearance would remove habitat potentially used by water voles for foraging and shelter. As part of the precautionary assessment, it is assumed that loss of these habitats could result in a permanent adverse effect on conservation status that is significant up to the county/metropolitan level.
- 7.5.29 No significant effects are expected on the otter population during the construction of the Westbury viaduct and the Turweston viaduct that cross the River Great Ouse and its tributaries or any culverts. Only small areas of water-margin vegetation will be removed, extensive areas of habitat suitable for breeding and foraging will remain unaffected throughout the wider area and the likely increases in disturbance are unlikely to stop all movement across the area.
- 7.5.30 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts are considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in a significant adverse effect on the conservation status of the population concerned will differ dependent on the status of the species concerned.
- 7.5.31 No significant effects are expected on the conservation status of the terrestrial beetle and fly, and other invertebrate populations at Finmere Quarry and Helmdon Disused Railway SSSI are expected. Extensive alternative habitat will remain unaffected throughout these areas.
- 7.5.32 No significant effects are expected on the conservation status on the fish assemblages at the River Great Ouse are expected. Extensive habitat along the River will be retained and measures will be undertaken (as described in the avoidance and mitigation section above) for safe passage to be maintained for these species.
- 7.5.33 It is considered unlikely that any other effects on species receptors at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-002.

Other mitigation measures

- 7.5.34 This section describes and assesses additional elements designed to reduce or compensate for significant ecological effects. These include habitat creation and habitat enhancement and will be undertaken in line with the principles of mitigation (Appendix 5: CT-001-000/2).
- 7.5.35 Ecological compensation areas have been incorporated into the land required for construction of the Proposed Scheme, these are:
- land to the north of the Grassy Plantation (approximately 4.5ha) will contain new lowland mixed deciduous woodland, a habitat of principal importance, and grassland;
 - land to the south of the River Great Ouse (approximately 5.7ha) will contain lowland calcareous grassland, a habitat of principal importance;

- land to the north of the River Great Ouse (approximately 4.5ha) will contain lowland meadow grassland, and lowland fen, both habitats of principal importance;
- land north of Turweston (approximately 2ha) will consist of grassland; and
- land immediately east of Helmdon Disused Railway SSSI will contain approximately 7ha of lowland calcareous grassland, scrub, hedgerows and approximately 3ha of lowland mixed deciduous woodland.

7.5.36 The following additional measures will be undertaken to maintain the movement of animals across the Proposed Scheme:

- linear planting either side of, and parallel to the Proposed Scheme between Finmere and Westbury to link existing woodland with newly created habitat;
- the planting on the embankments of the Bridleway 213/4 accommodation overbridge and A421 London Road overbridge to encourage flying species to cross the route safely at height; and
- linear planting to link the watercourse at Mossycorner Spinney with the new planting under the Westbury viaduct along the River Great Ouse.

7.5.37 Other areas of landscape planting and floodplain compensation may provide additional benefits to ecology, particularly opportunities for foraging and sheltering. For example the creation of approximately 8ha of woodland with grassland to the east and west of Westbury viaduct.

7.5.38 The loss of approximately 0.8ha of grassland, of which 0.1ha is lowland calcareous grassland from Helmdon Disused Railway SSSI will be addressed through the creation of approximately 7ha of lowland calcareous grassland and scrub in one of the new ecological compensation areas. The new habitat will be created adjacent to the SSSI and in accordance with the principles of mitigation as set out in Volume 5: Appendix CT-001-000/2. This will include the translocation of soils and plant material from the area of the SSSI that will be lost. The large increase in extent of lowland calcareous grassland to the north of the land required for the construction of the Proposed Scheme and immediately east of the SSSI will offset the likely effects of fragmenting the SSSI, separating the southernmost end of the SSSI from the larger area of SSSI to the north. Following the maturation of this habitat it is anticipated that impacts from habitat loss and likely fragmentation will be reduced to a level at which they will not result in a significant effect on the integrity of this site.

7.5.39 To compensate for the loss of 0.6ha of woodland from Fox Covert (Whitfield) LWS, approximately 3ha of lowland deciduous woodland will be created in the land immediately east of Helmdon Disused Railway SSSI. The new planting will be connected to the remaining section of Fox Covert (Whitfield) LWS and thus increase the overall extent of the woodland. Any translocation of plant material from the woodland that will be removed will be undertaken in accordance with the principles of mitigation as set out in Volume 5: Appendix CT-001-000/2. Together these measures will reduce the effects of habitat loss and ensure there is no permanent effect on the integrity of the LWS.

- 7.5.40 The loss of up to 4.3ha of habitat from Turweston Manor Grassland LWS will be addressed by providing 4.5ha of species-rich grassland and fen north of the River Great Ouse and 5.7ha of land to the south of the River Great Ouse. A section of the 5.7ha area will be used for temporary material stockpiling during the construction period, but the remainder will provide a receptor site for the translocation of soils and plant material from the LWS (as described in the principles of mitigation as set out in Volume 5: Appendix CT-001-000/2). On completion of construction works, the entire 5.7ha will be available for habitat creation. Following the implementation of the compensation proposed, it is anticipated that the adverse impacts on Turweston Manor Grassland LWS will be reduced to a level that will not be significant.
- 7.5.41 Habitat loss of approximately 0.04ha from the Radstone Road Verge LWS will be compensated for by providing species-rich grassland along the eastern end of the access road and therefore adjacent to the LWS, and approximately 2.6ha of species-rich grassland close to Halse Copse South LWS (in the Greatworth to Lower Boddington area (CFA15)). In combination, these measures will reduce the effect of habitat loss to a temporary adverse effect lasting until the replacement grassland becomes established (at least five years). Following the implementation of the measures proposed the adverse impacts on Radstone Road Verge LWS will be reduced to a level at that will not result in any significant permanent effects on the integrity of this site.
- 7.5.42 To compensate for the loss of habitat from the Old LNER Railway DWS, linear woodland and scrub planting will be incorporated along the Barton to Mixbury cutting, east and west of the Proposed Scheme. The planting will be approximately 4km in length and will connect the northern section of the DWS and the ecological compensation area to the north of the Grassy Plantation. As part of the precautionary assessment, it has been assumed that all land identified for the temporary installation of powerline conductors and towers will be cleared of vegetation. However, only some of this land will be required and during the detailed design stage opportunities to retain parts of this area will be considered. In combination these measures will reduce the effect of habitat loss to a temporary adverse effect lasting until the replacement grassland, woodland and scrub becomes established. These measures are likely to offset and reduce the effects to a level that are not significant.
- 7.5.43 Habitat loss from the Grassy Plantation and the unnamed woodland to the south of Grassy Plantation will be compensated for by the creation of lowland mixed deciduous woodland within two ecological compensation areas; land to the east of Helmdon Disused Railway SSSI (approximately 3ha) and land to the north of the Grassy Plantation (approximately 4.5ha). An additional 8ha of planting will be created to the east and west of Westbury viaduct and approximately 3ha to the east and west of the Turweston cutting. Together and on maturation of the new woodland (at least 30 years) these measures will be sufficient to and reduce the impacts to a level that is not significant.
- 7.5.44 New hedgerows connected to existing habitat within the landscape will be created to compensate for the losses of wildlife corridors that hedgerows provide. The hedgerow replanting will be in accordance with the principles of mitigation (Appendix 5: CT-001-000/2). The species composition of the new hedges will take account of both

the hedgerows lost and those that remain in the surrounding area. Measures will include the reinforcement of the hedgerow network to the west of Westbury. Following maturation of the planting it is anticipated that any adverse impacts on hedgerows and the wildlife corridors they provide are expected to be reduced so that effects on conservation status are not significant.

- 7.5.45 Although no significant effects on the conservation status of the Natterer's bat population at Radstone are expected, measures will be undertaken to ensure access to foraging sites to the south of the Proposed Scheme is maintained. Planting on the embankments of the Helmdon Road overbridge will link with landscape planting and new hedgerows thus allowing bats to move between their roosts and habitats to the south of the Proposed Scheme; the bridge will not be lit as light can disturb bats and could discourage them from using this feature. New hedgerows will also link known commuting routes with the new woodland planting at Fox Covert (Whitfield) LWS. All measures will be undertaken in accordance with the principles of mitigation set out in Volume 5: Appendix CT-001-000/2.
- 7.5.46 The same measures and those described earlier in this section are likely to also reduce any effects on, and provide habitat connectivity for, the populations of brown long-eared bat, common pipistrelle, Daubenton's bat, noctule, serotine and soprano pipistrelle at Radstone.
- 7.5.47 Although there will be no significant effects on the conservation status of the brown long-eared bat population at Newton Purcell, linear planting will encourage bats along the A4421 Buckingham Road overbridge and maintain access between the maternity roost and likely foraging sites.
- 7.5.48 There will be an adverse effect on the conservation status of barn owl at the county/metropolitan level due to loss of one territory from near the Old LNER Railway DWS. To offset the likely loss of barn owls from the vicinity of the Proposed Scheme, opportunities to provide barn owl nesting boxes in areas greater than 1.5 km from the route will be explored with local landowners. As the availability of nesting sites is a limiting factor for this species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.
- 7.5.49 To address the loss of terrestrial habitat used by great crested newt metapopulations at Finmere Quarry, south of Widmore Farm and south-west of Widmore Farm, new terrestrial habitat will be created in the ecological mitigation area to the north of Grassy Plantation (approximately 4.5ha of grassland and woodland). The creation of suitable grassland with ponds, scrub and habitat features for hibernation will be provided in accordance with the principles of mitigation (Volume 5: Appendix CT-001-001/2), and is likely to be of higher quality habitat than that which it replaces. This new habitats will be sufficient to maintain the favourable conservation status of the metapopulations affected.
- 7.5.50 New habitat that will be suitable for great crested newt will be created to the west and east of Westbury viaduct (approximately 8ha) and to the north of Turweston (approximately 2ha). This will provide further habitat for populations that may be present in ponds that could not be surveyed. New habitats will include the provision of

replacement ponds, terrestrial habitat and hibernation features sufficient to maintain the favourable conservation status of a population, if present.

- 7.5.51 Compensatory habitat to address impacts on the great crested newt population at the breeding pond on the north-western side of the road between Newton Purcell and Finmere will be provided within the ecological compensation area north of Grassy Plantation (4.5ha), in accordance with the principles of mitigation identified (Volume 5: Appendix CT-001-000/2). The new habitats will be sufficient to maintain the favourable conservation status of the population affected.
- 7.5.52 Impacts on the reptile populations between Newton Purcell and Finmere and at Finmere Quarry will be compensated for by the creation of habitat to the south of the Godington viaduct in the Calvert, Steeple Claydon, Twyford and Chetwode area (CFA13) area. This new habitat will be approximately 12ha in size and created in accordance with the principles of mitigation (Volume 5: Appendix CT-001-000/2).
- 7.5.53 In order to account for any populations that are yet to be recorded, particularly near Radstone and Westbury, habitat will be created to the north of Turweston (approximately 2ha) and to the west and east of Westbury viaduct (approximately 8ha). Following the implementation of the measures proposed it is expected that any adverse impacts on reptile populations during construction would be reduced, so effects on the conservation status of the species are not significant.
- 7.5.54 To mitigate for the effects on the red hemp nettle population near Westbury measures will be undertaken to move any affected plants and provide new suitable habitat after construction. All measures will be undertaken in accordance with the principles of mitigation (Appendix 5: CT-001-000/2). In addition, only some of the habitat this species depends on will be required and during the detailed design stage opportunities to retain parts of this area will be considered. In combination these measures will address impacts during construction, so that effects on the conservation status of the species will not be significant.
- 7.5.55 If water voles are present along the River Great Ouse at Westbury, compensatory habitat will be created, particularly along the realigned sections of the river. It will be designed and implemented in accordance with the principles of mitigation (Volume 5: Appendix CT-001-000/2).
- 7.5.56 Mitigation measures to address the potential killing, injury and disturbance of badgers will be provided in accordance with the ecological principles of mitigation identified within Volume 5: Appendix CT-001-000/2. This will include the provision of badger-proof fencing and replacement setts where necessary. New planting within the ecological compensation areas will benefit badgers present in those areas by improving foraging habitat and providing new opportunities for sett creation.

Summary of likely residual significant effects

- 7.5.57 The mitigation, compensation and enhancement measures described above reduce the effects to a level that is not significant except for barn owl. The permanent loss of one barn owl territories represents a residual significant effect. However, if the proposed mitigation measures for barn owl are implemented through liaison with

landowners, the residual effect on barn owl would be reduced to a level that is not significant.

7.6 Effects arising from operation

Avoidance and mitigation measures

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

- creation of planted embankments either side of road, footpath and access crossing points will encourage bats to fly at a safe height over the Proposed Scheme and reduce the risk of train strike, particularly at Buckingham Road overbridge, the Bridleway 213/4 accommodation overbridge, A421 London Road overbridge, Turweston green overbridge and Radstone Road overbridge;
- the Westbury viaduct and Turweston viaduct will allow bats and other animals to safely pass under the Proposed Scheme; and
- the Turweston green bridge will allow bats and other animals to safely pass over the Proposed Scheme.

Assessment of impacts and effects

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

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

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

7.6.5 The Proposed Scheme will be in a 3.6m deep cutting where it crosses the Helmdon Disused Railway SSSI, but the trains will not be completely screened (i.e. the top of the trains will be above the base of the severed disused railway cutting) and the

catenary will be higher. This SSSI is optimum habitat for foraging and commuting bats, particularly the population of Natterer's bats that are expected to continue to use it during operation; the majority of its vegetation will be retained and it will continue to be a sheltered corridor that provides connectivity to much of the wider landscape. As this species often forages for insects close to the ground in and around vegetation any Natterer's bats following the SSSI alignment are likely to fly low across the HS2 cutting. This will increase the risk of mortality or injury caused by passing trains at the point where the Proposed Scheme crosses the SSSI.

- 7.6.6 Increased risk of mortality and injury could reduce the population of Natterer's bats that depends on the nearby maternity roost over several years and generations. The progressive reduction in numbers could adversely affect the viability of the breeding population. Although field surveys recorded a small proportion of this Natterer's bat population using the SSSI it is acknowledged that numbers are likely to change throughout the year and over time. Therefore as part of the precautionary assessment it is assumed that these impacts will result in a permanent adverse effect on the conservation status of the Natterer's bat population at Radstone that will be significant at the regional level.
- 7.6.7 As part of the precautionary assessment it is assumed that other bat populations are likely to forage and commute around ground level are likely to experience a similar risk of collision and injury. These are:
- the population of brown long-eared bat associated with the maternity roost at buildings along Radstone road and the Church of St Lawrence; and
 - the population of common pipistrelle associated with the maternity roost at the Church of St Lawrence and the likely maternity roost at Radstone Village.
- 7.6.8 As part of the precautionary assessment it is assumed that collision and injury will result in permanent adverse effects on the conservation status of these bat populations that will be significant at the county/metropolitan level.
- 7.6.9 Surveys demonstrated that bats commute along linear habitat features such as the River Great Ouse and disused railways that will be crossed by the Proposed Scheme. The risk of bat populations or assemblages within the rest of this area being stuck by passing trains will however, be reduced to level that is not significant by the avoidance and mitigation measures described previously.
- 7.6.10 The noise made by passing trains has the potential to disturb birds within habitats close to the Proposed Scheme. Birds habituate to loud noises that they hear regularly and frequently, and hence it is considered that this will not generally cause significant effects. There is some evidence to suggest that breeding bird densities can be reduced where there is persistent noise from busy roads due to birds being unable to hear each other's songs. However, this is not expected to occur with the Proposed Scheme as trains will pass quickly. The effect of train noise on breeding birds is therefore not considered to be significant.
- 7.6.11 The majority of bird species that are known to be present in the area are not considered to be particularly vulnerable to collision with trains. However, barn owls are often killed by cars and trains. This is because they hunt low over the rough

grassland habitats that are associated with road verges and railway embankments and are slow moving. Evidence suggests that such mortality is likely to result in the loss of all breeding populations of barn owls within 1.5km of the Proposed Scheme. This is considered to be significant at up to the county/metropolitan level.

- 7.6.12 It is considered unlikely that any other effects at more than the local/parish level will occur. Effects at the local/parish level are listed in Volume 5: Appendix EC-005-002.

Other mitigation measures

- 7.6.13 This section describes additional elements designed to reduce or compensate for significant ecological effects. These include measures, such as habitat manipulation and fencing, to discourage species from foraging close to the Proposed Scheme.
- 7.6.14 To reduce the risk of Natterer's bats that roost near Radstone being struck by passing trains, a physical barrier, will be constructed on either side of the route as it crosses the Helmdon Disused Railway SSSI. This will force Natterer's bats to fly up and over the route, avoiding passing trains and associated catenary. On the eastern side of the railway a noise fence barrier is proposed and a low level fencing/netting on top of the noise fence barrier will perform this function. On the western side a combination of earthworks, fencing/netting and planting will be used to create a similar barrier, as appropriate. The top of these barriers will be up to 8m above rail level. Following the implementation of these measures, any adverse effects on bats will be reduced to the local parish level or below. No significant effect on the conservation status of the Natterer's bat population is expected.
- 7.6.15 The barriers on the embankments either side of the route will also reduce the potential mortality of brown long-eared bat and common pipistrelle bat populations that are also present near Radstone. These measures will be sufficient to maintain the conservation status of these populations.
- 7.6.16 In addition, the planting on the embankments of the Helmdon Road overbridge, as described in the avoidance and mitigation section, will provide an alternative crossing point for bats flying north-south in this area. The elevation of the planting on the embankment will encourage bats to fly at a safe height over the Proposed Scheme, thus reducing the risk of collision and injury. It may also reduce the number of bats using the Helmdon Disused Railway SSSI to cross the route and thus further reduce risk of mortality. The bridge will not be lit as light can disturb bats and could discourage them from using this feature.
- 7.6.17 HS2 Ltd will continue to monitor the Natterer's bat population in this area of the route during the period up to construction, and if it is demonstrated that any of the above measures are not required to maintain conservation status of local populations, then the mitigation provision may be reduced accordingly.
- 7.6.18 Train strike is likely to result in the loss of barn owls which nest close to the route. As part of the precautionary assessment it is assumed all territories within close proximity to the route could be lost and therefore adverse effects are likely to remain significant at the county/metropolitan. To offset these losses opportunities to provide barn owl nesting boxes in areas greater than 1.5km from the route will be explored with local landowners. As the availability of nesting sites is a limiting factor for this

species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.

Summary of likely residual significant effects

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

8 Land quality

8.1 Introduction

- 8.1.1 This section presents the baseline conditions that exist along the Proposed Scheme in relation to land quality and reports the likely impacts and any significant effects resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, mining or mineral resources point of view, including: geological sites of special scientific interest (SSSI), local geological sites (LGS), areas of current underground or opencast mining and areas of designated mineral resources. Mitigation measures are presented and any residual effects are summarised.
- 8.1.2 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (for example contaminated soils may need to be removed or the construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment. In addition, a review has been undertaken to establish whether the operation of the Proposed Scheme will lead to contamination of its surrounding environment and what needs to be done to prevent such contamination.
- 8.1.3 The main environmental features of this area include the River Great Ouse, Helmdon SSSI and the underlying White, Taynton and Blisworth Limestone Principal aquifers. The main land quality issues in this area include:
- four current and historical landfills along the route;
 - Three dismantled railways;
 - mineral consultation areas (MCA) for sand and gravel; and
 - mineral safeguarding areas (MSA) for sand and gravel extraction.
- 8.1.4 Details of baseline information and the land quality assessment methodology are outlined in the following appendices (presented in Volume 5):
- Appendix CT-001-000/1: the SMR and Appendix CT-001-000/2 the SMR Addendum; and
 - Appendix LQ-001-014: Land quality appendix.
- 8.1.5 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Water resources and flood risk assessment (Section 13). Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3, Section 16.
- 8.1.6 Engagement has been undertaken with the Environment Agency, the Ministry of Defence (MoD) and Cherwell District Council (CDC), Aylesbury Vale District Council (AVDC) and South Northamptonshire District Councils (SNDC) regarding land

contamination, and Oxfordshire, Buckinghamshire and Northamptonshire County Councils with regards to mineral policy. To date, information has been received on mineral extraction and MSA and contaminated land (June 2013).. Further responses are awaited from the MoD and Petroleum Officers in relation to potential land contamination. Information sought has been incorporated where received .

8.2 Scope, assumptions and limitations

- 8.2.1 The assessment scope, key assumptions and limitations for the land quality assessment are set out in Volume 1 and in the SMR and its addendum presented in Volume 5 (Appendices CT-001-000/1 and 2). This section follows the standard assessment methodology.
- 8.2.2 Baseline data were reviewed for the area of land required to construct the Proposed Scheme together with a buffer extending out for a minimum of 250m, but in the case of groundwater data up to 1km. This is defined as the study area.
- 8.2.3 Familiarisation visits to the study area were made in July 2012 where the location of the Proposed Scheme was viewed from points of public access only. Due to access constraints not all sites considered to have the greatest potential for contamination were visited. However, the purpose of site visits is to verify desktop information and the lack of complete site walkovers is considered unlikely to have substantially affected the land quality assessment. Site visit notes are presented in Volume 5: Appendices LQ-001-014.

8.3 Environmental baseline

Existing baseline

- 8.3.1 Unless otherwise stated, all features described in this section are presented in Maps LQ-01-031 to LQ-01-035 (Volume 5, Land Quality Map Book).

Geology

- 8.3.2 This section describes the underlying ground conditions within the study area. It first describes any made ground present, followed by near surface superficial deposits and lastly describes the deeper bedrock geology. The geological mapping is illustrated on Map WR-02-014 (Volume 5, Water Resources and Flood Risk Assessment Map Book).
- 8.3.3 There is a large area of made ground, likely associated with Finmere Quarry, an active landfill, to the south-west of Finmere. There is a smaller area of artificial deposits located east of Turweston at Ballabeg. Although the route in this study area mostly crosses agricultural land, a cover of made ground may also be present in built up areas, including the former railway along the southern end of the route, as a result of previous cycles of development.
- 8.3.4 Superficial drift deposits for the majority of the study area consist of Glacial Till, described as stony clay with flint and chalk pebbles; Glaciofluvial deposits, described as sand and gravel; and Head deposits, described as stony and silty clay. River alluvium, described as clay generally underlain by gravel and associated with the River Great Ouse, is also present.

8.3.5 The underlying bedrock geology consists mainly of the limestone or limestone and mudstone formations of the Great Oolite Group which is up to 65m thick in total. This consists, specifically, from south to north, of: the Cornbrash Formation, Forest Marble Formation, White Limestone Formation, Taynton Formation, Rutland Formation and the Blisworth Limestone Formation. Horsehay Sand Formation, also of the Great Oolite Group (sand and sandstone) is present west of Westbury.

8.3.6 The Whitby Mudstone Formation, up to 38m thick, is the bedrock geology underlying the area of the River Great Ouse.

Groundwater

8.3.7 The White Limestone, Taynton and Blisworth Limestone Formations have been designated as a Principal aquifer by the Environment Agency. The Forest Marble, Horsehay Sand, limestone of the Cornbrash Formations and Glaciofluvial Deposits have been designated as Secondary A aquifers. The mudstone of the Rutland Formation has been designated as a Secondary B aquifer. Head deposits have been designated as a Secondary (undifferentiated) aquifer. The Whitby Mudstone Formation and Glacial Till have been designated as Unproductive.

8.3.8 The route does not pass through any groundwater source protection zones.

8.3.9 There are no groundwater abstractions for Public Water Supply or other licensed abstractions within 1km of the route within this study area.

8.3.10 A single private unlicensed groundwater abstraction at Mixbury Hall has been identified.

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

Surface waters

8.3.12 The most significant water feature is the River Great Ouse, which crosses the route west of Westbury and again to the north of Turweston. There are also a number of other surface water features, including surface drains and ponds in this area.

8.3.13 There are no surface water abstraction points within 1km of the route.

8.3.14 Further information on surface waters is provided in Section 13.

Current and historical land use

8.3.15 Current potentially contaminative land uses include:

- Finmere Railway Cutting landfill;
- Finmere Quarry and landfill; and
- Turweston Aerodrome (formerly RAF Turweston).

8.3.16 The principal historical potentially contaminative land uses are:

- Finmere Railway Cutting landfills;
- Mixbury Railway Cutting Landfill;

- Radstone Turn landfill;
- clay, brick and tile manufacturer (Map LQ-01-032, grid reference E7, Land Quality Map Book) potentially infilled sand and gravel quarries along the route; and
- Finmere station and dismantled railway.

8.3.17 Current and historical landfills noted above are detailed in Table 12.

Table 12: Landfill sites located within the study area

Name	Location (refs to Land Quality Map Book)	Authorised to accept
Finmere Railway Cutting landfill	Adjacent to the Proposed Scheme (Map LQ -01-032, centred on grid reference G6, Volume 5, Land Quality Map Book)	Construction (commercial and industrial), paper, glass, plastic, timber, metal, soil, foundry sand, hardcore, and cardboard. Operated by Premier Aggregates Ltd.
Finmere Quarry landfill	45m from the centre line of the Proposed Scheme (Map LQ -01-032, centred on grid reference F5, Volume 5, Land Quality Map Book)	Household, commercial and industrial waste. Operated by Premier Aggregates Ltd.
Mixbury Railway Cutting landfill	50m west of the Proposed Scheme but east of Mixbury (Map LQ -01-033, centred on grid reference I7, Volume 5, Land Quality Map Book)	Inert and household waste. Fly tipping was recorded at Mixbury Railway.
Radstone Turn landfill	West of Whitfield (Map LQ -01-035a, grid reference J5, Volume 5, Land Quality Map Book)	Inert waste.

8.3.18 Contaminants commonly associated with these uses could include metals, semi-metals, asbestos, organic and inorganic compounds. Infilled pits could also give rise to landfill gases such as methane, carbon dioxide or volatile organic compounds.

Other regulatory data

8.3.19 Regulatory data reviewed include pollution incidents, radioactive and hazardous substances consents and environmental permits (previously landfill, Integrated Pollution Control (IPC) and Integrated Pollution Prevention and Control (IPPC) licences). Notable data are as follows:

- two Local Authority PPC licences registered to Brackley Sawmills for the manufacture of timber and wood-based products and Brackley Service Station for a petrol filling station;
- two IPPC licences registered to Faccenda Group Limited; and
- one Local Authority Prevention Control enforcement at Brackley Sawmills.

Mining/mineral resources

- 8.3.20 The Buckinghamshire Minerals and Waste Core Strategy⁶⁵ confirms that the Proposed Scheme through Buckinghamshire will not pass through any minerals consultation/safeguarding areas.
- 8.3.21 The OCC Minerals and Waste Local Plan⁶⁶ remains the overarching document for minerals planning within the county. It does not identify any defined mineral safeguarding areas. An area between Finmere and Mixbury has been designated by Oxfordshire County Council as a mineral consultation area for sand and gravel resources. Extraction in part of this area is currently occurring as part of Finmere Quarry.
- 8.3.22 According to the Northamptonshire Core Strategy Development Plan Document⁶⁷, there are two MSA within 250m of the Proposed Scheme, both for sand and gravel resources. The first is located to the south of the route, north-east of Brackley, and the second underlies the route at the northern end of the study area, extending into the Greatworth to Lower Boddington area (CFA15).
- 8.3.23 Finmere Quarry is located immediately to the east of the route. Planning permission for developing and extending the life of Finmere Quarry landfill was issued in January 2012, permitting non-hazardous landfilling at the site until 31st December 2035 with final restoration completed by 31st December 2039. Two further planning applications were approved in 2010. Both applications are to extend the life of the consented extension to the quarry. For the first, located west of the existing Finmere Quarry, extraction of minerals (sand and gravel) is to cease by 31 December 2016 and the deposit of waste is to cease by 31 December 2018. The access route included in this application crosses the route of the Proposed Scheme. For the second, located south of the existing Finmere Quarry, extraction of minerals is to cease by 31 December 2017 and deposit of quarry reject materials is to cease by December 2018, with restoration completed by 31 December 2019.
- 8.3.24 A third planning application has been approved for the change of use of the materials recycling facility at Finmere Quarry to add biodrying and gasification waste treatment technologies and associated power generation together with the extension of the operational life of the materials recycling facility. However, to date, the materials recycling facility has not been built.
- 8.3.25 There are three areas historically quarried for sand and gravel within this study area as identified by the British Geological Survey (BGS): one is located near Widmore Farm at the southern end of the study area, and two are located north and south of Radstone, including Radstone gravel pit. All are classified by the BGS as having pit status C (a site which, at date of entry, has ceased to extract minerals).

⁶⁵Buckinghamshire County Council (2012), *Minerals and Waste Core Strategy Development Plan Document, Minerals and Waste Local Development Framework*.

⁶⁶Oxfordshire County Council (1996), *Minerals and Waste Local Plan, Saved Policies 2007*.

⁶⁷Northamptonshire County Council (2010), *Northamptonshire Minerals and Waste Development Framework, Core Strategy Development Plan Document*.

- 8.3.26 Superficial sand and gravel deposits and bedrock limestone, present in a number of locations, have been identified across the area by the BGS as a potential mineral resource.

Geo-conservation resources

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

Receptors

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

Table 13: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents in existing properties.	High
		Workers.	Moderate
	Controlled waters	Principal aquifer of the White Limestone Formation.	High
		Secondary A aquifer of the Cornbrash, Forest Marble and Horsehay Sand Formations and Secondary B Rutland Formation aquifer.	Moderate
		Secondary A aquifer of the Glaciofluvial and Head deposits.	Moderate
		River Great Ouse.	High
	Mineral resources	Mineral resource of sand and gravel.	Low
	Ecological	Helmdon SSSI.	High
	Built environment	Buildings and property.	Low to high
		Underground structures and services.	Low
Impacts on mining/mineral sites (severance and sterilisation of mineral sites)	Natural environment	Mineral resource of sand and gravel (MSA and MCA).	Low
		Mineral resource of sand and gravel with planning permission for extraction.	Moderate

Future baseline

- 8.3.29 The approved planning application to extend Finmere Quarry to the west includes a access route that crosses the route of the Proposed Scheme. Restoration of the quarry is to be completed by 31st December 2019, and aftercare for the site will continue

until 31st December 2024. There may therefore be an overlap between construction of the Proposed Scheme and operation of the mineral site. Alternative access arrangements for the quarry may, therefore, be required. There are currently no further identified committed development sites within the study area that are likely to change the land quality baseline during either construction or operation of the Proposed Scheme.

8.4 Effects arising during construction

Avoidance and mitigation measures

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

- methods to control noise, waste, dust, odour, gasses and vapours (draft CoCP, Sections 5, 7, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (draft CoCP, Section 5);
- the management of human exposure for both construction workers and people living and working nearby (draft CoCP, Section 11);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (draft CoCP, Sections 7 and 15);
- management of any unexpected contamination found during construction (draft CoCP, Section 11);
- a post remediation permit to work system (draft CoCP, Section 11);
- storage requirements for hazardous substances such as oil (draft CoCP, Section 16);
- traffic management to ensure that there is a network of designated haul roads to minimise compaction/degradation of soils (draft CoCP, Section 7); and
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (draft CoCP, Section 16).

8.4.2 The draft CoCP requires that a programme of further desk and site based investigation will take place prior to construction to confirm areas of contamination and that a risk assessment is undertaken to determine what, if any, site specific remediation measures will be required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants (draft CoCP, Section 11). The investigation and assessment of potentially contaminated sites will be undertaken in accordance with:

- Environment Agency CLR11 Model Procedures for the Management of Land Contamination (2004)⁶⁸; and
- British Standard BS10175 Investigation of Potentially Contaminated Sites (2011)⁶⁹.

- 8.4.3 Where significant contamination is encountered, a remedial options appraisal will be undertaken to define the most appropriate remediation techniques. This appraisal will be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with Sustainable Remediation Forum UK's publication A Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010)⁷⁰. The preferred option will then be developed into a remediation strategy, in consultation with regulatory authorities prior to implementation.
- 8.4.4 Contaminated soils excavated from the site, wherever reasonably practicable, will be treated as necessary to remove or render any contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Techniques are likely to include stabilisation methods, soil washing and bio-remediation to remove oil contaminants. Contaminated soil disposed of off-site will be taken to a soil treatment facility, another construction site (for treatment, as necessary, and re-use) or to an appropriately permitted landfill.

Assessment of impacts and effects

- 8.4.5 The route will be constructed mainly in cutting with sections of embankment to the west of Westbury and east of Brackley. There will be two short viaducts, Westbury viaduct over the River Great Ouse and Turweston viaduct. The route follows a disused railway at the southern end of the study area.
- 8.4.6 Construction works will include earthworks, utility diversions, deep foundations, temporary dewatering and other activities. In addition, road infrastructure works will be required within this section of the Proposed Scheme.
- 8.4.7 Two auto-transformer stations will be located in this study area, at Tibbetts Farm and Whitfield, south of the A43 Oxford Road. They will be located on undeveloped greenfield sites.
- 8.4.8 There will be one main construction site compound, Brackley South, and seven satellite construction sites in this area.

Land contamination

- 8.4.9 In line with the assessment methodology, as set out in the SMR, SMR Addendum and its appendices, an initial screening process was undertaken (identified in the methodology as Stages A and B) to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. In total, 23 areas were considered

⁶⁸ Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*.

⁶⁹ British Standard BS10175 (2011), *Investigation of Potentially Contaminated Sites*.

⁷⁰ Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

during this screening process; 13 of these areas were taken forward to more detailed risk assessments (Stages C and D), in which the potential risks were assessed more fully. The majority of the areas undergoing the more detailed risk assessments were landfills (historical and current) and historical potentially infilled gravel or clay pits. All areas assessed are shown on Maps LQ-01-031 to LQ-01-035 (Volume 5, Land Quality Map Book) and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

8.4.10 Conceptual site models (CSM) have been produced for the six areas taken to Stage C and D assessments. The detailed CSM are provided in Volume 5: Appendix LQ 001-017 and the results of the baseline risk assessments are summarised in this section. Potentially contaminated areas have been grouped and considered together, where appropriate. The following factors have determined the need for Stage C and D assessments:

- whether the area is on or off the Proposed Scheme or associated offline works; e.g. roads;
- the vertical alignment, i.e. whether the Proposed Scheme is in cutting or on embankment;
- the presence of underlying Principal or Secondary A aquifers or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

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

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

Area ref ⁽¹⁾	Area name (see refs in the Volume 5, Land quality Map Book)	Main potential impacts	Main baseline risk ^{(2), (3)}
14-1	Finmere Quarry Landfill (Map LQ-01-32, centred on grid reference F5)	Exposure of on-site human receptors (commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate
		Exposure of on-site human receptors (commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Moderate/low
		Exposure of on-site human receptors (commercial) to asphyxiative or explosive gases.	Moderate
		Exposure of Secondary A Forest Marble and Glaciofluvial deposits to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
		Exposure of on-site properties to lateral migration and build up of asphyxiative or explosive gases.	High

Area ref ⁽¹⁾	Area name (see refs in the Volume 5, Land quality Map Book)	Main potential impacts	Main baseline risk ^{(2), (3)}
		Exposure of on-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Low
14-2	Finmere Railway Cutting Landfill (Map LQ-01-32, centred on grid reference G6)	Exposure of Secondary A Forest Marble Formation to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
14-3	Mixbury Railway Cutting Landfill (Map LQ-01-33, centred on grid reference I7)	Exposure of off-site human receptors (residential and commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate/low
		Exposure of off-site human receptors (residential and commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Moderate/low
		Exposure of off-site human receptors (residential and commercial) to asphyxiative or explosive gases.	High
		Exposure of Secondary A White Limestone aquifer to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
		Exposure of off-site properties to lateral migration and build up of asphyxiative or explosive gases.	High
		Exposure of off-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Low
14-4	Historical clay, brick and tile manufacturer (Map LQ-01-32, centred on grid reference F5)	Exposure of on and off-site human receptors (residential and commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate/low
		Exposure of on and off-site human receptors (residential and commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Low
		Exposure of on and off-site human receptors (residential and commercial) to asphyxiative or explosive gases.	Moderate
		Exposure of Secondary A Glaciofluvial sand and gravel aquifer to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Very low
		Exposure of on-site properties to lateral migration and build up of asphyxiative or explosive gases.	Moderate
		Exposure of on-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Very low
14-5	Historical Finmere Station and Dismantled Railway (Map LQ-01-32, centred on grid reference E6)	Exposure of off-site human receptors (residential and commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Low
		Exposure of off-site human receptors (residential and commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Low
		Exposure of off-site human receptors (residential and commercial) to asphyxiative or explosive gases.	Moderate/low

Area ref ⁽¹⁾	Area name (see refs in the Volume 5, Land quality Map Book)	Main potential impacts	Main baseline risk ^{(2), (3)}
		Exposure of White Limestone Principal and Secondary A Glaciofluvial sand and gravel aquifers to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
		Exposure of off-site properties to lateral migration and build up of asphyxiative or explosive gases.	Moderate/low
		Exposure of off-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Very low
14-6	Dismantled railway crossing route (Map LQ-01-33, centred on grid reference F7)	Exposure of White Limestone Principal and Secondary undifferentiated Head aquifers to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
		Exposure of White River Great Ouse to leaching of contaminants from soil to groundwater and lateral migration in groundwater.	Moderate/low
		Exposure of White River Great Ouse to leaching of contaminants from surface run-off.	Low
14-7	Former RAF Turweston, now Turweston Aerodrome, farm and housing (Map LQ-01-34, centred on grid reference G4)	Exposure of on-site human receptors (residential and commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate
		Exposure of on-site human receptors (residential and commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Moderate
		Exposure of on-site human receptors (residential and commercial) to asphyxiative or explosive gases.	Moderate
		Exposure of off-site human receptors (residential) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate/low
		Exposure of off-site human receptors (residential) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Moderate/low
		Exposure of off-site human receptors (residential) to asphyxiative or explosive gases.	Moderate/low
		Exposure of White Limestone Principal and Secondary A Glaciofluvial sand and gravel aquifer of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate
		Exposure of on and off-site properties to lateral migration and build up of asphyxiative or explosive gases.	Moderate
		Exposure of on and off-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Moderate/low

Area ref ⁽¹⁾	Area name (see refs in the Volume 5, Land quality Map Book)	Main potential impacts	Main baseline risk ^{(2), (3)}
14-8	Dismantled railway crossing route (Helmdon Disused Railway) (Map LQ-01-35a, grid reference H7)	Exposure of off-site human receptors (residential) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Low
		Exposure of off-site human receptors (residential) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Low
		Exposure of off-site human receptors (residential) to asphyxiative or explosive gases.	Moderate/low
		Exposure of White Limestone Principal and Taynton Limestone to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate/low
		Exposure of off-site ecological receptors (Helmdon Disused Railway SSSI) to direct contact with contaminants in soil and groundwater.	Low
		Exposure of off-site properties to lateral migration and build up of asphyxiative or explosive gases.	Moderate/low
		Exposure of off-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Very low
14-9	Former sand and gravel quarry (Map LQ-01-35a, grid reference C6,	Exposure of secondary A Glaciofluvial deposits to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Very low
14-10	Petrol Filling Station (Map LQ-01-34, grid reference D9)	Exposure of on-site human receptors (commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Low
		Exposure of on-site human receptors (commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Moderate
		Exposure of on-site human receptors (commercial) to asphyxiative or explosive gases.	High
		Exposure of Principal aquifer Taynton Limestone Formation to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate
		Exposure of on-site properties to lateral migration and build up of asphyxiative or explosive gases.	High
		Exposure of on-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Moderate
14-15	Historical sand pit (Map LQ-01-32, grid reference F6)	Exposure of Secondary A Glaciofluvial sand and gravel aquifer to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Very low
14-21	Radstone Turn Inert Landfill (closed) (Map LQ-01-35a, grid reference J5)	Exposure of Principal Blisworth Limestone aquifer to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Very low

Area ref ⁽¹⁾	Area name (see refs in the Volume 5, Land quality Map Book)	Main potential impacts	Main baseline risk ^{(2), (3)}
14-22	Brackley Road Sewage Works (Map LQ-01-033, grid reference C10)	Exposure of on-site human receptors (commercial) to contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dusts.	Moderate/low
		Exposure of on-site human receptors (commercial) to contamination by inhalation of migrating ground-gas and volatile vapours from contaminated water.	Low
		Exposure of on-site human receptors (commercial) to asphyxiative or explosive gases.	Moderate
		Exposure of Principal aquifers, Taynton Limestone and Rutland Formation and Secondary A Horsehay Sand Formation to leaching of contaminants from soil to groundwater and vertical and lateral migration in groundwater.	Moderate
		Exposure of Principal aquifers, Taynton Limestone and Rutland Formation and Secondary A Horsehay Sand Formation to contaminants from surface water run-off.	Low
		Exposure of River Great Ouse to leaching of contaminants from soil to groundwater and lateral migration in groundwater.	Moderate/low
		Exposure of on-site properties to lateral migration and build up of asphyxiative or explosive gases.	Moderate
		Exposure of on-site properties to direct contact of property with contaminants in soil and surface water/groundwater.	Very low

(1) Each area is assigned a unique identification number (See Vol 5, Appendix LQ-001-0xx).

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

(3) The moderate or high risks identified reflect the uncertainty in existing baseline information. Whilst there are unlikely to be properties or receptors that experience the reported high or moderate existing baseline risk in the absence of site investigation a precautionary, worst case risk is reported in the table.

Temporary effects

- 8.4.12 An assessment of the effects of contamination has been undertaken by comparing the CSM developed for potential contaminated areas at baseline, construction and post construction stages. The baseline and construction CSM have been compared to assess effects at the construction stage.
- 8.4.13 Table 15 presents the summary of the construction effects obtained from a comparison of the baseline and construction impacts. The construction risk assessment takes into account the implementation of the mitigation measures set out within the draft CoCP. The details of these comparisons are presented, Volume 5: Appendix LQ-001-014.
- 8.4.14 The baseline and construction CSM have been compared to determine the change in level of risk to receptors during the construction stage, and thus to define the level of effect at the construction stage. Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is assessed to remain as high. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.

Table 15: Summary of temporary (construction) effects

Area ref	Area name	Main baseline risk	Main construction risk ^{(1), (2)}	Temporary effect and significance
14-1	Finmere Quarry Landfill	Low to high	Low to high	Negligible (not significant)
14-2	Finmere Railway Cutting Landfill	Moderate/low	Moderate	Minor adverse (not significant)
14-3	Mixbury Railway Cutting Landfill	Low to high	Low to high	Negligible (not significant)
14-4	Historical clay, brick and tile manufacturer	Very low to moderate	Very low to moderate	Negligible (not significant)
14-5	Historical Finmere Station and dismantled railway along HS2 route	Very low to moderate/low	None Moderate/Low	Negligible (not significant)
14-6	Dismantled railway crosses HS2 route	Low to moderate/low	Low to moderate/Low	Negligible (not significant)
14-7	Former RAF Turweston, now Turweston Aerodrome, farm and housing	Moderate/low to moderate	Moderate/low to moderate	Negligible (not significant)
14-8	Dismantled railway crosses HS2 route (Helmdon Disused Railway SSSI)	Very low to moderate/low	Very low to Moderate	Minor adverse (not significant)
14-9	Former sand and gravel quarry	Very low	Low	Minor adverse (not significant)
14-10	Petrol filling station	Low to high	Low to high	Negligible (not significant)
14-15	Historical sand pit	Very low	Low	Minor adverse (not significant)
14-21	Radstone Turn Inert Landfill	Very low	Very low	Negligible (not significant)
14-22	Brackley Road Sewage Works	Very low to moderate	Very low to moderate	Negligible (not significant)

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

(2) The high risks identified reflect the uncertainty in existing baseline information. Whilst there are unlikely to be properties or receptors that experience the reported high risk in the absence of site investigation a precautionary, worst case risk is reported in the table. Application of the processes and measures within the CoCP will ensure that site risks during the construction stage are controlled

8.4.15 Table 15 indicates that based upon the assessment, the construction phase is expected to have a minor adverse effect to negligible effect on the receptors overall. These effects are not considered to be significant in relation to potential land contamination. The main construction risk is the risk from the construction of the Proposed Scheme assuming that any mitigation measures as set out in the draft CoCP have been implemented. The temporary effect and significance has been determined by calculating the change in risk between the main baseline risk and the main construction risk. Therefore, 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.

- 8.4.16 There is a potential for soil disturbance and the mobilisation of contaminants where construction activities such as piling and the construction of cuttings and culverts directly encounter contaminated materials. Sites where this may occur include Finmere Railway Cutting Landfill, the former Great Central Main Line along the route and the former potentially infilled sand and gravel extraction sites. With the application of measures in the draft CoCP such as dust and odour control, and management of rainwater ingress, only temporary minor adverse (non-significant) effects are anticipated.
- 8.4.17 During the construction of the cutting across Helmdon Disused Railway SSSI, there is an increased likelihood of mobilising contaminants from the former railway (where the extent and nature of infill and buildup of the trackbed is not fully understood at present). This has the potential to affect surface water receptors in this area by virtue of contaminant leaching in rainwater and subsequent run-off and might also cause windblown dusts to affect the remainder of the SSSI. However, such effects will be substantially mitigated by the application of the requirements of the draft CoCP, and are not considered to be significant.
- 8.4.18 The landfill at Finmere Railway Cutting is likely to be fully remediated during construction since it is located entirely within the footprint of the disused railway where the Proposed Scheme will reuse the existing cutting corridor. However, there may be temporary minor construction effects on the Limestone Principal aquifer, where exposure of the waste to rainwater leaching occurs during excavation for relatively short periods of time. Again, with the application of the draft CoCP including measures to reduce rainwater infiltration this effect is not considered to be significant.
- 8.4.19 The landfill area at Mixbury cutting is located close to the edge of an area of earthworks for constructing the cutting for the Proposed Scheme. It is possible that contaminants or ground gases could leach from the railway cutting to the new construction area. This will need to be carefully considered prior to earthworks in this area. However, the effect is unlikely to be significant due to the application of measures in the draft CoCP such as gas vents or barriers to control landfill gases, and control of rainwater ingress and run-off to limit leaching.

Permanent effects

- 8.4.20 Baseline and post-construction CSM have been compared to assess the permanent (post-construction) effects. The post-construction CSM assumes that all the required remediation has been carried out and validated.
- 8.4.21 Table 16 includes the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these are significant. The details of these comparisons are presented in Volume 5 (Appendix LQ 001-017).

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

Area ref	Area name	Main baseline risk	Main construction risk ⁽¹⁾	Temporary effect and significance
14-1	Finmere Quarry Landfill	Low to high	Low to high	Negligible (not significant)
14-2	Finmere Railway Cutting Landfill	Moderate/low	Very low	Moderate beneficial (significant)
14-3	Mixbury Railway Cutting Landfill	Low to high	Low to high	Negligible (not significant)
14-4	Historical clay, brick and tile manufacturer	Very low to moderate	Very low to moderate	Negligible (not significant)
14-5	Historical Finmere Station and dismantled railway along HS2 route	Very low to moderate/low	None to moderate/low	Negligible (not significant)
14-6	Dismantled railway crosses HS2 route	Low to moderate/low	Low to moderate/low	Negligible (not significant)
14-7	Former RAF Turweston, now Turweston Aerodrome, farm and housing	Moderate to moderate/low	Moderate/low to moderate	Negligible (not significant)
14-8	Dismantled railway crosses HS2 route (Helmdon Disused Railway SSSI)	Very low to moderate/low	Very low to moderate	Negligible (not significant)
14-9	Former sand and gravel quarry	Very low	None	Minor beneficial (not significant)
14-10	Petrol filling station	Low to high	Low to high	Negligible (not significant)
14-15	Historical sand pit	Very low	Low	Minor adverse (not significant)
14-21	Radstone Turn Inert Landfill	Very low	None	Minor beneficial (not significant)
14-22	Brackley Road Sewage Works	Very low to moderate	Very low to moderate	Negligible (not significant)

(1) The high risks identified reflect the uncertainty in existing baseline information. Whilst there are unlikely to be properties or receptors that experience the reported high risk in the absence of site investigation a precautionary, worst case risk is reported in the table. Application of the processes and measures within the CoCP will ensure that site risks during the construction stage are controlled.

8.4.22 In Table 16, the magnitude of the permanent effects and their significance have been determined by calculating the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This may be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.

8.4.23 Table 16 shows that the Proposed Scheme results in either a reduction or no change in the level of risk already existing at each site for both on site and off site receptors. The table indicates that following remediation, there will generally be an overall negligible to moderate beneficial effect due to the remediation of contaminated materials in the construction areas. The only exception is the historic sand pit (site reference 14-15) where there will be a minor adverse effect, since the construction of the cutting has the potential to expose contaminants from the fill, which will not necessarily be

remediated as part of the Proposed Scheme. However, measures embedded in the design may include vents and barriers for works near landfill sites to control landfill gases and leachates, which will reduce the impact. There are anticipated to be no significant cumulative permanent effects.

Mining/mineral resources

- 8.4.24 Construction of the Proposed Scheme has the potential to impact existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource, direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance⁷¹ that may occur during the construction phase of the Proposed Scheme, possibly continuing through to the operation.
- 8.4.25 Parts of the study area fall within a mineral consultation area designated by Oxfordshire County Council for sand and gravel extraction. Extractions from this area are currently occurring as part of Finmere Quarry.
- 8.4.26 There are some current landfilling operations at Finmere Quarry, which is being filled with non-hazardous wastes until 2035. There are two approved planning permissions for extension of the excavation and landfilling operations to the south and west of Finmere Quarry. These are outside of the area required for construction, although do include a haul route that will cross the route of the Proposed Scheme. A planning application has also been approved for the change of use of the materials recycling facility at Finmere Quarry to add biodrying and gasification waste treatment technologies and associated power generation, together with the extension of the operational life of the materials recycling facility. However, to date, the materials recycling facility has not been built.
- 8.4.27 There are two MSA for sand and gravel resources within 250m of the route as designated by Northamptonshire County Council. The first is located on and adjacent to the south of the route and north-east of Brackley and the second is located on the route north of Radstone. The area closer to Brackley will be largely untouched by the construction phase which is only on the edge of the safeguarded area, leaving the majority of that area intact.

Temporary effects

- 8.4.28 The landfilling operations will not be significantly affected by construction of the Proposed Scheme, since they are outside the area required for the Proposed Scheme. However, the haul route approved for the extension to the west of the quarry will cross the route of the Proposed Scheme. There may be an overlap between construction of the Proposed Scheme and operation of the mineral site, requiring alternative access arrangements, since aftercare of the Finmere Quarry extension will continue until 31st December 2024.

⁷¹ In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site.

Permanent effects

8.4.29 There are two MSA that will be affected by the Proposed Scheme. The route impinges upon the north-eastern edge of the first, which is north of Brackley. The second, which is north-west of Radstone, is bisected by the route. Construction of the Proposed Scheme will marginally affect the designated MSA north of Brackley, resulting in a minor adverse impact but negligible effect. The effect is assessed as not significant, since the majority of the resource lies outside the land required to construct the Proposed Scheme. However, the route will isolate one part of the MSA to the north-west of Radstone from the other. This is assessed as a moderate impact and a minor adverse effect as summarised in Table 17.

Table 17: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance
Area north of Brackley (Map LQ-01-035a)	Mineral Safeguarding Area.	Mineral Safeguarding Area for building stone extraction.	Medium	Minor	Negligible (not significant)
Area of land northwest of Radstone (Map LQ-01-035a)	Mineral Safeguarding Area.	Mineral Safeguarding Area for building stone extraction.	Medium	Moderate	Minor adverse (not significant)

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

Geo-conservation sites

8.4.31 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

8.4.32 At site 14-15, the historical sand pit at the northern end of this study area, where there is a minor adverse effect, measures in the design may include vents and barriers to control landfill gases, should these need controlling associated with works near the waste infill. These measures will be confirmed following completion of the ground investigations required by the draft CoCP.

8.4.33 It may be necessary to install ground gas protection and leachate control measures at landfill locations such as Mixbury Railway cutting, if all of the contaminated materials are not removed at the time of construction. In addition, venting measures may be required to mitigate any significant effect arising from placing environmental mitigation earthworks next to this landfill.

8.4.34 Mitigation of the effects on mineral resources will include prior extraction of the resource for use within the project or elsewhere. Extraction may be limited to landscaped areas within the Proposed Scheme adjacent to rather than beneath the track bed, which will require good founding conditions. A plan will be discussed and agreed in advance of the construction works with the landowner, the mineral planning department at the relevant County Council and any other interested parties to assist

in achieving an effective management of minerals within the affected location of the MSA.

Summary of likely significant residual effects

- 8.4.35 No likely significant adverse effects are anticipated with the application of the mitigation measures detailed above with the exception of a moderate beneficial effect at Finmere Railway Cutting landfill.

8.5 Effects arising from operation

Avoidance and mitigation measures

- 8.5.1 Maintenance and operation of the Proposed Scheme will be in accordance with environmental legislation and good practice whereby appropriate spillage and pollution response procedures will be established.

Assessment of impacts and effects

- 8.5.2 Two auto-transformer stations will be located in this study area: at Tibbetts Farm and Whitfield, south of the A43 Oxford Road. These will both be located on undeveloped greenfield sites. An auto-transformer station can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, the proposed auto-transformer station, in common with other modern substations, will use secondary containment appropriate to the level of risk.
- 8.5.3 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.
- 8.5.4 It is unlikely that there will be any cumulative effects on land quality receptors due to the environmental controls that will be placed on operational procedures.

Other mitigation measures

- 8.5.5 There may be ongoing monitoring requirements following remediation works carried out during construction. Such monitoring, including monitoring of groundwater quality or ground gas, could extend into the operational phase of the Proposed Scheme.

Summary of likely significant residual effects

- 8.5.6 No significant residual effects are anticipated associated with the operation of the Proposed Scheme.

9 Landscape and visual assessment

9.1 Introduction

- 9.1.1 This section reports the assessment of the likely significant landscape and visual effects. It starts by summarising the baseline conditions found within and around the route of the Proposed Scheme and goes on to describe the significant effects that will arise during construction and operation on landscape character areas (LCA) and visual receptors.
- 9.1.2 In this section, the operational assessment section refers not to the running of the trains but also the presence of the new permanent infrastructure associated with the Proposed Scheme.
- 9.1.3 Principal landscape and visual issues in the area include:
- temporary effects to LCA and visual receptors during construction arising from the presence of construction plant, removal of existing vegetation and disruption to agricultural land. This will be particularly apparent where associated with the most extensive areas of cutting and overbridge construction earthworks; and
 - permanent landscape and visual effects during operation arising from the presence of new engineered landforms cutting across the existing landscape, new viaducts, noise fence barriers, fencing, overbridges, highway infrastructure, overhead line equipment and the noise and visual effect of the regular passing of high speed trains. In the majority of cases permanent effects will reduce over time as planting matures.
- 9.1.4 A separate but related assessment of effects on the setting of heritage assets is included in Section 6 – Cultural Heritage. Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented in Volume 5: Appendix LV-001-014, which comprises the following parts:
- Part 1 Engagement with technical stakeholders;
 - Part 2 Environmental baseline report;
 - Part 3 Assessment matrices; and
 - Part 4 Schedule of non-significant effects.
- 9.1.5 The extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages has been discussed with Aylesbury Vale District Council (AVDC), Buckinghamshire County Council (BCC), South Northamptonshire Council (SNC), Northamptonshire County Council (NCC), Oxfordshire County Council (OCC), and the River Nene Regional Park. Summer field surveys, including photographic studies of LCA and visual assessment of viewpoints, were undertaken from May to September 2012 and from May to June 2013. Winter surveys were undertaken from December 2012 to March 2013.

9.2 Scope, assumption and limitations

- 9.2.1 The assessment scope, key assumptions and limitations for the landscape and visual assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-0001-000/1) and the SMR Addendum (Volume 5: Appendix CT-0001-000/2). This report follows the standard assessment methodology.
- 9.2.2 The study area has been informed by the construction and operational phase zones of theoretical visibility (ZTV), which are shown in Maps LV-07-051 to LV-07-056 and LV-08-051 to LV-08-056 (Volume 5 Landscape and Visual Assessment Map Book). The ZTV has been produced in line with the methodology described in the SMR Addendum (Volume 5: Appendix CT-001-000/2), and is an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover will mean the actual visibility is substantially less than that shown in the ZTV. Tall construction plant (e.g. cranes and piling rigs) are excluded from the ZTV for the construction phase and overhead line equipment is excluded from the ZTV for the operational phase, but these are described and taken into account in the assessment of effects on landscape character areas and visual receptors.
- 9.2.3 LCA and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed. Long distance views of up to 1.75km have been considered at locations such as Brackley.

Limitations

- 9.2.4 During the baseline survey there were some areas which were inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement has been used to approximate the likely views from these locations. This was a constraint, particularly at Newton Purcell and Turweston.

9.3 Environmental baseline

Existing baseline

Landscape baseline

- 9.3.1 The predominantly rural landscape is defined by a regular framework of woodland plantations associated with a farmland plateau in the south, giving way to a more open, broadly domed and gently undulating landform in the north. The broad valley of the River Great Ouse has a notable influence on local topography and views, though the watercourse itself is often concealed within a narrow channel that meanders across the valley floor. For the most part, land use is mixed arable and pastoral farming, though notably includes a racecourse and an operational airfield at Turweston, and a redundant airfield, quarry and landfill site at Finmere.
- 9.3.2 Tree cover contributes notably to the character of the area and is apparent as individual trees within field hedgerows, and as more substantial copses and blocks of woodland. The field patterns are typically medium to large scale, including smaller fields close to settlements. Dismantled railways and associated vegetation contribute notably to tree cover, particularly in the vicinity of Newton Purcell, Mixbury, Westbury and Radstone where its linear and slightly elevated nature limits the extent of views across the landscape. A more extensive pattern of tree cover in proximity to

Turweston and between Newton Purcell and Mixbury, presents a more wooded and intimate landscape context. Evidence of wooded estate parkland remains to the south of the A43 Oxford Road where woodland plantations, copses and isolated trees interrupt the patchwork of arable and pastoral fields. The extent of tree and hedgerow cover is eroded in places where the merging of fields has resulted in the loss of field boundary vegetation; as occurs around Radstone and Westbury.

- 9.3.3 The primary settlement pattern is characterised by small scale widely dispersed villages and isolated farmsteads, as well as substantial settlements such as Brackley and larger villages such as Newton Purcell, Finmere, Westbury, Turweston, Whitfield and Radstone.
- 9.3.4 Electricity pylons are prominent features in the landscape, as are the A43 Oxford Road and A422 Brackley Road in the north of the study area and the A421 London Road in the central part of the area. Modern commercial developments are prominent on the south-eastern outskirts of Brackley. There is an extensive network of PRow, including the long distance route of the Westbury Circular Ride.
- 9.3.5 The LCA have been determined with reference to the Natural England National Character Areas⁷², Northamptonshire Landscape Character Assessment⁷³, Oxfordshire Wildlife and Landscape Study⁷⁴, the Cherwell Landscape Assessment⁷⁵ and the Aylesbury Vale Landscape Character Assessment⁷⁶.
- 9.3.6 Descriptions of all LCA are provided in Volume 5: Appendix LV-001-014 Part 2. For the purpose of this assessment the study area has been sub-divided into four discrete LCA, three of which are most likely to be affected. A summary of these LCA is provided below. The LCA are shown in Maps LV-02-051 to LV-02-056 (Volume 5 Landscape and Visual Assessment Map Book).

Shelswell and Turweston Wooded Estatelands and Farmland Plateau LCA

- 9.3.7 The area comprises a rolling landscape with a strong pattern of arable and pastoral fields. Remnant estate parklands, occasional copses/plantations and trees contribute to a varied landscape mosaic. Areas of gently rolling open ridges are apparent, characterising a transition from the wooded estatelands into the Great Ouse valley farmlands. Hedgerows tend to be well maintained, with many containing mature trees. Settlement is typically a dispersed pattern of farms and dwellings and also includes the larger villages of Newton Purcell, Finmere and Mixbury. Other notable human influences in the area include Finmere Quarry, the A421 London Road, minor roads, dismantled railways, overhead power lines and Turweston aerodrome. Given the predominantly agricultural land use, the area is of medium tranquillity, whilst the overall landscape condition is considered to be fair. The area is valued locally by residents and users of the network of PRow. Therefore, this area has a medium sensitivity to change.

⁷² Natural England; The Character of England; <http://www.naturalengland.org.uk/publications/nca/default.aspx>; Accessed September 2013.

⁷³ Northamptonshire County Council (2006), *Current Landscape Character Assessment*.

⁷⁴ Oxfordshire County Council, Natural England and the Earth Trust (2004), *Oxfordshire Wildlife & Landscape Study*.

⁷⁵ Cherwell District Council (1995), *Cherwell Landscape Assessment*.

⁷⁶ Aylesbury Vale District Council; 2008; *Aylesbury Vale Landscape Character Assessment*. <http://www.aylesburyvaldc.gov.uk/planning-policy/existing-policy-documents/withdrawn-core-strategy/avldf-evidence-base/environment-evidence/av-lca-may2008/>; Accessed August 2013.

The Great Ouse Valley Farmlands LCA

- 9.3.8 The undulating valley sides of the shallow, meandering River Great Ouse reflect the pattern of tributaries which join the river. A mixture of larger arable fields occupies the gentler slopes with smaller fields of pasture on the steeper valley sides. The pattern of hedgerows and trees is well-defined, although sparse and fragmented in places. Small copses and tree belts are concentrated on steeper slopes and along watercourses in the minor valleys. An extensive poplar plantation lies within the valley floor west of Westbury where two dismantled railway lines also cross the River Great Ouse.
- 9.3.9 Settlements include the villages of Westbury and Turweston, the eastern fringe of Brackley adjacent to the A43 Oxford Road and dispersed farms and dwellings. Various local PRoW cross the area, including the long distance Westbury Circular Ride, which are valued locally by residents and users. Given the predominantly agricultural land use, the area is of medium tranquillity, whilst the overall landscape condition is considered to be fair. Therefore, this area has a medium sensitivity to change.

The Tove Catchment Undulating Claylands LCA

- 9.3.10 The area is characterised by a broadly doming landform and gently undulating topography. Land use is typically agricultural with improved pasture located around villages and on valley sides. Where pasture predominates, a more intricate and intimate pattern prevails, defined by maintained, and in places overgrown, field boundary hedgerows with trees. Woodland is uncommon, although Fox Covert, south of Radstone is a locally prominent feature. Settlement is characterised by dispersed farms and dwellings, including the villages of Whitfield and Radstone and is notably influenced by the urban edge of Brackley. Various secondary and minor roads and farm tracks cross with the area; the route of the A43 Oxford Road is more prominent. A network of PRoW also cross the area, which is valued locally by residents and users. Given the predominantly agricultural land use, the area is of medium tranquillity, aside from areas close to power lines, roads and settlement where tranquillity is locally reduced. The overall landscape condition is considered to be fair. Therefore, this area has a medium sensitivity to change.

Visual baseline

- 9.3.11 Descriptions of the identified representative viewpoints are provided in Volume 5: Appendix LV-001-014 Part 2. 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 which are shown in Maps LV-07-051 to LV-07-056 and LV-08-051 to LV-08-056 (Volume 5, Landscape and Visual Assessment Map Book). In each case, the middle number (xxx.x.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport.
- 9.3.12 No protected views have been identified within the study area.
- 9.3.13 Residential receptors have a high sensitivity to change and are concentrated within the villages of Newton Purcell, Finmere, Mixbury, Westbury, Turweston, Whitfield and Radstone and the larger settlement area of Brackley, but also include grouped and individual properties located throughout the study area. Views are typically rural, across arable and pastoral fields, where the combination of flat and gently undulating

topography, with successive belts of mature vegetation bordering fields, limits the extents of views. Where topography is more elevated, such as on the upper valley slopes of the Great Ouse Valley or within the cresting dome of the undulating landform, more extensive views are possible.

- 9.3.14 Recreational receptors with a high sensitivity to change are located on PRow throughout the study area, including the Westbury Circular Ride. The viewpoints are typically located in rural, agricultural locations, with arable or pastoral fields defining the immediate setting and wooded skylines or hedgerow field boundaries forming some degree of enclosure.
- 9.3.15 Views experienced by people travelling along 'scenic' rural roads associate with numerous roads throughout the study area and have a medium sensitivity to change. People travelling on main roads, including the A43 Oxford Road at Brackley, have a low sensitivity to change. Highway views are typically characterised by glimpsed views through roadside hedgerows across agricultural fields, with wooded backdrops and occasionally more elevated views across wider extents of countryside.

Future baseline

- 9.3.16 A summary of the committed developments which are assumed to be built and occupied prior to either the construction or operation of the Proposed Scheme is provided below, along with the consequential effect on the character of LCA and nature of views. Developments which would introduce new visual receptors which may be significantly affected are also described. These developments are listed in Volume 5: Appendix CT-004-000 and shown in Maps CT-13-031 to CT-13-035 (Volume 5, Cross Topic Appendix 1 Map Book).

Construction (2017)

- 9.3.17 The extension to the existing sand and gravel quarry and landfill site at Finmere will include phased excavation and backfill reinstatement of an extensive area of land to the west of the Proposed Scheme. The final phase of operation, prior to restoration in 2019, is scheduled to take place within a parcel of land between Widmore Farm and the Proposed Scheme. The restoration of the quarry includes a return to agriculture and the introduction of a notable component of woodland planting south of Grassy Plantation, with longer term benefit to screening of the Proposed Scheme (although likely to have achieved limited establishment at 2017, but with potential to benefit the screening of later stages of construction).
- 9.3.18 The introduction of a third timber barn to complement the existing two barns at Mill Farm, Westbury, will accentuate the presence of built form in views from the western edge of Westbury. The proposed development will be accompanied by a belt of tree planting to contribute to screening of all three barns. At the start of the construction phase, the barn buildings will partly obscure views of the Proposed Scheme. Within the later stages of construction, the planting will contribute a screening effect to views of the viaduct in particular.
- 9.3.19 The residential extension of the north-eastern edge of Brackley at Brackley Sawmills will introduce two and three storey residential properties, including some with a north-easterly aspect facing towards the Proposed Scheme. Views will be possible of

construction operations associated with re-alignment of the A43 Oxford Road and Brackley South cutting main compound rather than views of the route alignment works. The current view from the north-eastern residential edge of Brackley looks out across the existing industrial area that the residential development will replace. The existing built context of views from the north-eastern residential edge of Brackley will not therefore significantly change as an outcome of the Brackley Sawmills development.

- 9.3.20 New visual receptors associated with completion of the Brackley Sawmills residential development have been identified as being significantly affected during construction. These are assessed in relation to Viewpoint 185.2.003: View looking north-east from residences in the Brackley Sawmills residential development.

Operation (year 1 – 2026)

- 9.3.21 By 2026, tree planting associated with the quarry restoration at Finmere will have begun to contribute to screening of the Proposed Scheme from surrounding PRow and to assist integration of the Proposed Scheme into its surroundings.
- 9.3.22 Planting associated with the barn development at Westbury will have begun to contribute to screening of the barn structures and in turn contribute to screening of views from Westbury towards the Proposed Scheme.
- 9.3.23 The residential development of Brackley Sawmills will not substantially alter existing views of the Proposed Scheme. Nor will Brackley Sawmills experience significant landscape or visual effects as a result of the Proposed Scheme.

9.4 Temporary effects arising during construction

- 9.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible in many locations and will have the potential to give rise to significant temporary effects that cannot be mitigated practicably. Such effects are temporary and vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main civil engineering works will take place, including establishment of compounds, main earthworks and structure works. The effects associated with the peak construction phase in this study area will generally be considered to be long term given the construction programme (see Section 2.3). Overall, civil engineering works in this study area will be undertaken between the middle of 2017 and the end of 2022. The Brackley south cutting main compound will be in place for approximately five years. Satellite compounds will be in place for between approximately one and a half and three and a half years. The civil engineering works at most individual sites along the route in this study area will occur for a period of between approximately six months and two years, with the exception of the Barton to Mixbury cutting, Turweston cutting and Brackley north cutting which will occur for a period of approximately three years. Effects during other phases of works are likely to be lesser due to less construction equipment being required at the time and a reduced intensity of construction activity.

9.4.2 The construction works that have been taken into account in determining the effects on landscape and visual receptors include:

- construction of mitigation earthworks to the north and south of Newton Purcell;
- construction of the A4421 Buckingham Road highway embankment and overbridge at Newton Purcell;
- excavation of Barton to Mixbury cutting between the A421 London Road and Mixbury;
- relocation of an overhead power line pylon at Featherbed Lane;
- construction of Westbury viaduct;
- excavation of Turweston cutting between Westbury and Turweston and associated materials processing and storage at Turweston;
- diversion of an overhead power line from the east to the west side of the Proposed Scheme at Turweston;
- construction of Turweston viaduct;
- construction of the A43 Oxford Road re-alignment;
- excavation of Brackley south cutting between the A43 Oxford Road and Radstone;
- construction of mitigation earthworks at Radstone;
- construction of Radstone Road highway embankment and overbridge at Radstone;
- construction sites with concentrations of buildings, vehicles and materials at A4421 Buckingham Road overbridge, A421 London Road overbridge, Featherbed Lane overbridge, Westbury viaduct, Brackley Road overbridge, Turweston green overbridge, Brackley south cutting and Radstone Road overbridge;
- construction traffic along the Proposed Scheme and along public roads joining the route from the A4421 Buckingham Road, A421 London Road, A422 Brackley Road, A43 Oxford Road and Radstone Road;
- general earthworks along the Proposed Scheme requiring cut/fill, vegetation removal, modification of landform, disruption to agricultural land and the presence of construction plant; and
- temporary diversions to highways, re-alignment of PRow and agricultural land/property access, including access for excavated material handling.

Avoidance and mitigation measures

9.4.3 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include the following (see Volume 5: Appendix CT-003-000/1):

- maximising the retention and protection of existing trees and vegetation where possible (draft CoCP Section 12.2);
- use of well-maintained hoardings and fencing (draft CoCP Section 12.2);
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses (draft CoCP Section 5.4);
- replacement of any trees intended to be retained which may be accidentally felled or die as a consequence of construction works (draft CoCP Section 12.2); and
- appropriate maintenance of planting and seeding works and implementation of management measures, to continue through the construction period as landscape works are completed (draft CoCP Section 12.4).

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

Assessment of temporary impacts and effects

9.4.5 The most apparent changes to landscape character and viewpoints during construction will relate to the temporary presence of construction plant, the removal of existing landscape elements, such as trees, hedges and agricultural land, and extensive landform earthworks. The influence of earthworks will notably include material processing centres and associated stockpiling of material up to 15m high to the east of Turweston. Changes will most significantly affect the setting and outlook of the settlements of Newton Purcell, Westbury, Turweston and Radstone and the setting and views of the network of PRow throughout the area. The height of the construction plant and viaducts, and the close proximity of construction activities to viewpoints, coupled with the absence of intervening screening (apart from the site hoardings) will result in significant visual effects during construction. The topography in certain locations and the retention of intervening hedgerows and trees will partially screen low level construction activity.

Landscape assessment

9.4.6 The following section describes the likely significant effects on LCA during construction. All LCA within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5: Appendix LV-001-014 Part 4.

Shelswell and Turweston Wooded Estatelands and Farmland Plateau LCA

9.4.7 The LCA coincides with land required for the construction of the Proposed Scheme for approximately 6km between the southern boundary of the area at Newton Purcell and Turweston. Construction activities will include removal of trees along the existing dismantled railway which coincides with the southern 3km of the route between

Newton Purcell and Mixbury. Woodland blocks and sections of hedgerow intersected by the route will also be removed, most notably impacting on the regular woodland plantation pattern between Newton Purcell and Mixbury.

- 9.4.8 The uniformity of the agricultural landscape will be disrupted by the excavation of cuttings to a depth of up to 7m in the vicinity of Mixbury and up to 18m in the vicinity of Turweston and associated stockpiling and grading of approximately 3m high screening earthworks at Newton Purcell. This will notably affect the setting of Newton Purcell and Turweston, accentuated at Turweston by the processing and export of materials arising from excavation of the cutting and associated materials storage stockpiles between up to 15m high.
- 9.4.9 Agricultural land will be disrupted along the length of the route as a consequence of construction operations. Three residential properties at Newton Purcell and Turweston will also be demolished. The construction of highway and pedestrian overbridges and the diversion of power lines will require the use of tall construction plant, most notably affecting the setting of Newton Purcell. A number of PRow and roads will be diverted to accommodate construction operations, affecting movement locally.
- 9.4.10 Construction activity will introduce vehicles and lighting to the area. This is likely to reduce tranquillity across the LCA as a whole, though particularly in the vicinity of compounds and concentrations of construction activity associated with the A4421 Buckingham Road overbridge, A421 London Road overbridge, Turweston green overbridge and Turweston cutting.
- 9.4.11 The magnitude of change will be medium, due to the removal of characteristic, long established landscape components, extensive earthworks operations and introduction of construction plant into the rural landscape. However, this will diminish across the wider LCA as a whole due to the screening influence of landform and vegetation.
- 9.4.12 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

The Great Ouse Valley Farmlands LCA

- 9.4.13 The LCA, and the valley, coincide with land required for the construction of the Proposed Scheme for approximately 2km over two distinct sections, at Turweston and Westbury. Construction will include the removal of woodland and hedgerows which intersect the route and the removal of part of the existing poplar plantation within the River Great Ouse floodplain.
- 9.4.14 There will be extensive, temporary and direct disruption at Westbury and Turweston due to temporary storage of excavated material on the upper valley slopes, grading of a viaduct launch pad at Westbury and the shaping of balancing pond and flood compensation areas. The extent of disruption will be accentuated at Turweston by the processing and export of materials arising from excavation of the cutting and associated materials storage stockpiles up to 15m high.
- 9.4.15 Agricultural land will be removed from cultivation and severed along the length of the route in this area. The corridor of the existing dismantled railway will also be severed

at Westbury. Construction of viaducts will require the use of tall construction plant, affecting the setting of Westbury and Turweston. A number of PRoW, including the Westbury Circular Ride, along with highways crossing the route, will be diverted to accommodate construction operations.

- 9.4.16 Construction activity will introduce vehicles and lighting to the area, reducing tranquillity across the LCA and particularly in proximity to the Westbury and Turweston viaducts and Turweston cutting sites.
- 9.4.17 The magnitude of change will be medium, due to the removal of characteristic, long-established landscape components, extensive earthworks operations and introduction of construction plant into the rural landscape. However, this will diminish across the wider LCA as a whole due to the screening influence of landform and vegetation.
- 9.4.18 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

The Tove Catchment Undulating Claylands LCA

- 9.4.19 The LCA coincides with land required for the construction of the Proposed Scheme for approximately 4km between Turweston and Radstone, up to the northern boundary of the area.
- 9.4.20 Construction activities will include removal of the southern end of Fox Covert near Radstone and the removal of existing vegetation associated with re-alignment of the A43 Oxford Road. Sections of hedgerow that intersect the route will also be removed.
- 9.4.21 The excavation of cuttings to a depth of up to 18m and associated stockpiling will disrupt the uniformity, severing agricultural land along the length of the route in this area. This will most notably affect the setting of Radstone, where route profiling will be complemented by an extensive area of landscape earthworks.
- 9.4.22 Residential properties at Iletts Farm will be demolished. Part of the Whitfield Racecourse will also be severed. Tall construction plant will be used to construct highway and pedestrian overbridges, altering the setting between the A43 Oxford Road and Radstone. The route of a dismantled railway will be severed at Radstone, reducing vegetation cover in the area and increasing the sense of openness. A number of PRoW and highways will also be diverted or realigned to accommodate construction operations, most notably re-alignment of the A43 Oxford Road.
- 9.4.23 Construction activity will introduce vehicles and lighting to the area which will reduce tranquillity across the LCA and particularly in proximity to compounds and concentrations of construction activity associated with the diverted alignment of the A43 Oxford Road, Radstone Road overbridge and Radstone mitigation earthworks.
- 9.4.24 The magnitude of change will be medium, due to the removal of characteristic, long-established landscape components, extensive earthworks operations and introduction of construction plant into the rural landscape. However, this will diminish across the wider LCA as a whole due to the screening influence of landform and vegetation.
- 9.4.25 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect.

Visual assessment

- 9.4.26 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken during winter, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf. Where residential receptors experience significant effects at night time arising from additional lighting, these are also presented in this section. Representative viewpoints within the study area considered to experience a non-significant effect (minor adverse or negligible) are described in Volume 5: Appendix LV-001-014 Part 4.
- 9.4.27 The number identifies the viewpoint locations which are shown in Maps LV-07-051 to LV-07-056 (Volume 5, Landscape and Visual Assessment Map Book). In each case, the middle number (xxx.x.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport.
- 9.4.28 Where a viewpoint may represent multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity may be lower than those reported.

Viewpoint 167.2.001: View looking east from PRow adjacent to residential properties on the southern edge of Newton Purcell (located on PRow 308/3/10)

- 9.4.29 The Proposed Scheme will cross this view around 435m from the viewpoint. The construction of the Footpath BHA/2 overbridge (approximately 545m away), in combination with more general construction activities and earthworks will be visible in the middle ground, although intervening hedgerows and hedgerow trees will partially filter views of this construction. There will also be oblique views of the permanent re-alignment of the A4421 (A4421 Buckingham Road overbridge) over the Proposed Scheme (approximately 760m away) and the A4421 Buckingham Road overbridge satellite compound to the north-east of the Proposed Scheme (approximately 930m away), partially filtered and screened by intervening buildings and vegetation associated with Newton Purcell. Temporary material stockpiles approximately 3m in height will be located to the east of the viewpoint (west of the Proposed Scheme) and to the north-east of the viewpoint (east of the Proposed Scheme) (approximately 435m away). In addition, a temporary site access route will be located to the east of the viewpoint, (west of the Proposed Scheme), screened and filtered in places due to the intervening hedgerow vegetation. The magnitude of change is considered to be medium.
- 9.4.30 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects.
- 9.4.31 At night, continuous lighting is proposed at the A4421 Buckingham Road overbridge satellite compound. However, oblique views and intervening properties in Newton Purcell will limit these effects. Therefore, the magnitude of change to this receptor at night is considered to be medium, resulting in a moderate adverse effect.

Viewpoint 169.2.001: View looking north-east from the A4421 Buckingham Road adjacent to residential properties near Station House, Newton Purcell

- 9.4.32 The Proposed Scheme will cross within 115m of this viewpoint. The permanent re-alignment of the A4421 Buckingham Road overbridge (approximately 140m away) and the A4421 Buckingham Road overbridge satellite compound to the north-east, on the east side of the route (approximately 300m away), in combination with more general construction activities and earthworks will be visible in the foreground. Vegetation removal and earthworks along the length of the route will be visible, resulting in open views towards the construction works. Open views will be available towards temporary materials stockpiles approximately 3m in height which will be located to the east of the Proposed Scheme (approximately 220m away). Station House, visible in direct views approximately 100m away, will be demolished. In addition, a temporary site access route will be located on the east side of the Proposed Scheme, beyond the temporary material stockpile. There will also be oblique views of the construction of the Footpath BHA/2 overbridge to the south-east (approximately 385m away), partially screened and filtered by intervening hedgerow vegetation. Given the substantial changes in close proximity to the viewpoint within the direct field of view, the magnitude of change is considered to be high.
- 9.4.33 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.34 At night, continuous lighting is proposed at the A4421 Buckingham Road overbridge satellite compound. Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 169.3.002: View looking east from PRow north of Newton Purcell (located on PRow 308/7/40)

- 9.4.35 The Proposed Scheme will cross within 315m of this viewpoint. There will be oblique views of the permanent road re-alignment of the A4421 Buckingham Road and the A4421 Buckingham Road overbridge satellite compound to the south-east (approximately 650m away) and a PRow overbridge (Bridleway 213/7 overbridge) to the east (approximately 900m away), in combination with more general construction activities and earthworks in the middle-ground. Temporary material stockpiles approximately up to 5m in height will be located to the east of the Proposed Scheme approximately 400m away. A temporary site access route will be located on the east side of the Proposed Scheme, beyond the temporary material storage stockpile. Oblique views will be possible of the Footpath BHA/2 overbridge to the south-east of the viewpoint (approximately 1.12km away). Given the substantial changes in close proximity to the viewpoint, the magnitude of change is considered to be high.
- 9.4.36 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.

Viewpoint 170.2.001: View looking south-west from Barley Fields residential property on the A4421 Buckingham Road, north of Newton Purcell

- 9.4.37 The Proposed Scheme will pass within 20m of this viewpoint. Existing vegetation in the foreground and middle ground associated with the dismantled railway and

roadside hedgerows will largely be removed, resulting in open views towards construction. The permanent re-alignment of the A4421 Buckingham Road overbridge over the Proposed Scheme (approximately 60m away) and the A4421 Buckingham Road overbridge satellite compound (approximately 120m away), in combination with more general construction activity and earthworks will be visible in the foreground. There will also be oblique views of the construction of the Footpath BHA/2 overbridge to the south-east of the viewpoint (approximately 465m away), filtered and screened in places by intervening hedgerow vegetation. An area for temporary material stockpiles approximately 5m in height, will be located to the south of the view, in front of the construction activities (approximately 250m away). Temporary site access routes will be located to the south-west and north-west of the viewpoint, on the east side of the Proposed Scheme. Given the substantial changes in close proximity to the viewpoint, within the direct field of view, the magnitude of change is considered to be high.

- 9.4.38 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.39 At night, continuous lighting is proposed at the A4421 Buckingham Road overbridge satellite compound which will markedly increase the extent of lighting in the view, which is currently only intermittently lit by passing vehicles on the A4421 Buckingham Road. Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 170.2.002: View looking west from the entrance to Boundary Farm, on the A4421 Buckingham Road north of Newton Purcell

- 9.4.40 The Proposed Scheme will cross this view around 350m from the viewpoint. Direct views of construction activities in the middle to background will include the permanent re-alignment of the A4421 Buckingham Road overbridge over the Proposed Scheme (approximately 350m away) and the A4421 Buckingham Road overbridge satellite compound (approximately 560m away), in combination with more general construction activity and earthworks. Existing vegetation in the middle ground associated with the dismantled railway will be removed, resulting in a notable increase in openness and focus on construction activities within the extent of view from Boundary Farm. There will also be oblique views of the construction of the Footpath BHA/2 overbridge to the south-west of the viewpoint (approximately 960m away), filtered in places by intervening hedgerow vegetation. An area for the temporary material stockpile up to 5m in height, will be located to the south of the view, in front of the construction activities (approximately 625m away). Temporary site access routes will be located to the south-west of the viewpoint, on the east side of the Proposed Scheme. Given the substantial changes in close proximity to the viewpoint, within the direct field of view, the magnitude of change is considered to be high.
- 9.4.41 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.42 At night, continuous lighting is proposed at the A4421 Buckingham Road overbridge satellite compound. Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 171.2.001: View looking north-east from Widmore Farm, west of Finmere

- 9.4.43 The Proposed Scheme will cross within 150m of this viewpoint. The permanent re-alignment of the A421 London Road over the Proposed Scheme (A421 London Road overbridge) approximately 420m away and the creation of a new access road to Widmore Farm over the Proposed Scheme (Bridleway 213/4 accommodation overbridge) approximately 20m away, with associated earthworks and bridge structures will be visible in the foreground. More general construction activity and earthworks will also be visible, along with an area for temporary material stockpile up to 5m in height (approximately 340m away) and a temporary site access route, both located to the east of the view, on the east side of the Proposed Scheme. Existing vegetation along the dismantled railway line will largely be removed and the lack of intervening vegetation will result in open views of construction activities. Visibility of the existing landfill site will be accentuated. Overall, the magnitude of change is considered to be high.
- 9.4.44 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.45 The night time effect of construction lighting will be non-significant. This is reported in Volume 5: Appendix LV-001-014 Part4.

Viewpoint 172.4.001: View looking west from the A421 London Road near entrance to Finmere Quarry

- 9.4.46 The Proposed Scheme will be located within 150m on this viewpoint. Existing vegetation along the dismantled railway line and along the A421 London Road will largely be removed, resulting in open views to the middle ground of the view. Some vegetation will be retained in the immediate foreground of the view, adjacent to the A421 London Road, providing a limited screening and filtering effect. The permanent re-alignment of the A421 London Road over the Proposed Scheme (A421 London Road overbridge) approximately 100m away, an overbridge at Widmore Farm (Bridleway 213/4 accommodation overbridge) approximately 250m away and the A421 London Road overbridge satellite compound to the north-west approximately 640m away, in combination with more general construction activity and earthworks will be visible in the middle ground. To the east of the Proposed Scheme looking west from the viewpoint, a temporary material stockpile up to 5m in height (approximately 520m away) and a temporary site access haul road will be located, of which largely open and partially filtered views will be available. Given the substantial changes in close proximity to the viewpoint, within the direct field of view, the magnitude of change is considered to be high.
- 9.4.47 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 173.2.002: View looking east from dismantled railway overbridge on Featherbed Lane, east of Mixbury

- 9.4.48 The Proposed Scheme will be located within 15m of this viewpoint. Existing vegetation along the dismantled railway line will largely be removed, and as there is

currently little intervening vegetation, views of construction will be open. Construction activities visible in the foreground will include the Featherbed Lane overbridge over the Proposed Scheme (approximately 15m away), the re-alignment of Footpath 303/7 via Featherbed Lane overbridge, the Featherbed Lane overbridge satellite compound (approximately 185m away), along with associated earthworks. More general construction activity and earthworks will be visible, along with an area for temporary material stockpile up to 5m in height (approximately 95m away) and a temporary site access route, both located to the east of the view, on the east side of the Proposed Scheme and an area for the temporary storage of material with a height of up to 5m located to the west of the view, on the west side of the Proposed Scheme (approximately 110m away). An overhead power line pylon will be relocated to a position approximately 100m south-east of its current location within the extent of view. Overall, the magnitude of change is considered to be high.

- 9.4.49 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect.
- 9.4.50 At night, continuous lighting is proposed at the Featherbed Lane overbridge satellite compound. Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 173.2.003: View looking north-east from Featherbed Lane adjacent to Mixbury Lodge Farm

- 9.4.51 The Proposed Scheme will be located approximately 500m from this viewpoint. Existing vegetation along the dismantled railway will largely be removed and as there is currently little intervening vegetation, views of construction will be open. Construction activities visible in the middle ground will include the permanent re-alignment of the A421 (A421 London Road overbridge) approximately 565m away and its satellite compound to the south-east (approximately 800m away) and the new Featherbed Lane overbridge over the Proposed Scheme and its satellite compound area (approximately 575m away). A temporary site access haul road to the north-east of the viewpoint along with general construction activity and earthworks will also be visible. Given the extensiveness of views of construction, the magnitude of change is considered to be high.
- 9.4.52 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.53 At night, continuous lighting is proposed at the A421 London Road overbridge satellite compound and Featherbed Lane overbridge satellite compound (seen in oblique views to the north-east). Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 173.4.001: View looking east from the A421 London Road, adjacent to the entrance to Oaks Farm, west of Finmere

- 9.4.54 The Proposed Scheme will be located within 30m of this viewpoint. Existing vegetation in the foreground along the A421 London Road and in the middle ground along the dismantled railway will largely be removed and as there is little intervening vegetation, views of construction will be open. Construction activities visible in the

middle ground will include the permanent re-alignment of the A421 (A421 London Road overbridge) to the south-east (approximately 30m away), the new Featherbed Lane overbridge over the Proposed Scheme to the north (approximately 765m away), A421 London Road overbridge satellite compound to the south-east (approximately 300m away), and general construction activity and earthworks. A temporary material stockpile up to 5m in height (approximately 30m away) to the west of the Proposed Scheme and a temporary site access haul road will be visible to the east of the Proposed Scheme, beyond the visible construction activities. Existing vegetation along the dismantled railway will largely be removed. Overall, the magnitude of change is considered to be high.

- 9.4.55 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 174.2.001: View looking west from Warren Farm, west of Finmere

- 9.4.56 Existing vegetation along the dismantled railway will largely be removed. However, vegetation within the gardens of the properties will be retained, filtering views towards the open landscape in the middle ground. Construction will be visible in the foreground, approximately 140m from the viewpoint. Activities in close proximity will include the substantial earthworks associated with creation of the cutting. Other elements will include the permanent re-alignment of the A421 London Road with associated bridge and earthworks, to the south (A421 London Road overbridge), approximately 230m away. A421 London Road overbridge satellite compound is proposed to the south-west of the viewpoint, on the western side of the Proposed Scheme (approximately 265m away), located behind but screened to some extent by the construction activities. Temporary material stockpiles up to 5m in height will be located to the south-west, west and east of the viewpoint, the closest being approximately 145m away, with a temporary site access haul road located along the line of the Proposed Scheme to the west of the viewpoint, in front of the construction activities. Given the substantial changes in close proximity to the viewpoint, within the direct field of view, the magnitude of change is considered to be high.

- 9.4.57 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.

- 9.4.58 At night, continuous lighting is proposed at the A421 London Road overbridge satellite compound and the Featherbed Lane overbridge satellite compound. Therefore, the magnitude of change to this receptor at night is considered to be high, resulting in major adverse effects.

Viewpoint 175.3.001: View looking east from the PRoW to the north-east of the settlement of Mixbury (located on PRoW 303/22/20)

- 9.4.59 Construction activities will be visible in the middle ground, approximately 190m from the viewpoint. Limited intervening vegetation results in open views from this viewpoint. Activities in the view will include the construction of the Bridleway 303/4 overbridge (approximately 220m away), which will be part of a PRoW re-alignment (Bridleway 303/4/20 diverted via Bridleway 303/4 overbridge), and the Mixbury culvert to the south-east, in combination with more general construction activity and earthworks. To the west of the Proposed Scheme looking east from the viewpoint, a

temporary material stockpile up to 5m high approximately 190m away, and a temporary site access haul road will be located in front of the construction activities, screening the lower elements. Given the substantial changes in close proximity to the viewpoint and the limited extent of intervening vegetation, the magnitude of change is considered to be high.

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

Viewpoint 176.2.002: View looking west from Fulwell Road south of Westbury adjacent to residential properties at the Old Barn on Fulwell Hill

- 9.4.61 Construction activities will be visible in the middle ground approximately 1.3km from this viewpoint. The view will include the construction of the Bridleway 303/4 overbridge (approximately 1.2km away), the Westbury Circular Ride re-alignment (approximately 1.28km away, oblique views of the Westbury viaduct over the River Great Ouse (approximately 1.4km away), in combination with views of more general construction activity and earthworks. A temporary material stockpile up to 5m in height (approximately 1.35km away) and a temporary site access haul road will be visible to the west of the Proposed Scheme. Whilst there are expansive views from this elevated vantage point, the existing intervening vegetation will filter views of construction activity. Given that construction activities will be partially filtered by intervening vegetation, the magnitude for change is considered to be medium.

- 9.4.62 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects.

- 9.4.63 At night, continuous lighting is proposed at the Westbury viaduct satellite compound. However, given the presence of intervening vegetation which will partially filter views. The magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 177.3.001: View looking east from a PRow north of Mixbury (located on PRow AK/016)

- 9.4.64 Construction activities visible approximately 1.04km from this viewpoint will include the Westbury viaduct over the River Great Ouse floodplain (approximately 1.05km away), the Westbury viaduct satellite compound (approximately 975m away), and the Westbury Circular Ride re-alignment (approximately 970m away), in combination with more general construction activity and earthworks. A temporary site access haul road will be visible to the east of the Proposed Scheme, behind the construction activities, along with temporary material stockpiles on the east and west sides of the Proposed Scheme, in front and behind the construction activity, the closest of which is located approximately 725m away. Given that the dense intervening vegetation will be retained, partially filtering views of construction, the magnitude of change is considered to be medium.

- 9.4.65 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 177.3.002: View looking east from PRow south-west of Westbury

9.4.66 Construction activities visible in the middle ground, approximately 80m from the viewpoint, will include the Westbury viaduct over the River Great Ouse floodplain to the north-east (approximately 160m away), the Westbury viaduct satellite compound (approximately 300m away), and the Westbury Circular Ride re-alignment (approximately 80m away), in combination with more general construction activity and earthworks. A temporary site access haul road will be visible to the east of the Proposed Scheme, along with temporary material stockpiles to the west of the Proposed Scheme, north and south of the viewpoint (the closest of which is located approximately 55m away). Given the openness of views of construction activities in close proximity to the viewpoint, the magnitude of change is considered to be high.

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

Viewpoint 178.2.002: View looking west from PRow adjacent to residential properties on the north-western edge of Westbury and the A422 Brackley Road (located on PRow WBB/17/1)

9.4.68 Construction activities visible in the middle ground, approximately 650m from the viewpoint, will include the Westbury viaduct over the River Great Ouse (approximately 715m away), the Westbury viaduct satellite compound (approximately 655m away), the A422 Brackley Road overbridge satellite compound (approximately 880m away), the Westbury Circular Ride re-alignment (approximately 675m away) and three balancing ponds in the vicinity of the viaduct, along with more general construction activity and earthworks. Tall cranes associated with the construction of the viaduct will be prominent on the skyline. A temporary site access haul road will also be visible along the line of the Proposed Scheme, in front of the construction activities. Temporary material stockpiles are located on the east side of the Proposed Scheme to the north of the viewpoint, approximately 660m away). Existing intervening vegetation will filter views of construction activities. Overall, the magnitude of change is considered to be medium.

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

9.4.70 At night, continuous lighting is proposed at the Westbury viaduct satellite compound and the A422 Brackley Road overbridge satellite compound, partially filtered by intervening vegetation. Therefore, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 178.2.003: View looking south-west from the A422 Brackley Road adjacent to residential properties on the north-western edge of Westbury

9.4.71 The construction of the Proposed Scheme will appear in the middle ground and background around 725m from the viewpoint. Activities visible in the middle ground will include the Westbury viaduct over the River Great Ouse (approximately 900m away), the Westbury viaduct satellite compound (approximately 800m away), the A422 Brackley Road overbridge satellite compound (approximately 820m away) the Westbury Circular Ride re-alignment (approximately 925m away) and three balancing

ponds in the vicinity of the viaduct along with more general construction activity and earthworks. Tall cranes required to construct the viaduct will be prominent. A temporary site access haul road will also be visible along the line of, and to the east of, the Proposed Scheme, in front of the construction activities. Temporary material stockpiles will be located to the east of the Proposed Scheme in front of construction activities, approximately 725m north-west of the viewpoint. Existing intervening vegetation will filter views of construction. As a consequence, the magnitude of change is considered to be medium.

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

9.4.73 At night, continuous lighting is proposed at the Westbury viaduct satellite compound and the A422 Brackley Road overbridge satellite compound. Therefore, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 179.2.001: View looking east from Grovehill Farm

9.4.74 Construction of the permanent A422 Brackley Road overbridge road re-alignment over the Proposed Scheme to the north-east of the viewpoint, the A422 Brackley Road overbridge satellite compound to the north-east (on the east side of the Proposed Scheme), and a PRow re-alignment (Footpath WBB/17 accommodation overbridge) to the east of the viewpoint, along with more general construction activity and earthworks will be visible in the middle ground, approximately 300m from the viewpoint. A temporary site access haul road and stockpiles of excavated material will be located to the east of the viewpoint, located behind and filtered by the construction activity (approximately 425m away). The majority of the existing field boundary vegetation along the eastern boundary of the immediate intervening field will be removed. However, the woodland surrounding the residential receptor will contribute to screening of views. Given that construction activities will be visible, the magnitude of change is considered to be medium.

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

9.4.76 At night, continuous lighting is proposed at the Westbury viaduct satellite compound and the A422 Brackley Road overbridge satellite compound. Given the screening and filtering effects of the trees surrounding the property, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 179.4.001: View looking east from the A422 Brackley Road east of Brackley

9.4.77 Construction activities visible in the middle ground, approximately 500m from the viewpoint, will include the permanent A422 Brackley Road overbridge re-alignment over the Proposed Scheme and the A422 Brackley Road overbridge satellite compound to the east of the viewpoint, in combination with more general construction activity and earthworks. Oblique views towards the south-east of the viewpoint of the Westbury viaduct satellite compound. Existing intervening hedgerows and vegetation along the A43 Oxford Road will be removed, resulting in

open views. A temporary site access haul road will also be located to the east of the viewpoint on the east side of the Proposed Scheme. Material stockpiles between approximately 8-15m high associated with the Turweston cutting excavation material processing centres will be visible as a backdrop to general construction activity. Given that construction will be openly visible, the magnitude of change is considered to be high.

- 9.4.78 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 180.2.001: View looking south-west from Oatleys Farm, east of Brackley

- 9.4.79 The construction of the Proposed Scheme will be visible in the fore to middle-ground, around 225m from the viewpoint. Activities in the middle ground will include the permanent A422 Brackley Road overbridge re-alignment over the Proposed Scheme (approximately 225m away), A422 Brackley Road overbridge satellite compound located to the north of the Proposed Scheme (approximately 865m away), a PRow re-alignment (Footpath WBB/17 accommodation overbridge) approximately 800m away, in combination with more general construction activity and earthworks. A temporary site access haul road will also be located to the west of the viewpoint on the east side of the Proposed Scheme. Material stockpiles between approximately 8-15m high associated with the Turweston cutting excavation material processing centres will be apparent components of the view, but may in turn contribute to screening of more general construction activity beyond. Existing intervening vegetation will partially screen construction activities. However, the magnitude of change is considered to be high.

- 9.4.80 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.

- 9.4.81 At night, continuous lighting is proposed at the A422 Brackley Road overbridge satellite compound and the Turweston green overbridge satellite compound. Given the screening and filtering effects of the intervening trees in the landscape, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 183.2.002: View looking north-east from the PRow leading to Versions Farm, south of the A43 Oxford Road (located on PRow BD/010)

- 9.4.82 Rising ground and intervening field boundary vegetation will partially filter views of construction activities in the middle ground, approximately 300m from the viewpoint. The view will include the construction of the permanent A43 Oxford Road re-alignment (A43 Oxford Road overbridge) over the Proposed Scheme, located approximately 430m to the north-east of the viewpoint. There will also be oblique views of the Brackley south cutting main compound approximately 430m to the north-east, on the western side of the Proposed Scheme. The construction of the Turweston viaduct over the River Great Ouse and floodplain will also be visible in oblique views approximately 515m to the south-east of the viewpoint. Temporary materials stockpiles with a height of up to 5m and a temporary site access haul road will be located approximately 370m to the south-east, on the east side of the

Proposed Scheme, behind the construction activities. Overall, the magnitude of change is considered to be medium.

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

9.4.84 At night, continuous lighting is proposed at the Brackley south cutting main compound. Given the screening and filtering effects of the intervening trees in the landscape, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 183.2.003: View looking north-east from north-eastern edge of Turweston

9.4.85 The construction of the Proposed Scheme will cross this view around 140m from the viewpoint. Vegetation in the foreground will be removed opening up views towards the Proposed Scheme. Construction activities visible in the foreground will include oblique views to the north of the Turweston viaduct over the River Great Ouse and floodplain (approximately 425m away) and oblique views to the south of the Turweston green overbridge (approximately 385m away) and Turweston green overbridge satellite compound (approximately 580m away), in combination with more general construction activity and earthworks. A temporary site access haul road will also be visible to the east of the Proposed Scheme, behind the construction activities, along with temporary stockpiles of excavated materials (approximately 265m away). The diversion of an overhead power line from the eastern to the western side of the Proposed Scheme will associate with the taking down and putting up of new pylon structures and power lines. The nearest new pylon will be located approximately 120m east of the viewpoint. Given the substantial changes in close proximity to the viewpoint, within the direct field of view, the magnitude of change is considered to be high.

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

9.4.87 The night time effect of construction lighting will be non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 183.3.003: View looking east from Turweston Road, adjacent to the entrance to Rachel's Farm

9.4.88 The construction of the Turweston viaduct over the River Great Ouse, in combination with more general construction activity and earthworks will be visible in the middle ground, approximately 550m from the viewpoint.

9.4.89 A temporary site access haul road will be visible to the east of the Proposed Scheme, along with temporary stockpiles of materials with an approximate height of 5m, located behind the construction activities approximately 615m away. Existing intervening vegetation will partially screen views of construction operations along the Proposed Scheme. Therefore, the magnitude of change is considered to be medium.

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

Viewpoint 183.4.002: View looking north-east from the A43 Oxford Road roundabout on the north-eastern edge of Brackley

- 9.4.91 The Proposed Scheme will be located around 75m from the viewpoint at its closest point. The construction of the permanent A43 Oxford Road (A43 Oxford Road overbridge) road re-alignment over the Proposed Scheme (approximately 75m away) and the Brackley south cutting main compound to the north of the viewpoint (approximately 555m away), in combination with more general construction activity and earthworks, will be visible in the middle ground. In addition, to the north, a temporary material stockpile up to 5m high (approximately 75m away) and a temporary site access haul road will be visible in front of the construction activities. Existing intervening vegetation including boundary hedgerows and linear tree belts along the A43 Oxford Road will be removed, resulting in open views towards the Proposed Scheme. Overall, the magnitude of change is considered to be high.
- 9.4.92 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 184.3.001: View looking west from PRow south-west of Whitfield (located on PRow TUW/7/01)

- 9.4.93 The construction of the Proposed Scheme will cross this view around 630m from the viewpoint. Visible middle ground construction elements from this viewpoint will include the Turweston viaduct over the River Great Ouse (approximately 845m away) and the A43 Oxford Road re-alignment over the Proposed Scheme (approximately 945m), in combination with more general construction activity and earthworks. To the east of the Proposed Scheme looking west from the viewpoint, a temporary material stockpile up to 5m high and a temporary site access haul road will be located approximately 735m away, visible in front of the construction activities. To the west of the viewpoint, the Brackley south cutting main compound will be located approximately 1km away, on the west side of the Proposed Scheme, with views screened and filtered by the intervening construction activity. Existing vegetation will contribute to the screening of potential views. Therefore, the magnitude of change is considered to be high.
- 9.4.94 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.

Viewpoint 185.2.003: View looking north-east from residences in the Brackley Sawmills residential development

- 9.4.95 It is assumed that the Brackley Sawmills residential development will be mostly built and occupied in advance of construction of the Proposed Scheme, as discussed in Section 9.3.
- 9.4.96 The realignment of the A43 Oxford Road will be visible in the middle ground approximately 250m north-east of the viewpoint. Visible activity will include the removal of the existing A43 Oxford Road highway vegetation, highway cutting and embankment earthworks and construction traffic moving along the new highway alignment. Temporary materials stockpiles up to 5m in height will be visible on the western side of the realigned route of the A43 Oxford Road and where associated with

the Brackley south cutting on the skyline, approximately 700m north of the viewpoint. As views will be partially filtered by intervening vegetation the magnitude of change is considered to be medium.

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

9.4.98 The night time effect of construction lighting will be non-significant. This is reported in Volume 5: Appendix LV-001-014 Part4.

Viewpoint 185.3.001: View looking north-east from PRow north-east of Brackley (located on PRow AX/016)

9.4.99 The construction of the Proposed Scheme will cross this view around 45m from the viewpoint. The removal of vegetation in the foreground will result in open views towards the Proposed Scheme. Visible construction elements in the foreground will include the Bridleway AX16 accommodation overbridge approximately 15m away and oblique views of the permanent A43 Oxford Road re-alignment over the Proposed Scheme (A43 Oxford Road overbridge) approximately 490m away and the Brackley south cutting main compound to the south of the viewpoint approximately 345m away, in combination with more general construction activity and earthworks. To the west of the Proposed Scheme looking east from the viewpoint, a temporary material stockpile up to 5m in height (approximately 45m away) and a temporary site access haul road will be located, viewed in front of the construction activity. Given the substantial change in close proximity to the viewpoint receptor and within the direct field of view, the magnitude of change is considered to be high.

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

Viewpoint 186.2.001: View looking west from north-eastern edge of Whitfield

9.4.101 The construction of the Proposed Scheme will cross this view around 305m from the viewpoint. Hedgerow vegetation and vegetation associated with the curtilage of properties in Whitfield will be retained in the foreground, however a linear tree belt of vegetation in the middle ground associated with the A43 Oxford Road will be removed in places associated with the A4421 Buckingham Road overbridge approximately 305m away, resulting in filtered views. Construction elements visible in the background will include the permanent re-alignment of the A43 Oxford Road over the Proposed Scheme (A43 Oxford Road overbridge) approximately 345m away, oblique views of the Brackley south cutting main compound to the north-west approximately 1.1km away, oblique views of the Turweston viaduct over the River Great Ouse approximately 1.2km away and cranes used to construct the viaduct to the south-west of the viewpoint, in combination with more general construction activity and earthworks. A temporary material stockpile up to 5m in height (approximately 975m away) and a temporary site access haul road will be located in front of the construction activity, looking west from the viewpoint. Given that views will be partially filtered by intervening vegetation, the magnitude of change is considered to be medium.

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

9.4.103 At night, continuous lighting is proposed at the Brackley south cutting main compound. Given the screening and filtering effects of the intervening trees in the landscape, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 186.2.002: View looking west from Radstone Road between the A43 Oxford Road and Radstone, adjacent to a newly constructed residential property

9.4.104 The construction of the Proposed Scheme will cross this view around 190m from the viewpoint at its closest point. Little existing intervening vegetation exists aside from the roadside hedgerows and intermittent hedgerow trees, resulting in filtered views. Construction elements visible in the middle and background will include the permanent re-alignment of the A43 Oxford Road over the Proposed Scheme (A43 Oxford Road overbridge) approximately 190m away, along with the Brackley South main compound to the west of the Proposed Scheme approximately 625m away, in combination with more general construction activity and earthworks. Temporary material stockpile areas up to 5m in height will be located to the west of the Proposed Scheme behind the construction activity approximately 600m away and therefore mainly screened. Given the partial alteration in the composition of the view, the magnitude of change is considered to be medium.

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

9.4.106 At night, continuous lighting is proposed at the Brackley south cutting main compound. Given the screening and filtering effects of the intervening landform and field boundary vegetation, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 186.3.001: View looking west from a PRoW between the A43 Oxford Road and Radstone, north of Fox Covert (located on PRoW AX/016)

9.4.107 The construction of the Proposed Scheme will cross this view around 215m from the viewpoint. The Fox Covert woodland block will limit views to the south-west, and the well vegetated dismantled railway line will limit views to the north-west. However, little intervening vegetation exists to the west (oblique views from the viewpoint) resulting in more open views in this direction. Construction elements visible in the middle ground will include the Bridleway AX16 accommodation overbridge approximately 195m away, in combination with more general construction activity and earthworks. A temporary material stockpile up to 5m in height approximately 335m away and a temporary site access haul road will be located to the west of the viewpoint, screened behind the construction activities. Given that construction activities will be partially filtered by intervening vegetation and oblique views from the viewpoint, the magnitude of change is considered to be medium.

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

Viewpoint 188.2.002: View looking west from the southern edge of the village of Radstone

- 9.4.109 The construction of the Proposed Scheme will cross this view around 365m from the viewpoint. Although intervening vegetation associated with the stream and Radstone roadside to the south will be removed, vegetation associated with the settlement of Radstone and rising topography will screen and filter some elements in places. Construction activities visible in the middle ground from this viewpoint will include the re-alignment of Radstone Road over the Proposed Scheme approximately 420m away (Radstone Road overbridge and associated Footpath AX7 re-alignment), the Radstone Road overbridge satellite compound to the west of the Proposed Scheme approximately 460m away and a PRow overbridge (Footpath AX15 overbridge) to the south of the viewpoint approximately 485m away, in combination with more general construction activity and earthworks. Given the addition of visible activities within the view, the magnitude of change is considered to be high.
- 9.4.110 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.111 At night, continuous lighting is proposed at the Radstone Road overbridge satellite compound. Given that intervening landform and field boundary vegetation will filter or partially screen views, the magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 188.3.001: View looking west from PRow south-east of Radstone (located on PRow AX/012)

- 9.4.112 The construction of the Proposed Scheme will cross this view around 500m from the viewpoint. High levels of existing intervening vegetation such as the well vegetated dismantled railway and field boundary vegetation will filter and screen views towards the Proposed Scheme. Construction activities visible in the middle ground will include a PRow overbridge (Footpath AX15 overbridge) approximately 495m away and Bridleway AX16 accommodation overbridge (approximately 765m away and oblique views to the west of the re-alignment of Radstone Road over the Proposed Scheme approximately 750m away (Radstone Road overbridge and associated Footpath AX7 re-alignment) in combination with more general construction activity and earthworks. A temporary material stockpile up to 5m in height (approximately 700m away) and a temporary site access haul road will be located to the west of the viewpoint, though partially filtered by intervening vegetation. The magnitude of change is considered to be medium.
- 9.4.113 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 188.3.002: View looking south-west from PRow north-east of Radstone (located on PRow AX/009)

- 9.4.114 The Proposed Scheme will cross this view around 1.5km from the viewpoint. Construction activities visible in the background will include the bridleway overbridge (Bridleway AX16 accommodation overbridge) to the south-west of the viewpoint approximately 1.6km away, the PRow overbridge (Footpath AX15 overbridge) to the

south-west approximately 1.5km away and oblique views of the Radstone Road overbridge and Footpath AX7 re-alignment (both approximately 1.5km away) and the associated Radstone Road overbridge satellite compound to the west approximately 1.65km away, in combination with more general construction activity and earthworks. To the west, a temporary material stockpile with a maximum height of 5m approximately 1.66km away and a temporary site access haul road will be visible. The high levels of intervening vegetation associated with the stream and dismantled railway, along with curtilage vegetation associated with Radstone will partially filter views and as a consequence, the magnitude of change is considered to be medium.

- 9.4.115 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects.

Viewpoint 189.3.003: View looking north-east from PRow east of Halse (located on PRow AX/001)

- 9.4.116 The construction of the Proposed Scheme will cross this view around 55m from the viewpoint. Intervening field boundary vegetation will be removed to enable construction resulting in more open views. Construction activities visible in the foreground will include a PRow overbridge (Bridleway AX18 accommodation overbridge along with Footpath AX5 and Bridleway AX19 re-alignments) both approximately 460m away, in combination with more general construction activity and earthworks. A temporary material stockpile up to 5m in height (approximately 55m away) and a temporary site access haul road will be visible to the east of the viewpoint in front of the construction activity. Given the open views of construction activities, the magnitude of change is considered to be high.
- 9.4.117 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.

Viewpoint 190.2.002: View looking south-west from a minor road on the western edge of the village of Radstone

- 9.4.118 The construction of the Proposed Scheme will cross this view around 45m from the viewpoint. Existing vegetation along Radstone Road and field boundary vegetation will be generally removed to enable construction. Any vegetation that is retained in the immediate foreground will filter views. Construction activities visible in the foreground and middle ground will include the Radstone Road re-alignment over the Proposed Scheme (Radstone Road overbridge and Footpath AX7 re-alignment approximately 750m away) and a PRow overbridge (Bridleway AX18 accommodation overbridge along with Footpath AX5 and Bridleway AX19 re-alignments, approximately 45m away), in combination with more general construction activity and earthworks. However, given the substantial changes within close proximity to the viewpoint within the direct field of view and the elevation of the realigned route of Radstone Road, the magnitude of change is considered to be high.
- 9.4.119 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.
- 9.4.120 At night, continuous lighting is proposed at the Radstone Road overbridge satellite compound. Given the screening and filtering effects of intervening vegetation, the

magnitude of change to this receptor at night is considered to be medium, resulting in moderate adverse effects.

Viewpoint 190.3.002: View looking north-west from Radstone Road, north of Radstone

- 9.4.121 The construction of the Proposed Scheme will cross this view around 255m from the viewpoint. Existing roadside vegetation will be retained, however intervening field boundary vegetation will be removed resulting in generally open views. There will be oblique views to the south of the Radstone Road re-alignment over the Proposed Scheme approximately 270m away (Radstone Road overbridge and Footpath AX7 re-alignment) and a bridleway and PRow overbridge approximately 255m away (Bridleway AX18 accommodation overbridge and Footpath AX5 re-alignment). Oblique views to the north will include views of the Footpath AN22 accommodation overbridge approximately 900m away in combination with more general construction activity and earthworks. A temporary material stockpile up to 5m in height and approximately 480m away as well as a temporary site access haul road will be located to the west of the viewpoint and will be visible behind the construction activity. Overall, the magnitude of change is considered to be high.
- 9.4.122 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects.

Cumulative effects

- 9.4.123 Section 2.1 and Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the construction of the Proposed Scheme. The consequential cumulative effect of these developments on LCA and viewpoints is described below. These developments are shown in Maps CT-13-031 to CT13-035 (Volume 5, Cross Topic Appendix 1 Map Book).
- 9.4.124 Due to the combined presence of construction activity and plant at the Proposed Scheme and the Finmere Quarry western extension extraction and restoration development, the barn development at Westbury and the Brackley Sawmills residential development, effects on the following receptors, which are significant when considering the construction of the Proposed Scheme on its own, would be exacerbated:
- Shelswell and Turweston Wooded Estate lands and Farmland Plateau LCA (Finmere Quarry);
 - viewpoints associated with isolated properties and PRow north of Newton Purcell (Finmere Quarry);
 - viewpoints on the north-western edge of the settlement of Westbury and adjacent PRow (barn development);
 - viewpoints on the north-eastern edge of Brackley (Brackley Sawmills residential development); and

- viewpoints on the A43 Oxford Road (Brackley Sawmills residential development).

9.4.125 In this area there are no known instances where receptors that will not be significantly affected by the construction of the Proposed Scheme on its own, will be significantly adversely affected by the combined presence of construction activity and plant from the surrounding developments.

Other mitigation measures

9.4.126 To further reduce the significant effects described above, consideration of where planting can be established early in the construction programme will be given during the detail design stage. This may include consideration of early planting in ecological mitigation sites that would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be practicably mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. Therefore, no other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

9.4.127 These effects will be temporary and reversible in nature lasting only for the duration of the construction works. Any residual effects will generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed from surrounding residential receptors, and users of PRow and main roads within the study area.

9.5 Permanent effects arising during operation

9.5.1 The specific elements of the Proposed Scheme that have been taken into account in determining the effects on landscape and visual receptors include:

- A4421 Buckingham Road highway embankment and overbridge at Newton Purcell;
- cutting between the A421 London Road and Mixbury;
- Westbury viaduct;
- cutting between Westbury and Turweston;
- Turweston green overbridge;
- Turweston viaduct;
- the re-aligned A43 Oxford Road;
- cutting between the A43 Oxford Road and Radstone;
- Radstone Road highway embankment and overbridge;
- footpath and bridleway overbridges along the length of the Proposed Scheme within the extent of the study area;

- earthworks cuttings and embankments generally along the length of the Proposed Scheme; and
- change in land use due to severance of agricultural land along the length of the Proposed Scheme (see Section 3).

Avoidance and mitigation measures

9.5.2 The operational assessment of impacts and effects is based on year 1 (2026), year 15 (2041) and year 60 (2086) of the Proposed Scheme. A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that have been incorporated into the design of the Proposed Scheme include:

- embankment and cuttings, both for the route of the Proposed Scheme and highway re-alignments, have been shaped so as to integrate the Proposed Scheme into the character of the surrounding landscape. Planting will reflect tree and shrub species native to the UK and characteristic of the local LCA;
- where it is considered that a noise fence barrier will create a visual impact on neighbouring residential properties, a landscape bund will be provided where reasonably practicable;
- balancing ponds will be integrated into the landscape to alleviate flooding and also provide opportunities for biodiversity; and
- planting, including native broad-leaved woodland, shrub and hedgerows, will be implemented along various sections of the Proposed Scheme to screen it from neighbouring residential properties and users of adjacent PRow and to aid integration of the Proposed Scheme into the landscape. Selection of species will take into account possible climate change impacts associated with the quality and availability of water and the potential increase in pests and diseases.

9.5.3 These measures have been taken account of in the assessment of the operational effects below.

Assessment of impacts and effects

9.5.4 The likely significant effects on the landscape character and viewpoints in operation will arise from:

- new engineered landforms cutting across the existing landscape;
- the introduction of new viaducts approximately 11m high⁷⁷ with associated infrastructure;
- the introduction of noise fence barriers that will create a manmade linear feature;
- permanent severance of land;

⁷⁷ Viaduct heights are given to rail level.

- the introduction of highway infrastructure into the rural environment, including road bridges;
- the introduction of overhead line equipment; and
- the introduction of regular high speed trains.

9.5.5 At a number of locations, views of the Proposed Scheme will be obscured by the rising landform, retention of intervening hedgerows and trees and the route of the Proposed Scheme within a cutting. Furthermore, effects will reduce over time as planting established as part of the Proposed Scheme matures.

Landscape assessment

9.5.6 This section describes the significant effects on LCA during year 1, year 15 and year 60 of operation. Non-significant effects on LCA are presented in Volume 5: Appendix LV-001-014 Part 4.

9.5.7 The assessment of effects in year 15 assumes proposed planting has grown by approximately 450mm a year (i.e. trees would be 7-7.5m high). The assessment of effects in year 60 assumes all planting has reached its fully mature height.

Shelswell and Turweston Wooded Estatelands and Farmland Plateau LCA

9.5.8 Approximately 6km of the route of the Proposed Scheme will run through the LCA between Newton Purcell in the south and Turweston. The route will pass through a cutting up to approximately 7m deep north of Newton Purcell, with an approximately 3m high false cutting on the western side. The cutting will then reduce in depth as it passes Widmore Farm before increasing again to a depth of approximately 10m where the route passes Mixbury. Between the viaducts at Westbury and Turweston, located within the adjacent Great Ouse Valley Farmlands LCA, the route will pass through a cutting up to approximately 20m deep and beneath a short section of green overbridge at Turweston. Effects on the landscape character of this LCA in year 1 of operation will include:

- engineered landforms of steep slopes cutting across the natural landform and uncharacteristic in the context of the adjacent landscape;
- introduction of overhead line equipment and trains visible where located in shallow cutting, which introduces additional infrastructure within a largely rural context;
- introduction of elevated structures in the landscape including two pedestrian overbridges and four road overbridges;
- introduction of noise fence barriers as a distinct linear feature, contrasting with the natural landscape; and
- permanent severance of agricultural land in places, within a general presumption for farmland to be reinstated and returned to agricultural use.

9.5.9 There will be a reduction in tranquillity as a result of the visual interruption and noise caused by passing trains in the predominantly rural context.

- 9.5.10 Overall, the presence of rail infrastructure, landform and bridges, along with the movement and sound of trains, will result in a medium magnitude of change in year 1 of operation.
- 9.5.11 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation, which is considered to be significant.
- 9.5.12 Planting will have established sufficiently by year 15 of operation to integrate the Proposed Scheme more fully into the rural landscape, including through:
- reducing the influence of engineered landforms; and
 - partially screening overhead line equipment and trains on embankment or where located in shallow cutting.
- 9.5.13 By year 15 and beyond to year 60 of operation, although the movement and noise of the trains will remain present in the landscape, the maturity of planting established as part of the Proposed Scheme will result in greater landscape integration and reduce effects to be non-significant. This is reported in Volume 5: Appendix LV-001-014, Part 4.

The Great Ouse Valley Farmlands LCA

- 9.5.14 The route of the Proposed Scheme will run for approximately 2km within this LCA at Turweston and Westbury. The Proposed Scheme will pass through a cutting up to 7m deep. It will then emerge into the Great Ouse valley on an embankment up to approximately 10m high with approximately 3m high false cutting. The route will then cross an approximately 11m high viaduct before passing along an embankment up to approximately 10m high with approximately 3m high false cutting and entering a cutting approximately 20m deep. At the second crossing point of the River Great Ouse at Turweston, the Proposed Scheme will emerge from a section of cutting up to approximately 15m deep and cross an embankment up to approximately 9m, then high onto an approximately 10m high viaduct and then on to the adjoining embankment. Effects on the landscape character of this LCA in year 1 of operation will include:
- engineered landforms of steep slopes cutting across the natural landform and uncharacteristic in the context of the adjacent landscape;
 - introduction of overhead line equipment and trains visible on embankment or where located in shallow cutting, which introduces additional infrastructure within a largely rural context;
 - introduction of elevated structures in the landscape including two pedestrian overbridges and two viaducts;
 - introduction of balancing ponds within the river valley floodplain;
 - introduction of noise fence barriers as a distinct linear feature, contrasting with the natural landscape; and

- agricultural land either side of the Proposed Scheme will generally be reinstated and returned to agricultural use but there will be permanent severance of land, creating pockets of isolated farmland.

9.5.15 There will be a reduction in tranquillity as a result of the visual interruption and noise of passing trains in the predominantly rural context.

9.5.16 Overall, the presence of rail infrastructure, landform and bridges, along with the movement and sound of trains, will lead to a medium magnitude of change in year 1 of operation.

9.5.17 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation, which is considered to be significant.

9.5.18 Planting will have established sufficiently by year 15 of operation to integrate the Proposed Scheme more fully into the rural landscape, including through:

- reducing the influence of engineered landforms; and
- partially screening overhead line equipment and trains on embankment or where located in shallow cutting.

9.5.19 By year 15 and beyond to year 60 of operation, although the movement and noise of the trains will remain present in the landscape, the maturity of planting established as part of the Proposed Scheme will result in greater landscape integration and reduce effects to be non-significant. This is reported in Volume 5: Appendix LV-001-014, Part 4.

The Tove Catchment Undulating Claylands LCA

9.5.20 Approximately 4km of the route will pass between Turweston and Radstone up to the northern boundary of the area. After crossing the River Great Ouse at Turweston, the route will initially enter a cutting up to 7m deep. On passing the A43 Oxford Road, the cutting will deepen up to approximately 18m before reducing in depth to a short, approximately 3m high section of embankment at Radstone and then returning to a cutting up to approximately 7m deep. The engineered cutting and embankment profiles of the Proposed Scheme will, however, be locally modified to the south and west of Radstone with the additional enclosure afforded by approximately 5m high false cuttings. Effects on the landscape character of this LCA in year 1 of operation will include:

- engineered landforms of steep slopes cutting across the natural landform and uncharacteristic in the context of the adjacent landscape;
- introduction of elevated structures in the landscape including two pedestrian overbridges and two highway overbridges;
- introduction of noise fence barriers as a distinct linear feature, contrasting with the natural landscape; and

- agricultural land either side of the Proposed Scheme will generally be reinstated and returned to agricultural use but there will be permanent severance of land, creating pockets of isolated farmland.

- 9.5.21 Tranquillity will be reduced by the visual interruption and noise of trains in the predominantly rural context.
- 9.5.22 Overall, the presence of rail infrastructure, landform and bridges, along with the movement and sound of trains, will result in a medium magnitude of change in year 1 of operation.
- 9.5.23 The medium magnitude of change, assessed alongside the medium sensitivity of the character area, will result in a moderate adverse effect in year 1 of operation, which is considered to be significant.
- 9.5.24 Planting will have established sufficiently by year 15 of operation to integrate the Proposed Scheme more fully into the rural landscape, including through:
- reducing the influence of engineered landforms; and
 - partially screening overhead line equipment and trains on embankment or where located in shallow cutting.
- 9.5.25 By year 15 and beyond to year 60 of operation, although the movement and noise of the trains will remain present in the landscape, the maturity of planting established as part of the Proposed Scheme will result in greater landscape integration and reduce effects to be non-significant. This is reported in Volume 5: Appendix LV-001-014, Part 4.

Visual assessment

- 9.5.26 This section describes the significant effects on visual receptors during year 1, year 15 and year 60 of operation. Non-significant effects on visual receptors are presented in Volume 5: Appendix LV-001-014 Part 4.
- 9.5.27 For each viewpoint the following assessments have been undertaken:
- effects during winter of year 1 of operation;
 - effects during summer of year 1 of operation;
 - effects during summer of year 15 of operation; and
 - effects during summer of year 60 of operation.
- 9.5.28 Where significant effects have been identified, an assessment of effects at night time arising from additional lighting has also been undertaken.
- 9.5.29 The number identifies the viewpoint locations that are shown in Maps LV-08-051 to LV-08-056 (Volume 5, Landscape and Visual Assessment Map Book). In each case, the middle number (xxx.x.xxx) identifies the type of receptor that is present in this area – 2: Residential, 3: Recreational, 4: Transport.

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

Viewpoint 167.2.001: View looking east from PRow adjacent to residential properties on the southern edge of Newton Purcell (located on PRow 308/3/10)

9.5.31 The Proposed Scheme, including the tracks, track bed, trains, noise fence barriers and overhead line equipment will be visible in the background, approximately 600m from the viewpoint. The loss of vegetation removed along the dismantled railway during construction will be apparent in the background of the view. Retained intervening hedgerows and buildings associated with Newton Purcell will partially screen views of the lower elements of the Proposed Scheme. Oblique views to the left of the A4421 Buckingham Road re-alignment will be screened and filtered in places by vegetation and buildings associated with Newton Purcell. Overall, the magnitude of change is considered to be medium.

9.5.32 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.

9.5.33 During the summer, due to the limited level of vegetation remaining along the dismantled railway following construction, the magnitude of change is considered to be medium, resulting in a moderate adverse effect.

9.5.34 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 169.2.001: View looking north-east from the A4421 Buckingham Road adjacent to residential properties near Station House, Newton Purcell

9.5.35 The noise fence barriers will be visible in the middle to background extent of view, within approximately 200m of the viewpoint. Footpath BHA/2 overbridge will be visible in the background to the right of view, approximately 400m from the viewpoint. The loss of vegetation removed during construction along the dismantled railway and A4421 Buckingham Road roadside will be apparent in the middle ground of the view. The A4421 (A4421 Buckingham Road overbridge) will also be a perceptible component of the foreground to middle ground extent of view, immediately beyond the line of site to the left of the viewpoint. Overall, the magnitude of change is considered to be high.

9.5.36 The winter view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-089 (Volume 2, CFA14 Map Book).

9.5.37 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in major adverse effects in the winter of year 1 of operation.

- 9.5.38 During the summer, due to the limited level of vegetation along the dismantled railway and A4421 Buckingham Road roadside following construction, the magnitude of change is considered to be high, resulting in a major adverse effect.
- 9.5.39 By year 15 of operation, hedgerow planting along the line of the route north of the A4421 Buckingham Road will have matured, contributing to screening of views of the Proposed Scheme. Therefore, the magnitude of change will reduce to medium and a moderate adverse effect will remain, which is considered to be significant.
- 9.5.40 The summer view of the Proposed Scheme from this location during year 15 of operation is illustrated on the photomontage shown in Figure LV-01-240 (Volume 2, CFA14 Map Book).
- 9.5.41 By year 60 of operation, hedgerow planting along the line of the route north of the A4421 Buckingham Road will have matured, contributing to a screening effect. Therefore, the assessment will reduce and a moderate adverse effect will remain.

Viewpoint 169.3.002: View looking east from PRow north of Newton Purcell (located on PRow 308/7/40)

- 9.5.42 Taller elements of the Proposed Scheme including the noise fence barriers, trains and overhead line equipment will be visible towards the middle ground of the view, approximately 400m from the viewpoint. The loss of vegetation along the dismantled railway during construction will be apparent in the middle ground of the view. The re-alignment of the A4421 Buckingham Road over the Proposed Scheme (A4421 Buckingham Road overbridge) and the Bridleway 213/7 overbridge will be prominent in views to the southeast and north-east and will appear as a new element in the landscape. An approximately 3m high bund will be located to the north of the A4421 Buckingham Road, with a hedgerow planted along the length of the top of the bund, in combination with retained field boundary vegetation in the foreground, will screen views of the lower elements of the Proposed Scheme. The planted hedgerow, at year 1, will have yet to mature and will contribute little to screening. Overall, the magnitude of change is considered to be medium.
- 9.5.43 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.44 During the summer, the intervening field boundary vegetation will further screen the lower elements of the Proposed Scheme. However, despite the enhanced screening, the magnitude of change is considered to remain medium and as such will also result in moderate adverse effects.
- 9.5.45 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 170.2.001: View looking south-west from Barley Fields residential property on the A4421 Buckingham Road, north of Newton Purcell

- 9.5.46 The majority of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers), will be visible towards the middle ground of the viewpoint

(approximately 100m). The loss of vegetation along the dismantled railway during construction will be visible in the foreground and middle ground extent of view. The A4421 Buckingham Road re-alignment will be visible in the immediate foreground (approximately 50m away). A screen bund will be located directly south of the viewpoint on both sides of the Proposed Scheme, screening lower elements of the Proposed Scheme in this direction. Overall, the magnitude of change is considered to be high.

- 9.5.47 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.
- 9.5.48 The winter view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-090 (Volume 2, CFA14 Map Book).
- 9.5.49 During the summer, views will be considered to remain similar due to the limited levels of vegetation that will be likely to be retained following construction. The magnitude of effect is considered to remain high and as such will also result in a major adverse effect.
- 9.5.50 By year 15 of operation, there will be a noticeable change in the view as a result of maturing vegetation. Therefore, the assessment will reduce to medium, resulting in a moderate adverse effect.
- 9.5.51 The summer view of the Proposed Scheme from this location during year 15 of operation is illustrated on the photomontage shown in Figure LV-01-241 (Volume 2, CFA14 Map Book).
- 9.5.52 By year 60 of operation, the maturity of vegetation will contribute further to screening of the view. The magnitude of change will however remain medium, resulting in a moderate adverse effect.

Viewpoint 170.2.002: View looking west from the entrance to Boundary Farm, on the A4421 Buckingham Road north of Newton Purcell

- 9.5.53 The majority of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible towards the middle to background of the viewpoint, approximately 700m from the viewpoint. The loss of vegetation along the dismantled railway during construction will be visible in the middle ground of the view; however retained field boundary hedgerows will be present in the foreground. The re-alignment of the A4421 Buckingham Road over the Proposed Scheme (A4421 Buckingham Road overbridge) will be prominent in the middle to background to the south. Views of the Bridleway 213/7 overbridge will also be available to the north-east, which will appear as a new element in the landscape. A screen bund will be located directly south of the viewpoint. A hedgerow will be located along the length of the top of the bunding, however, at year 1 will have yet to mature and will contribute little to screening. Overall, the magnitude of change is considered to be high.
- 9.5.54 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.55 During the summer, existing field boundary vegetation will further screen views of the Proposed Scheme, particularly the lower elements such as the tracks and trains. However, the magnitude of effect is considered to remain high resulting in a major adverse effect.

9.5.56 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 171.2.001: View looking north-east from Widmore Farm, west of Finmere

9.5.57 The Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible towards the fore to middle ground (approximately 100m from the viewpoint). The loss of vegetation along the dismantled railway during construction will be visible in the fore to middle ground of the view, however retained field boundary hedgerows will be present in the immediate foreground. The A421 London Road overbridge and the Bridleway 213/4 accommodation overbridge will be prominent in the middle ground to the north-east. A screen bund will be located directly to the east of the viewpoint, screening lower elements of the Proposed Scheme. Hedgerow planting will be located to the east and west of the Proposed Scheme, but at year 1 will have yet to mature and will contribute little to screening. Overall, the magnitude is considered to be high.

9.5.58 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.59 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain high resulting in a major adverse effect.

9.5.60 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 172.4.001: View looking west from the A421 London Road near entrance to Finmere Quarry

9.5.61 The Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible towards the middle ground (approximately 500m from the viewpoint). The loss of vegetation along the dismantled railway during construction will be visible in the middle ground of the view, however retained roadside vegetation will be present in the immediate foreground and will contribute to partial filtering of views. The A421 London Road overbridge and the Bridleway 213/4 accommodation overbridge will be prominent in the middle ground to the west. Hedgerow planting will be located to the east and west of the Proposed Scheme, but at year 1 will have yet to mature and will contribute little to screening. Overall, the magnitude is considered to be high.

9.5.62 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation. During the summer, intervening field boundary and roadside vegetation will further filter and screen views of the Proposed Scheme.

9.5.63 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will further reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 173.2.002: View looking east from dismantled railway overbridge on Featherbed Lane, east of Mixbury

9.5.64 There will be open views of the Proposed Scheme in the foreground, including the new Featherbed Lane overbridge over the Proposed Scheme (approximately 50m away). The loss of vegetation along the dismantled railway during construction will be visible in the foreground of the view, resulting in open views towards the Proposed Scheme. The Featherbed Lane overbridge will be prominent in the foreground of the view and will appear as a new element in the landscape. The overhead power line pylon will appear in its relocated position to the east of Featherbed Lane overbridge. Hedgerow planting north of the Featherbed Lane overbridge on both sides of the Proposed Scheme will have yet to mature and will contribute little to screening at year 1 of operation. Overall, the magnitude is considered to be high.

9.5.65 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.66 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain high and as such will also result in a major adverse effect.

9.5.67 By year 15 and beyond to year 60 of operation, planting will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 173.2.003: View looking north-east from Featherbed Lane adjacent to Mixbury Lodge Farm

9.5.68 An approximately 6.5m to 9m deep cutting will screen the lower elements of the Proposed Scheme and passing trains. The roofs of trains, overhead line equipment and noise fence barriers will, however, be visible in the middle ground. This will be located approximately 500m away from the viewpoint, within an open extent of view towards the Proposed Scheme. The loss of vegetation along the dismantled railway during construction will increase the sense of openness. Hedgerow planting will be located to both sides of the Proposed Scheme north of Oaks Farm and south of Featherbed Lane overbridge, but at year 1 will contribute little to screening. Overall, the magnitude of change is considered to be medium.

9.5.69 The winter view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-092 (Volume 2, CFA14 Map Book).

9.5.70 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.71 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain medium and as such will also result in a moderate adverse effect.

9.5.72 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 173.4.001: View looking east from the A421 London Road, adjacent to the entrance to Oaks Farm, west of Finmere

9.5.73 The absence of vegetation removed along the dismantled railway during construction will be noticeable in the foreground to middle ground of the view, resulting in open views towards the Proposed Scheme. The majority of the Proposed Scheme, including the trains, overhead line equipment and noise fence barriers will be visible in the foreground, approximately 300m away. The depth of the cutting at this point will vary between approximately 6m and 7m, resulting in the lower elements such as the tracks being screened. The re-alignment of the A421 London Road over the Proposed Scheme (A421 London Road overbridge) and oblique views to the north of the Featherbed Lane overbridge, although located to the south of the viewpoint, will be prominent in the middle ground to the south of the viewpoint. Linear planting will be located along the sides of the A421 London Road overbridge and to both sides of the Proposed Scheme north of A421 London Road overbridge and south of Featherbed Lane overbridge, however will contribute little to screening in year 1 of operation. Overall, the magnitude of change is considered to be high.

9.5.74 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.75 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain medium and as such will also result in a moderate adverse effect.

9.5.76 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 174.2.001: View looking west from Warren Farm, west of Finmere

9.5.77 The Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible in the middle ground of the view (approximately 450m from the viewpoint). Intervening vegetation associated with the gardens of the Warren Farm properties and field boundary hedgerows and trees will contribute to a filtering effect of the Proposed Scheme. The permanent re-alignment of the A421 (A421 London Road overbridge) to the south-west of the viewpoint will introduce a prominent feature into oblique views. Hedgerow planting will be located to both sides of the A421 London Road overbridge and south of the Featherbed Lane overbridge, however

this will contribute little to screening at year 1 of operation. Therefore, the magnitude of change is considered to be medium.

9.5.78 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.79 During the summer, there will be an enhanced screening effect due to the vegetation associated with the gardens of the properties. Therefore, the magnitude of change is assessed to be medium, giving rise to a moderate adverse effect.

9.5.80 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 175.3.001: View looking east from the PRoW to the north-east of the settlement of Mixbury (located on PRoW 303/22/20)

9.5.81 The Proposed Scheme including the tracks, track bed, trains, overhead line equipment and noise fence barriers will be visible towards the middle ground of the view, approximately 300m away. Approximately 3m high earth bunds will be located on both sides of the Proposed Scheme north of Bridleway 303/4 overbridge, screening the lower elements of the Proposed Scheme such as tracks and track bed in views to the north-east. Little intervening vegetation will remain following construction. The depth of the cutting at this point will vary from approximately 5m to 7m depth, 10m below the height of the viewpoint, screening all but the taller elements of the Proposed Scheme. The re-alignment of Bridleway 303/04 and the associated new Bridleway 303/4 overbridge will result in a permanent visual feature in the middle ground to the east of the viewpoint. Hedgerow planting located on both sides of the Proposed Scheme south of Bridleway 303/4 overbridge will contribute little to screening in year 1 of operation. Overall, the magnitude of change is considered to be high.

9.5.82 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.83 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain high and as such will also result in a major adverse effect.

9.5.84 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 176.2.002: View looking west from Fulwell Road south of Westbury adjacent to residential properties at the Old Barn on Fulwell Hill

9.5.85 There will be glimpsed views of the upper elements of the Proposed Scheme including the trains, overhead line equipment and noise fence barriers in the middle ground, approximately 1.3km from the viewpoint. Views of the upper elements of Westbury viaduct may also be available in oblique views. Elements visible in the middle ground

will include the Bridleway 303/4 overbridge and the Westbury Circular Ride re-alignment. The high levels of intervening vegetation, including the numerous small blocks of deciduous woodland and the hedgerow and tree field boundaries, will contribute to screening and filtering views of the Proposed Scheme. In addition, earth screen bunding (approximately 3m high) with planting will be located to the east and west of the Proposed Scheme, to the south of Westbury viaduct, which will screen views of the lower elements of the Proposed Scheme. Overall, the magnitude of change is considered to be medium.

9.5.86 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.87 During the summer, intervening woodland blocks, field boundary vegetation and vegetation along the dismantled railway will further screen views. However, this will not be sufficient to reduce the assessment. Therefore, the magnitude of change will be medium, resulting in a moderate adverse effect.

9.5.88 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 177.3.001: View looking east from a PRow north of Mixbury (located on PRow AK/016)

9.5.89 The upper elements of the Proposed Scheme (the trains, overhead line equipment and the noise fence barriers) will be visible in the middle ground of the view (approximately 90m). Extensive intervening vegetation will partially screen views of the Proposed Scheme. In addition, an approximately 3m high bund located on both sides of the Proposed Scheme south of the Westbury viaduct, will also contribute to screening of the lower elements of the Proposed Scheme and the viaduct. The height of embankment will vary between approximately 4.5m and 11.5m. Dispersed planting and enhanced existing vegetation will be located to the east side of the Proposed Scheme in the floodplain, but will contribute little towards screening in year 1 of operation. The Westbury viaduct over the River Great Ouse will result in a permanent visual feature in the middle ground to the east of the viewpoint. Overall, the magnitude of change is considered to be medium.

9.5.90 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in winter of year 1 of operation.

9.5.91 During the summer, there will be some enhanced screening to elements viewed to the east and south-east, however the viaduct will still remain visible. Despite this enhanced screening, the magnitude of change is assessed to be medium, resulting in a moderate adverse effect.

9.5.92 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 177. 3.002: View looking east from a PRow south-west of Westbury

- 9.5.93 The upper elements of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible in the middle ground of the viewpoint (approximately 350m). The height of the embankment and the viaduct at this point will vary between approximately 7m and 11.5m. The high levels of surrounding vegetation will partially screen views to the east and south-east. In addition, earth bunds, approximately 3m in height with planting located to both sides of the Proposed Scheme, north and south of Westbury viaduct, will also contribute to a screening effect of the lower elements of the Proposed Scheme and the viaduct. Dispersed planting and enhanced existing vegetation will be located to the east of the Proposed Scheme, on the floodplain adjacent to Westbury viaduct. However, the planting will contribute little to screening at year 1 of operation. However, the viaduct over the River Great Ouse (Westbury viaduct) will result in a permanent visual feature in the middle ground of the viewpoint. Overall, the magnitude of change is considered to be high.
- 9.5.94 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in winter of year 1 of operation.
- 9.5.95 During the summer, there will be some enhanced screening to elements viewed to the east and south-east, however the viaduct will still remain visible. Despite this enhanced screening, the magnitude of change is assessed to be high, resulting in a major adverse effect.
- 9.5.96 By year 15 of operation, tree and shrub planting on the embankments to either side of Westbury viaduct will have matured, contributing an enhanced screening effect, however views of the viaduct structure itself will still be possible. Therefore, the magnitude of change will reduce to medium, resulting in a moderate adverse effect.
- 9.5.97 By year 60 of operation, the increased maturity of tree and shrub planting on the embankments to either side of Westbury viaduct will contribute further to screening, however the viaduct will still be visible. Therefore, the magnitude of effect will remain medium, resulting in a moderate adverse effect, which is considered to be significant.

Viewpoint 178.2.002: View looking west from PRow adjacent to residential properties on the north-western edge of Westbury, and the A422 Brackley Road (located on PRow WBB/17/1)

- 9.5.98 The upper elements of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible in the middle ground of the viewpoint, along with Westbury viaduct, the Westbury Circular Ride re-alignment and the three balancing ponds in the vicinity of the viaduct (approximately 800m away). The height of the embankment and viaduct at this point will vary between approximately 6.5m and 11.5m. The relatively high density of intervening vegetation (including an existing young tree plantation that will have matured by the time of operation) will contribute notable screening effects. In addition, screening will be provided by an approximately 3m high earth bund located to the west and east of the Proposed Scheme, screening views of the lower elements of the route, along with an area of dispersed planting and enhanced existing vegetation. However, the viaduct

over the River Great Ouse will result in a permanent visual feature in the middle ground of the view. Overall, the magnitude of change is considered to be medium.

- 9.5.99 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.100 During the summer, the high levels of surrounding vegetation will further screen views of the Proposed Scheme. However, the viaduct will remain visible through the vegetation, therefore the magnitude of change is assessed to be medium, resulting in moderate adverse effects.
- 9.5.101 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 178.2.003: View looking south-west from the A422 Brackley Road adjacent to residential properties on the north-western edge of Westbury

- 9.5.102 The upper elements of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible in the middle to background of the viewpoint (approximately 1km away). The height of the embankment and the viaduct at this point will vary between approximately 6.5m and 11.5m. Earth bunds, approximately 3m high with planting will be located to the east and west of the Proposed Scheme, south and north of Westbury viaduct. In addition, an area of proposed planting will be located within the floodplain, along with enhancement of intervening existing hedgerows with additional hedgerow trees. However, the planting at year 1 will have yet to mature and will contribute little to screening. Overall, the magnitude of change is considered to be medium.
- 9.5.103 The winter view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-093 (Volume 2, CFA14 Map Book). It should be noted that whilst the timber barns within the extent of photomontage view partly obscure views of the viaduct, views from either side of the viewpoint experience more open views. The assessment therefore reflects the potential worst case visibility from this location.
- 9.5.104 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.105 During the summer, there will be an enhanced screening effect due to the high levels of surrounding vegetation. However, the viaduct will remain visible through and above the vegetation; therefore the magnitude of change is assessed to be medium, resulting in a moderate adverse effect.
- 9.5.106 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 179.2.001: View looking east from Grovehill Farm

- 9.5.107 The elements of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be screened within cutting in the middle ground extent of the viewpoint (approximately 300m). The depth of the cutting will vary between approximately 9m and 20m. The high density of vegetation immediately adjacent to the property, the roadside vegetation associated with the A422 Brackley Road, and field boundary vegetation and deep cutting will all contribute to screening views of the Proposed Scheme. Earth screen bunds approximately 3m high with planting will be located on the east and west sides of the Proposed Scheme, north of Westbury viaduct, which will also contribute to screening lower elements. However the upper elements of the permanent road re-alignment of the A422 (A422 Brackley Road overbridge) over the Proposed Scheme and a PRoW re-alignment (Footpath WBB/17 accommodation overbridge) to the east of the viewpoint, will be visible and will result in permanent visual features in the middle ground of the viewpoint. Hedgerow planting to the east and west of the Proposed Scheme will be located north of the Footpath WBB/17 accommodation overbridge, however at year 1, will have yet to mature and will contribute little to screening. Given the partial alteration in the composition of the view, the magnitude of change is considered to be medium.
- 9.5.108 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.109 During the summer, there will be enhanced screening due to the high levels of vegetation surrounding the receptor property and intervening vegetation along field boundaries and the A422 Brackley Road roadside. Despite the enhanced screening, the magnitude of change is assessed to be medium, resulting in moderate adverse effects.
- 9.5.110 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 181.2.004: View looking east from a minor road on the eastern edge of Turweston

- 9.5.111 Elements of the Proposed Scheme (including the trains, overhead line equipment and general extents of cutting landform) will be screened behind the foreground noise fence. The engineered highway and fencing associated with the Turweston green overbridge will be defining components of the foreground of the view. The loss of vegetation as an outcome of construction will result in an open view. The diversion of an overhead power line to an alignment west of the Proposed Scheme will remove the existing pylon and power lines from the extent of view. Hedgerow planting will be located to the east and west of the Proposed Scheme, however at year 1, will have yet to mature and will contribute little to screening. On the basis of the above, the magnitude of change is considered to be high.
- 9.5.112 The winter view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-094 (Volume 2, CFA14 Map Book).

- 9.5.113 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.
- 9.5.114 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain high and as such will result in a major adverse effect.
- 9.5.115 By year 15 and beyond to year 60 of operation, there will be limited change in the view as a result of maturing vegetation. Therefore, the assessment remains unchanged and a moderate adverse effect will remain.

Viewpoint 183.2.002: View looking north-east from the PRow leading to Versions Farm, south of the A43 Oxford Road (located on PRow BD/010)

- 9.5.116 The upper elements of the Proposed Scheme (trains and overhead line equipment) will be visible in the background of the view (approximately 300m). Intervening field boundary vegetation will screen and filter views towards the Proposed Scheme. The embankment and cutting will vary from approximately 2m high to approximately 7m deep, screening the lower elements of the Proposed Scheme such as the tracks and track bed. The A43 Oxford Road re-alignment (A43 Oxford Road overbridge) over the Proposed Scheme will result in a permanent visual feature in the background to the north-east of the view. The Turweston viaduct over the River Great Ouse and floodplain will be visible in oblique views to the south-east of the viewpoint. Given the partial alteration in the composition of the view, the magnitude of change is assessed to be medium.
- 9.5.117 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.118 During the summer, there will be some enhanced screening where field boundary and roadside vegetation was retained following construction. Despite the enhanced screening, the magnitude of change is considered to be medium, resulting in a moderate adverse effect.
- 9.5.119 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 183.2.003: View looking north-east from north-eastern edge of Turweston

- 9.5.120 The elements of the Proposed Scheme (including the trains, overhead line equipment and noise fence barriers) will be visible within the cutting within the foreground extents of the viewpoint, but will be screened within the wider area (approximately 200m). The depth of cutting at this point will vary between approximately 6m and 17m. Intervening field boundary vegetation will contribute to screening and filtering views of the Proposed Scheme. The Turweston green overbridge will result in a permanent visual feature in oblique views to the south-east of the viewpoint, and the Turweston viaduct will be visible in oblique views to the north of the viewpoint. The diversion of an overhead power line from the eastern to the western side of the Proposed Scheme will result in a new pylon located approximately 120m east of the

viewpoint and a closer proximity influence of power lines on the skyline. Planting will be located on both sides of the Turweston viaduct, along with enhancement of existing hedgerow vegetation and planting to the east and west sides of the Proposed Scheme will be located south of the Turweston viaduct, however at year 1 it will have yet to mature and will contribute little to screening. Due to the above, the magnitude of change is considered to be high.

9.5.121 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.122 During the summer, there will be some enhanced screening where field boundary vegetation was retained, along with vegetation associated with the curtilages of the residential properties. The magnitude of change is therefore considered to be medium, resulting in a moderate adverse effect.

9.5.123 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 183.3.003: View looking east from Turweston Road, adjacent to the entrance to Rachel’s Farm

9.5.124 The taller elements of the Proposed Scheme (such as the trains and the overhead line equipment) will be visible in the middle ground of the view (approximately 600m away). The cuttings and embankments associated with the track height will vary between approximately 6m deep and 9.5m high. The extensive cover of intervening vegetation including the riparian vegetation associated with the River Great Ouse, will result in partial screening of the Proposed Scheme. However, the approximately 9m high Turweston viaduct will result in a permanent visual feature in the middle ground of the viewpoint. Planting will be located on the embankments to the north and south Turweston viaduct, however at year 1 will have yet to mature and will contribute little to screening. Due to the above, the magnitude of change is considered to be medium.

9.5.125 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.126 During the summer, there will be insufficient intervening vegetation to contribute a notable screening effect. Therefore, the magnitude of change is assessed to be medium, resulting in a moderate adverse impact.

9.5.127 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 184.3.001: View looking west from PRow south-west of Whitfield (located on PRow TUW/7/01)

9.5.128 The Proposed Scheme (trains, overhead line equipment and track) will be intermittently visible in the foreground of the view (approximately 800m away). The height of embankment will vary from approximately 1.5m to 9.5m. Intervening field

boundary and woodland vegetation will screen and filter views towards the Proposed Scheme. The approximately 9m high Turweston viaduct, the new balancing ponds to the east and west sides of the Proposed Scheme and the A43 Oxford Road overbridge over the Proposed Scheme will result in a permanent visual feature to the south-west of the view, however intervening vegetation will contribute to the screening of views. Planting will be located on the north and south embankments of the Turweston viaduct, however at year 1 will not yet have matured and will contribute little to screening. Due to views of the Proposed Scheme being partially filtered by intervening vegetation, the magnitude of change is assessed to be medium.

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

9.5.130 During the summer, there will be an enhanced screening effect associated with field boundary vegetation, riparian vegetation associated with the River Great Ouse and intervening woodland blocks. However, this will be insufficient to reduce the magnitude of change, which is considered to be medium, resulting in a moderate adverse effect.

9.5.131 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 185.3.001: View looking north-east from PRoW north-east of Brackley (located on PRoW AX/016)

9.5.132 The elevated elements of the Proposed Scheme (trains and overhead line equipment) will be visible in the foreground of the view (approximately 100m away). The depth of cutting at this point will vary from approximately 7m to 18m, screening the lower elements of the Proposed Scheme such as the tracks and track bed in places. There will be little intervening vegetation to provide any screening. The permanent re-alignment of the A43 Oxford Road over the Proposed Scheme and the re-alignment of Bridleway AX16 (Bridleway AX16 accommodation overbridge) will result in permanent visual features in the foreground and middle ground to the east and south-east of the view and will appear as new features in the landscape. Hedgerow planting will be located to the east and west sides of the Proposed Scheme, north of the A43 Oxford Road, however at year 1, will have not yet matured and will contribute little to screening. Due to the addition of new features that will be highly visible, the magnitude of change is considered to be high.

9.5.133 The high magnitude of change assessed alongside the high sensitivity of the receptor will result in a major adverse effect in the winter of year 1 of operation.

9.5.134 During the summer, given the low levels of intervening vegetation, there will be little change in the view. Therefore, the magnitude of change is assessed as high, resulting in major adverse effects.

9.5.135 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme

including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 186.2.001: View looking west from north-eastern edge of Whitfield

- 9.5.136 The elevated elements of the Proposed Scheme (noise fence barriers, trains and overhead line equipment) will be visible in the background of the view (approximately 1.1km away). The depth of cutting at this point will vary between approximately 7m and 18m depth, screening the lower elements of the Proposed Scheme such as the tracks and track bed. The line will however emerge from cutting onto an approximately 9m high viaduct to cross the River Great Ouse (Turweston viaduct). Intervening vegetation associated with the curtilage of dwellings within Whitfield and along the A43 Oxford Road, will contribute some screening. Planting will be located on the north and south embankments of the viaduct, however at year 1 will not yet have matured and will contribute little to screening. The permanent re-alignment of the A43 Oxford Road over the Proposed Scheme (A43 Oxford Road overbridge) will result in a permanent visual feature in the middle ground to the west of the view, but will be screened behind existing A43 Oxford Road highway vegetation. Due to the substantial change being partially filtered by intervening vegetation, the magnitude of change is assessed to be medium.
- 9.5.137 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.138 During the summer, there will be enhanced screening in relation to intervening vegetation associated with the curtilage of properties within Whitfield and vegetation alongside the A43 Oxford Road. Despite the enhanced screening, the magnitude of change is considered to be medium, resulting in a moderate adverse effect.
- 9.5.139 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 186.2.002: View looking west from Radstone Road between the A43 Oxford Road and Radstone, adjacent to a newly constructed residential property

- 9.5.140 The elevated elements of the Proposed Scheme (including trains and overhead line equipment) will be screened within cutting within the background extents of view (approximately 500m away). The depth of cutting at this point will vary between approximately 7m and 18m. Intervening hedgerow vegetation will contribute to filtering views of the Proposed Scheme. The permanent realignment of the A43 Oxford Road over the Proposed Scheme (A43 Oxford Road overbridge) will result in a permanent visual feature in the middle ground of the view. Hedgerow planting will be located to the east and west sides of the Proposed Scheme, north of the A43. However, at year 1 it will have yet to mature and will contribute little to screening. Due to the substantial change being partially filtered by intervening landform, the magnitude of change is assessed to be medium.

- 9.5.141 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.142 There will be no change to the assessment during the summer, due to the low levels of intervening vegetation. Therefore, the magnitude of change is assessed as medium, resulting in moderate adverse effects.
- 9.5.143 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 186.3.001: View looking west from a PRoW between the A43 Oxford Road and Radstone, north of Fox Covert

- 9.5.144 The elevated elements of the Proposed Scheme (including trains and overhead line equipment) will be visible in oblique views in the middle ground of the viewpoint (approximately 300m away). The depth of the cutting at this point will vary between approximately 18m and 3m depth, along with approximately 3m high earth bunds to the east side of the Proposed Scheme, screening lower elements of the Proposed Scheme in places (such as the tracks and track bed). To the left of the view, Fox Covert will screen views towards the Proposed Scheme. The Bridleway AX16 accommodation overbridge will form a permanent visual feature in the middle ground of the view, introducing a new element into the landscape. Hedgerow planting will be located to both the east and west sides of the Proposed Scheme, north of the A43 Oxford Road, however at year 1 will have yet to mature and will contribute little to screening. Due to the above, the magnitude of change is considered to be medium.
- 9.5.145 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.146 During the summer, there will be some enhanced screening of the Proposed Scheme, however not to the west where little intervening vegetation exists, resulting in a medium magnitude of change and a moderate adverse effect.
- 9.5.147 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 186.4.003: View looking west from A43 Oxford Road at junction with Radstone Road

- 9.5.148 The elevated elements of the Proposed Scheme (including the trains and overhead line equipment) will be visible in the background of the view, directly along the route of the A43 Oxford Road (approximately 650m away). The depth of cutting at this point will vary between approximately 7m and 13.5m, screening the lower elements of the Proposed Scheme such as the tracks and track bed. The re-alignment of the A43 Oxford Road over the Proposed Scheme (A43 Oxford Road overbridge) will result in a permanent visual feature in the foreground of the view. Planting will be located to the east and west sides of the Proposed Scheme, north of the A43 Oxford Road, however at year 1 will have yet to mature and will contribute little towards screening. Due to

the addition of new features that will be highly visible, the magnitude of change is anticipated to be high.

9.5.149 The high magnitude of change assessed alongside the low sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.

9.5.150 During the summer, views remain similar due to the limited vegetation that will be retained following construction. The magnitude of change is considered to remain medium and as such will also result in a moderate adverse effect.

9.5.151 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 187.2.001: View looking east from Radstone Road adjacent to the residential property north of Hall Farm

9.5.152 The elevated elements of the Proposed Scheme (trains and overhead line equipment) will be visible in the middle ground of the view (approximately 200m away). The cutting and embankment at this point will vary between approximately 4m deep and approximately 3.5m high. The intervening vegetation will provide some screening of the lower elements of the Proposed Scheme such as the track bed and tracks. A PRoW overbridge (Footpath AX15 overbridge) will result in a permanent visual feature to the east of the view and will introduce a new element into the landscape. Hedgerow planting will be located to the east and west sides of the Proposed Scheme, to the north of the A43 Oxford Road, however at year 1 will have yet to mature and will contribute little towards screening. Due to the substantial change being partially screened by intervening landform and cutting, the magnitude of change is assessed to be medium.

9.5.153 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.154 During the summer, there will be some enhanced screening in relation to intervening vegetation such as roadside and field boundary hedgerows. Despite the enhanced screening, the magnitude of change is considered to be medium, resulting in a moderate adverse effect.

9.5.155 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 188.2.002: View looking west from the southern edge of the village of Radstone

9.5.156 The elevated elements of the Proposed Scheme (including, trains and overhead line equipment) will be visible in oblique views in the middle to background of the viewpoint (approximately 400m away). The height and depth of cutting and embankment at this point will vary between approximately 5.5m deep and approximately 3.5m high. In addition, earth bunding at approximately 5m high will be

included to both sides of the Proposed Scheme appearing in direct views from Radstone, screening views of the lower elements of the Proposed Scheme. Planting will also be located on both sides of the Proposed Scheme in the vicinity of Radstone, however at year 1 this will not yet have matured and will contribute little to screening. The Radstone Road re-alignment (Radstone Road overbridge along with Footpath AX7 re-alignment) over the Proposed Scheme and the PRow overbridge (Footpath AX15 overbridge) will result in permanent visual features in the middle to background of the view, introducing a new element to the landscape. Due views of the Proposed Scheme being partially filtered by intervening earth bunds, landform and vegetation, the change is considered to be medium.

- 9.5.157 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.158 During the summer, there will be some enhanced screening of the Proposed Scheme. Despite this enhanced screening, the magnitude of change is assessed to be medium, resulting in moderate adverse effects.
- 9.5.159 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 188.3.001: View looking west from PRow south-east of Radstone

- 9.5.160 The upper elements of the Proposed Scheme such as the trains and the overhead line equipment, will be visible in the middle ground of the view (approximately 500m). The depth and height of the cutting and embankment at this point will vary between approximately 6.5m deep and 3.5m high. The re-alignment of Radstone Road over the Proposed Scheme (visible in oblique views to the west of Radstone Road overbridge and associated Footpath AX7 re-alignment), along with the new PRow overbridges (Footpath AX15 overbridge and Bridleway AX16 accommodation overbridge), will result in permanent visual features in the middle ground of the view, introducing new elements to the landscape. Hedgerow planting will be located to the east and west sides of the Proposed Scheme, south of Radstone, and planting on the bunds on both sides of the Proposed Scheme west of Radstone, however at year 1 they will not yet be mature and will contribute little to screening. High levels of intervening vegetation will contribute screening, along with the presence of approximately 3m high earth screen bunds located to both the east and west of the Proposed Scheme, resulting in substantial change partially filtered by intervening vegetation and landform. Therefore, the magnitude of change is considered to be medium.
- 9.5.161 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.162 During the summer, the high levels of intervening vegetation will result in enhanced screening. The magnitude of change is considered to be medium, resulting in a moderate adverse effect.
- 9.5.163 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme

including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 188.3.002: View looking south-west from PRow north-east of Radstone (located on PRow AX/009)

- 9.5.164 The upper elements of the Proposed Scheme such as the trains and overhead line equipment, will be visible in the background of the view (approximately 1.5km). The height and depth of the cutting and embankment at this point will vary between approximately 14m depth and 3.5m height. The re-alignment of Radstone Road over the Proposed Scheme (Radstone Road overbridge and Footpath AX7 re-alignment), along with the new PRow overbridge (Footpath AX15 overbridge), will result in permanent visual features in the background of the view. However, high levels of intervening vegetation along with the presence of approximately 3m high earth screen bunds located to both the east and west of the Proposed Scheme, will partially filter views. Therefore, the magnitude of change is considered to be medium.
- 9.5.165 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.166 During the summer, the high levels of intervening vegetation will result in an enhanced screening effect. The magnitude of change is however considered to remain medium, resulting in a moderate adverse effect.
- 9.5.167 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 189.3.003: View looking north-east from PRow east of Halse (located on PRow AX/001)

- 9.5.168 The upper elements of the Proposed Scheme (trains and overhead line equipment) will be visible in the middle ground of the view (approximately 200m away). The depth of cutting at this point will vary from approximately 1m to 7m. Views will include oblique views of a PRow crossing (Bridleway AX18 accommodation overbridge including associated Footpath AX5 and Bridleway AX19 re-alignments), which will result in a permanent visual feature in the middle ground of the views. Approximately 3m high earth screen bunds will be located on the east and west side of the Proposed Scheme, which will contribute to screening of lower elements of the Proposed Scheme. Due to the substantial change being partially screened by intervening landform and bunding, the magnitude of change is assessed to be medium.
- 9.5.169 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in a moderate adverse effect in the winter of year 1 of operation.
- 9.5.170 During the summer, there will be an enhanced screening effect from the intervening field boundary vegetation. The magnitude of change is considered to be medium, resulting in a moderate adverse effect.
- 9.5.171 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme

including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Viewpoint 190.2.002: View looking south-west from a minor road on the western edge of the village of Radstone

- 9.5.172 The upper elements of the Proposed Scheme (including trains and overhead line equipment) will be visible in the middle ground of the view (approximately zoom away). The depth and height of cutting and embankment at this point will vary between approximately 6m depth and approximately 3.5m height, screening the lower elements in places, such as the tracks and track beds. Intervening field boundary and roadside hedgerows will contribute to screening of the Proposed Scheme. Approximately 3m high bunding will be located to both the east and west sides of the Proposed Scheme, contributing to screening of the lower elements of the Proposed Scheme. The Radstone Road re-alignment over the Proposed Scheme (Radstone Road overbridge and associated Footpath AX7 re-alignment) along with a PRow overbridge (Bridleway AX18 accommodation overbridge and associated Footpath AX5 and Bridleway AX19 re-alignments), will result in permanent visual features in the middle ground of the view, introducing new elements into the landscape. Given the partial alteration in the composition of the view, the magnitude of change is considered to be medium.
- 9.5.173 The medium magnitude of change assessed alongside the high sensitivity of the receptor will result in moderate adverse effects in the winter of year 1 of operation.
- 9.5.174 During the summer, there will be some enhancement of screening from any roadside vegetation retained following construction, however this will only be low and intermittent. Therefore, the magnitude of change is assessed to be medium, resulting in moderate adverse effects.
- 9.5.175 By year 15 and beyond to year 60 of operation, planting established as part of the Proposed Scheme will have matured, largely screening the Proposed Scheme including the overhead line equipment. This will reduce effects to being non-significant. This is reported in Volume 5: Appendix LV-001-014 Part 4.

Cumulative effects

- 9.5.176 Section 2.1 and Volume 5: Appendix CT-004-000 identify developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. These developments are shown in CT-13-031 to CT-13-035 (Volume 5, Cross Topic Appendix 1 Map Book) and listed in Volume 5: Appendix CT-004-000. It is considered that there are no cumulative effects of the Proposed Scheme in combination with any other committed development.

Other mitigation measures

- 9.5.177 The permanent effects of the Proposed Scheme on landscape and visual receptors have been substantially reduced through incorporation of the measures described previously. Effects in year 1 of operation may be further reduced by establishing planting early in the construction programme, which will be considered during the

detailed design stage. This would provide additional screening and greater integration of the Proposed Scheme into the landscape. No other mitigation measures are considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

Summary of likely residual significant effects

9.5.178 As no other mitigation measures are considered practicable, the permanent residual significant effects during operation remain as described above. In most cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following residual effects will remain following year 15 of operation:

- effects on views from the northern residential edge of Newton Purcell (receptor 169.2.001), residential properties at Barley Fields (170.2.001) and associated extents of the A4421 Buckingham Road, due to the influence of the A4421 Buckingham Road overbridge, noise fence barriers, trains and overhead line equipment;
- effects on views from PRow within the River Great Ouse Valley, including the Westbury Circular Ride (177.3.002) relating to views of Westbury viaduct and moving trains;
- effects on views from the minor road to Oatleys Hall (181.2.004) on the eastern edge of the settlement of Turweston;
- effects on views from PRow within the River Great Ouse Valley relating to views of Turweston viaduct and moving trains; and
- effects on users of PRow across parts of the study area, including the Westbury Circular Ride long distance trail, arising from the visibility of different elements of the Proposed Scheme including trains, noise fence barriers and overhead line equipment.

10 Socio-economics

10.1 Introduction

10.1.1 This section reports the likely significant economic and employment effects during the construction and operation of the Proposed Scheme.

10.1.2 The need for a socio-economic assessment results from the potential for the Proposed Scheme to affect:

- existing businesses and community organisations and thus the amount of local employment;
- local economies, including employment; and
- planned growth and development.

10.1.3 The beneficial and adverse socio-economic effects of the Proposed Scheme are reported at two different levels: route-wide; and CFA. Effects on levels of employment are reported at a route-wide level in Volume 3. Localised effects on businesses and observations on potential local economic effects are reported within each CFA report.

Construction

10.1.4 The proposed construction works will have the following relevance in terms of socio-economics provided in relation to:

- premises demolished, with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme; and
- potential employment opportunities arising from construction in the local area (including in adjacent CFA).

Operation

10.1.5 The operation of the Proposed Scheme will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

10.2 Scope, assumptions and limitations

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

10.3 Environmental baseline

Existing baseline

Study area description

10.3.1 Section 2 of this report provides a general overview of the Newton Purcell to Brackley area, which includes data of specific relevance to socio-economics notably

demographic and employment data. The following provides a brief overview in terms of employment, economic structure and the labour market within the area⁷⁸.

- 10.3.2 The Newton Purcell to Brackley area crosses three local authority boundaries: South Northamptonshire (Northamptonshire), Aylesbury Vale (Buckinghamshire) and Cherwell (Oxfordshire). Due to the geographic distribution of affected resources, the South Northamptonshire and Cherwell areas have been used as a basis for developing the environmental baseline.
- 10.3.3 Where possible, baseline data has been gathered on demographic character areas (DCA)⁷⁹ to provide a profile of local communities. Volume 5: Appendix SE-02-015 shows the location of these DCA. The area contains eight DCA; Finmere, Westbury, Turweston, Whitfield, Radstone, Newton Purcell, Mixbury and East Brackley.

Business and labour market

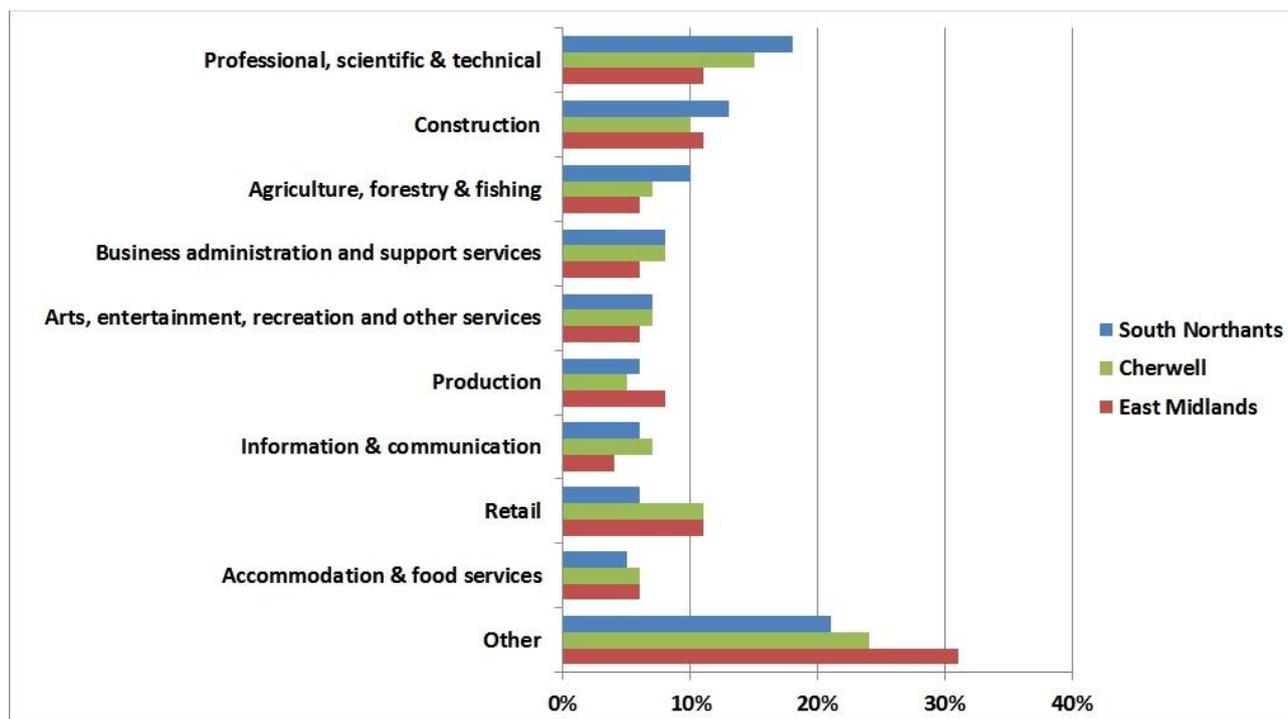
- 10.3.4 Within South Northamptonshire the professional, scientific and technical services sector accounts for the largest proportion of businesses (18%), with the construction (13%) and agriculture, forestry and fishing (10%) sectors also accounting for large proportions of businesses within the borough⁸⁰. Within Cherwell, the professional, scientific and technical services sector also accounts for the largest proportion of businesses (15%), with retail (11%) and construction (10%) also accounting for large proportions. For comparison, within the East Midlands region the professional, scientific and technical services sector also accounts for the largest number of businesses (11%), with construction (11%), retail (11%) and production (8%) sectors also accounting for relatively large numbers of businesses within the region. This is shown in Figure 7⁸¹.

⁷⁸ Further information on the socio-economics baseline in the area, including a business and labour market profile, is contained in Volume 5: Appendix SE-001-000.

⁷⁹ DCA have been determined through an understanding of local context and aim to be aligned as closely as possible to groups of lower super output areas (LSOAs).

⁸⁰ Office for National Statistics (ONS) (2011), *UK Business: Activity, Size and Location*, ONS, London. Please note 2011 data have been presented to provide an appropriate comparison with 2011 Census data.

⁸¹ The Figure presents the proportion of businesses within each business sector in the district but not the proportion of employment by sector.

Figure 7: Business sector composition in South Northamptonshire and the East Midlands^{82 83}

10.3.5 Approximately 28,000 people⁸⁴ worked in South Northamptonshire while 200 people worked within Westbury DCA, 100 each within Finmere, Turweston, Whitfield and Mixbury DCA and 3,800 within East Brackley DCA. Fewer than 100 jobs were recorded as being located within Radstone DCA and Newton Purcell DCA.

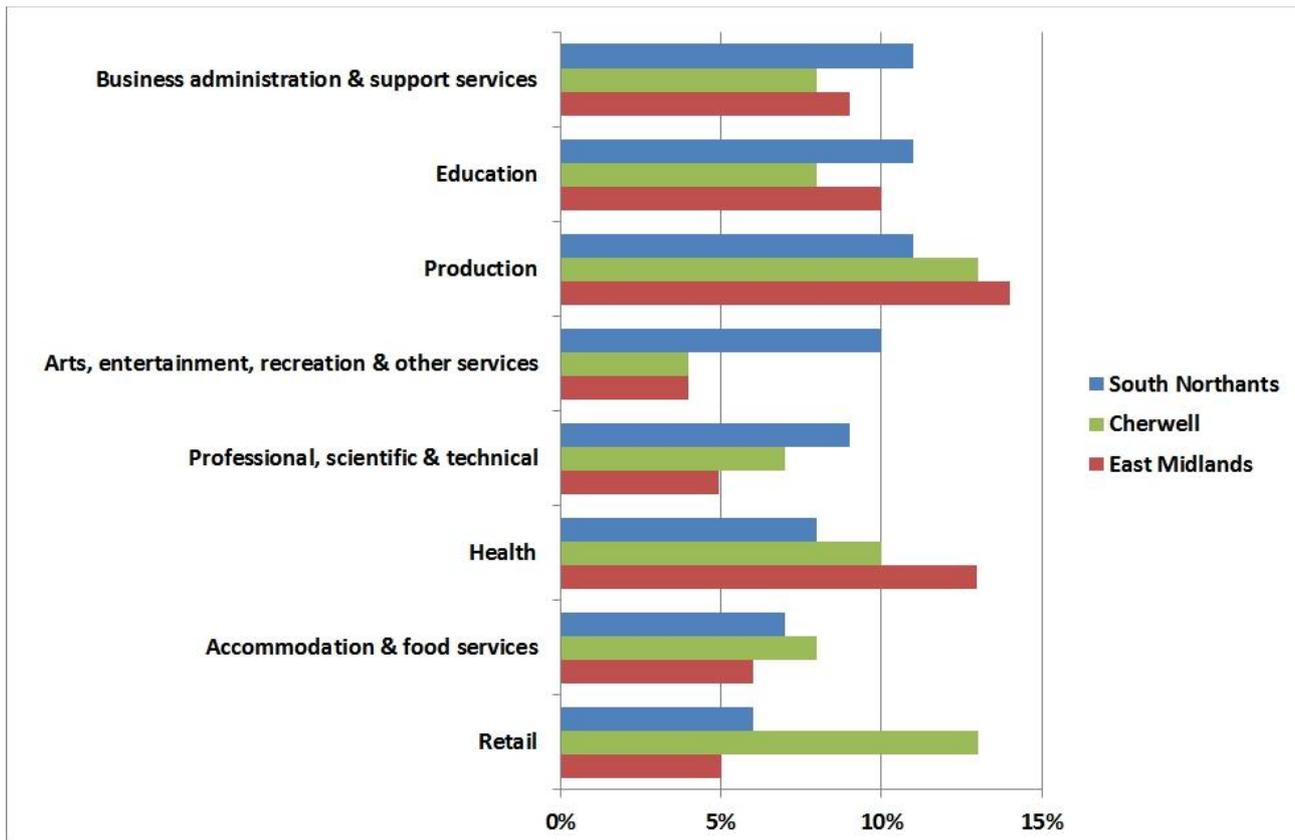
10.3.6 According to the ONS Business Register and Employment Survey 2011, the sectors with the highest proportion of employment in South Northamptonshire are business, administration and support services (11%), education (11%) and production (11%). The proportion of employees working in arts, entertainment, recreation and other services in South Northamptonshire (10%) is higher compared to both the East Midlands (4%) and England (5%). The health sector accounts for 8% of employment in the district, which is lower than the regional and national levels (13% and 12% respectively). This is shown in Figure 8. Within Cherwell, production (13%) accounts for the highest proportion of employment and is at the same level as recorded regionally (also 13%). Employment in retail (13%) in Cherwell is higher compared with the East Midlands as a whole (10%). The health sector accounts for 10% of employment in the district, though this is below the 14% of employment it accounts for in the East Midlands more widely.

⁸² 'Other' includes motor trades, wholesale, transport and storage, finance and insurance, property, public administration and defence, education and health sectors.

⁸³ Office of National Statistics (ONS) (2011), *UK Business: Activity, Size and Location 2011*, ONS, London. Please note 2011 data have been presented to provide an appropriate comparison with 2011 Census data.

⁸⁴ ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.

Figure 8: Employment by industrial sector in South Northamptonshire and the East Midlands^{85,86}



10.3.7 According to the 2011 Census⁸⁷, the employment rate⁸⁸ within South Northamptonshire in 2011 was 73% (which represents 46,000 people), higher than 64% recorded for the East Midlands and 65% for England as a whole. The large difference between resident workforce and jobs in the district reflects the high level of commuting out of the area. The employment rate in the Finmere DCA was 73%, 74% in both Westbury DCA and Turweston DCA, 82% in both Whitfield DCA and Radstone DCA, 78% in both Newton Purcell DCA and Mixbury DCA and 72% in East Brackley DCA.

10.3.8 The unemployment rate for South Northamptonshire in 2011 stood at 4%, which was lower than the England average of 7%. The unemployment rate in Turweston DCA was 4%, slightly higher than within both Finmere DCA and East Brackley DCA (both 3%), while in each of Westbury, Whitfield and Radstone the unemployment rate was 2%. No unemployment rates are reported for Newton Purcell DCA and Mixbury DCA due to data confidentiality issues⁸⁹.

10.3.9 According to the 2011 Census, 31% of South Northamptonshire residents aged 16 and over were qualified to National Vocational Qualification Level 4 (NVQ4), compared to 24% in the East Midlands and 27% in England, while 17% of South Northamptonshire

⁸⁵ 'Other' includes agriculture, forestry and fishing, construction, motor trades, wholesale, retail, information and communication, finance and insurance, property and public administration and defence sectors.

⁸⁶ ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.

⁸⁷ ONS (2012), *Census 2011*, ONS, London.

⁸⁸ The proportion of working age (16-74 years) residents in employment. Employment comprises the proportion of the total resident population who are 'in employment' and includes full-time students who are employed.

⁸⁹ Unemployment figures have been rounded to the nearest whole number. DCA unemployment rates are presented for each DCA in this chapter while in Section 2 they are shown in aggregate.

residents had no qualifications, which is lower than that recorded both for East Midlands (25%) and England (23%). In 2011, 44% of Finmere and Turweston DCA residents aged 16 and over were qualified to NVQ4 level, compared to 38% in Westbury DCA, 37% in Whitfield, Radstone, Newton Purcell and Mixbury DCA and 29% in East Brackley DCA.

- 10.3.10 The proportion of residents with no qualifications was 12% in Finmere DCA, 17% in Westbury DCA, 16% in Turweston DCA, Whitfield DCA and Radstone DCA, 18% in Newton Purcell DCA and Mixbury DCA and 19% in East Brackley DCA.
- 10.3.11 The eight DCA are each predominantly residential areas, set within a mostly rural and agricultural area, recording high rates of employment, low unemployment and high qualifications attainment compared to regional and national averages.

Future baseline

Construction (2017)

- 10.3.12 Volume 5: Appendix CT-004-000 provides details of the developments that are assumed to have been implemented by 2017. Implementation of all outstanding development consents and land allocations will result in fewer than five additional jobs⁹⁰ by 2017. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast.

Operation (2026)

- 10.3.13 Volume 5: Appendix CT-004-000 provides details of the developments that are assumed to have been implemented by 2026. There are no consents or allocations in this area that are expected to accommodate material additional employment between 2017-2026.

10.4 Effects arising during construction

Avoidance and mitigation measures

- 10.4.1 In order to avoid or minimise the environmental impacts during construction, the Proposed Scheme includes provisions to maintain access to businesses during the construction phase.
- 10.4.2 The draft CoCP includes a range of provisions that will help mitigate socio-economic effects associated with construction within this local area, including the following:
- consulting businesses located close to hoardings on their design, materials used and construction of the hoarding to reduce impacts on access to and visibility of their premises (draft CoCP, Section 5);
 - reducing nuisance through sensitive layout of construction sites (draft CoCP, Section 5);

⁹⁰ Potential employment has been estimated through employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 2nd Edition (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas.

- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (draft CoCP, Section 13);
- requiring contractors to pay due consideration to the impacts of extreme weather events and related conditions which may affect socio-economic resources during construction (draft CoCP, Section 5); and
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (draft CoCP, Section 14).

Assessment of impacts and effects

Temporary effects

Change in business amenity value

- 10.4.3 No non-agricultural businesses⁹¹ that are expected to experience significant amenity effects as a result of the Proposed Scheme have been identified within the area.

Isolation

- 10.4.4 No non-agricultural businesses that are expected to experience significant isolation effects as a result of the Proposed Scheme have been identified within the area.

Construction employment

- 10.4.5 There are plans to locate construction compounds for the Proposed Scheme at locations within the Newton Purcell to Brackley area, including Brackley South cutting main compound. These locations are set out in Section 2 of this report.
- 10.4.6 The use of these sites will result in the creation of up to 1,500 person years of construction employment⁹² opportunities, or approximately 150 full-time equivalent permanent jobs⁹³, that, 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 assessed as part of the route-wide assessment (Volume 3).
- 10.4.7 Direct construction employment created by the Proposed Scheme could also lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been assessed as part of the route-wide assessment (Volume 3).

Cumulative effects

- 10.4.8 No committed developments have been identified that are considered to interact with the Proposed Scheme.

⁹¹ Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.

⁹² 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.

⁹³ Based on the convention that 10 employment years is equivalent to one full time equivalent job.

- 10.4.9 Cumulative effects also arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (Volume 3).

Permanent effects

Businesses

- 10.4.10 Businesses directly affected, i.e. those that lie within land which will be acquired for the construction of the Proposed Scheme, are reported in groups where possible to form defined resources, based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses/resources are clustered together.
- 10.4.11 In all, two businesses within the area, a holiday homes business and Whitfield Racecourse, will be directly impacted upon by the Proposed Scheme. However, from an employment perspective, no significant direct effects on non-agricultural employment have been identified within the local area.
- 10.4.12 It is estimated that land required for the construction of the Proposed Scheme will result in the displacement or possible loss of approximately five jobs⁹⁴ within this area. Taking into account total employment within the area, the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area.

Cumulative effects

- 10.4.13 No committed (inter-project) developments have been identified that are considered to interact with the Proposed Scheme.
- 10.4.14 Cumulative effects also arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

Other mitigation measures

- 10.4.15 The assessment has concluded that there are no significant adverse effects arising during construction in relation to businesses directly affected by the Proposed Scheme.
- 10.4.16 Businesses displaced by the Proposed Scheme will be fully compensated within the provisions of the Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to new premises and will therefore provide additional support over and above statutory requirements to facilitate this process.
- 10.4.17 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd is committed to working with its

⁹⁴ Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 2nd Edition (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary from actual employment at the sites.

suppliers to build a skilled workforce that fuels further economic growth across the UK.

Summary of likely residual significant effects

- 10.4.18 No residual significant socio-economic effects are likely to arise during construction of the Proposed Scheme.

10.5 Effects arising during operation

Avoidance and mitigation measures

- 10.5.1 No mitigation measures are required during operation within this area.

Assessment of impacts and effects

Resources with direct effects

- 10.5.2 There are no resources considered likely to experience significant direct effects during the operational phase of the Proposed Scheme within this area.

Change in business amenity

- 10.5.3 No businesses have been identified within the area that are expected to experience significant amenity effects as a result of the Proposed Scheme.

Operational employment

- 10.5.4 Operational employment will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots which are considered unlikely to be accessed by residents of the study area.
- 10.5.5 Direct operational employment created by the Proposed Scheme could also lead to indirect employment opportunities for local businesses in terms of supplying the project or benefiting from expenditure of directly employed workers on goods and services. Some of these employment opportunities will be accessible to residents in the locality.
- 10.5.6 The impact of operational employment creation has been assessed as part of the route-wide assessment (Volume 3).

Cumulative effects

- 10.5.7 No committed developments have been identified that are considered to interact with the Proposed Scheme.

Other mitigation measures

- 10.5.8 The assessment has concluded that operational effects within this section of the route will be either negligible or beneficial and therefore mitigation is not needed.

Summary of likely residual significant effects

- 10.5.9 No residual significant socio-economic effects are likely to arise during operation of the Proposed Scheme.

11 Sound, noise and vibration

11.1 Introduction

11.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme for the Newton Purcell to Brackley area on:

- people, primarily where they live ('residential receptors') in terms of a) individual dwellings and b) on a wider community basis, including any shared community open areas⁹⁵; and
- community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'⁹⁶.

11.1.2 The assessment of likely significant effects from noise and vibration on agricultural, community, cultural heritage and ecology receptors and the assessment of tranquillity are presented in Sections 3, 5, 6, 7 and 9 of this report respectively.

11.1.3 In this assessment 'sound' is used to describe the acoustic conditions which people experience as a part of their everyday lives. The assessment considers how those conditions may change through time and how sound levels and the acoustic character of community areas is likely to be modified through the introduction of the Proposed Scheme. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

11.1.4 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect e.g. resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

11.1.5 This section sets out the means to avoid or reduce the adverse effects that may occur.

11.1.6 The approaches to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1 and scope and methodology are defined in the following documents:

- Scope and Methodology Report (SMR) (Appendix CT-001-000/1); and
- SMR addendum (Appendix CT-001-000/2).

11.1.7 More detailed information and mapping regarding the sound, noise and vibration assessment for Newton Purcell to Brackley is available in the relevant appendices in Volume 5:

⁹⁵ 'Shared community open areas' are those that the emerging National Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park to local green space) that is nearby.

⁹⁶ Quiet areas are defined in the Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity (further information is provided in Volume 5: Appendix SV-001-000).

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000);
- sound, noise and vibration baseline (Appendix SV-002-014);
- sound, noise and vibration construction assessment (Appendix SV-003-014);
- sound, noise and vibration operation assessment (Appendix SV-004-014); and
- Map Series SV-01, SV-02, SV-03 and SV-04 (Volume 5, Sound, noise and vibration Map book).

11.2 Environmental baseline

Existing baseline

- 11.2.1 The soundscape in this area is varied, reflecting the mixture of larger settlements, villages, hamlets and isolated individual properties in the district.
- 11.2.2 The area includes Newton Purcell in the south and the village of Radstone in the north. The town of Brackley is situated to the north west of the area where the A43 runs approximately perpendicular to the HS2 route. In addition to Newton Purcell and Radstone there are a number of other villages including Westbury, Mixbury and Turweston situated relatively close to the HS2 route.
- 11.2.3 Turweston, lying in the northern region of the area, has a varied sound environment and includes sound from the A43, the local road network, occasional aircraft over flights, agricultural activities, and natural sounds. Daytime sound levels in this region are typically around 45 to 50dB⁹⁷.
- 11.2.4 The sound environment at Newton Purcell includes the sound of traffic from the A4421, a relatively busy road that runs through the village, and natural sounds. Daytime sound levels around Newton Purcell range from around 45 to 70dB depending on proximity to the A4421.
- 11.2.5 At both Turweston and Newton Purcell, sound levels reduce during the night-time periods by around 5dB⁹⁸ as a result of reduced road traffic flows on main and local roads.
- 11.2.6 At the villages of Radstone and Mixbury and at isolated farmhouses within this area, a relatively quiet, natural soundscape predominates. The soundscape here is dominated by natural sounds, with intermittent sounds from agricultural activity. Occasional local road traffic and distant road traffic noise are also audible. In Radstone, sound levels are typically around 45dB over the daytime reducing to 35 to 40dB at night. In Mixbury, daytime and night-time sound levels are typically around 45dB and 40dB respectively.
- 11.2.7 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in Volume 5: Appendix SV-002-014.

⁹⁷ Quoted dB values at residential areas refer to the free-field 16 hour daytime (07:00 to 23:00) equivalent continuous sound pressure level, $L_{pAeq,16hr}$.

⁹⁸ Night-time sound levels refer to the free-field 8 hour night-time (23:00 to 07:00) equivalent continuous sound pressure level, $L_{pAeq,8hr}$.

- 11.2.8 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration⁹⁹. Vibration at all receptors from the Proposed Scheme has therefore been assessed using specific thresholds, below which receptors will not be affected by vibration. Further information is provided in Volume 1, Section 8.

Future baseline

- 11.2.9 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads¹⁰⁰, tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Construction (2017)

- 11.2.10 The assessment of noise from construction activities assumes a baseline year of 2017 which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline (2012/13) and the future baseline year of 2017. The assessment of noise from construction traffic assumes a baseline year of 2021, representative of the middle of the construction period when the construction traffic flows are expected to be at their peak. Further information can be found in the Traffic and Transport assessment.

Operation (2026)

- 11.2.11 The assessment is based upon the predicted change in sound levels that result from the Proposed Scheme. The assessment initially considered a worst case (that would overestimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2012/2013. Where significant effects were identified on this basis, the effects have been assessed using a baseline year of 2026 to coincide with the proposed start of passenger services. The future baseline is for the sound environment that would exist in 2026 without the Proposed Scheme.

11.3 Effects arising during construction

Local assumptions and limitations

Local assumptions

- 11.3.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report.

Local limitations

- 11.3.2 In this area, there are a number of locations where the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient information has been obtained to undertake the assessment. Further information is provided in Volume 5: Appendix SV-002-014.

⁹⁹ Further information is available in the Volume 5: Appendix SV-001-000, the SMR and its Addendum.

¹⁰⁰ Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph.

Avoidance and mitigation measures

11.3.3 The assessment assumes the implementation of the principles and management processes set out in the draft CoCP which are:

- Best Practicable Means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA) will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
- as part of BPM, mitigation measures are applied in the following order:
 - noise and vibration control at source: for example the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings¹⁰¹; and then
 - screening: for example local screening of equipment or perimeter hoarding;
- where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered in accordance with the draft CoCP's noise insulation and temporary re-housing policy;
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise, including control of working hours, and provide a further assessment of construction noise and vibration including confirmation of noise insulation / temporary re-housing provision;
- contractors will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to and be reviewed by the Nominated Undertaker and will be made available to the local authorities; and
- contractors will be required to comply with the terms of the CoCP and appropriate action will be taken by the Nominated Undertaker as required to ensure compliance.

11.3.4 In addition to this mitigation, taller screening as described in the draft CoCP¹⁰² has been assumed along the edge of the construction site boundary adjacent to the residential communities at Newton Purcell, Turweston and Radstone.

¹⁰¹ Warning signals that consist of bursts of noise.

¹⁰² As described in the draft CoCP, provided as necessary by solid temporary hoarding, temporary earth stockpiles, screening close to the activities or other means to provide equivalent noise reduction.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

11.3.5 The mitigation measures will reduce noise inside all dwellings such that it does not reach a level where it would significantly affect¹⁰³ residents.

Residential receptors: direct effects – communities

11.3.6 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

11.3.7 In locations with lower existing sound levels¹⁰⁴, construction noise effects are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life.

11.3.8 In this area, the mitigation measures reduce the effects of outdoor construction noise on the acoustic character around the local residential communities such that the adverse effects identified are considered to be not significant.

Residential receptors: indirect effects

11.3.9 Significant noise effects on residential receptors arising from construction traffic are unlikely to occur in this area.

Non-residential receptors: direct effects

11.3.10 Significant construction noise or vibration effects have been identified on a reasonable worst case basis on the following non-residential receptors:

- St Lawrence's Church, Radstone (CSV14-No1). Significant noise effects have been identified due to daytime construction noise associated with the Radstone Road overbridge and footpath diversions works. The forecast noise levels at the church may rise at times to around 55 to 60dB; and
- Proposed bed and breakfast development at Hall Farm¹⁰⁵, Radstone (CSV14-No2). Significant noise effects have been identified due to daytime construction activities associated with nearby landscape mitigation earthworks.

Non-residential receptors: indirect effects

11.3.11 Significant noise effects on non-residential receptors arising from construction traffic are unlikely to occur in this area.

Cumulative effects from the Proposed Scheme and other committed development

11.3.12 This assessment has considered the potential cumulative construction noise effects of the proposed scheme and other committed developments¹⁰⁶. In this area,

¹⁰³ Information is provided in the emerging National Planning Practice Guidance – Noise: <http://planningguidance.planningportal.gov.uk>.

¹⁰⁴ Further information is provided in Volume 5: Appendix SV-001-000.

¹⁰⁵ Refer to section 2 of this CFA report, committed development reference CFA14/4.

¹⁰⁶ Refer to Volume 5: Appendix CT-004-000..

construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

Summary of likely residual significant effects

- 11.3.13 The avoidance and mitigation measures reduce noise inside all dwellings from the construction activities such that it does not reach a level where it would significantly affect¹⁰³ residents.
- 11.3.14 The measures also reduce the effect of outdoor construction noise on the acoustic character around the local residential communities such that the adverse effects identified are not considered to be significant.
- 11.3.15 On a reasonable worst case basis, noise from specific construction activities has been identified as resulting in significant residual temporary effects on St Lawrence's Church, Radstone and at committed development CFA14/4, a proposed bed and breakfast development at Hall Farm, Radstone.
- 11.3.16 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

11.4 Effects arising during operation

Local assumptions and limitations

Local assumptions – service pattern

- 11.4.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based on the highest likely train flows, including the Phase Two services. Trains are expected to be 400m long during peak hours and a mix of 200m and 400m long trains at other times.
- 11.4.2 The expected passenger service frequency for both Phase One, and Phase One with Phase Two services, are described in Volume 1¹⁰⁷. As a reasonable worst case, this assessment is based upon the service pattern for Monday to Saturday including Phase Two services. Passenger services will start at or after 05:00 from the terminal stations and in this area will progressively increase to the number of trains per hour in each direction on the main lines set out in Table 18. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by 24:00. Train speeds are shown in Table 18.

¹⁰⁷ The change in noise and vibration effects between the different passenger services is assessed in Volume 1.

Table 18: Train flows and speeds

Description of line	Time period for peak daytime flows	Number of trains per hour in each direction with Phase Two services (Phase One only trains per hour in each direction is set out in brackets)	Speed
Main line between London and the north	0700 – 2100 hours	18 (14)	330kph for timetabled trains (assumed 90% of services), and 360kph for 10% of services

Avoidance and mitigation measures

11.4.3 The development of the Proposed Scheme has, as far as reasonably practicable, kept the alignment away from main communities and low in the ground. These avoidance measures have protected many communities from likely significant noise or vibration effects.

Airborne noise

11.4.4 HS2 trains will be quieter than the relevant current European Union specifications. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia. The track will be specified to reduce noise, as will the maintenance regime. Overall these measures would reduce noise emissions by approximately 3dB at 360kph compared to a current European high speed train operating on the new track. Further information is provided in Volume 5: Appendix SV-001-000.

11.4.5 To avoid or reduce significant airborne noise effects, the Proposed Scheme incorporates noise barriers in the form of landscape earthworks, noise fence barriers and / or 'low-level' barriers on viaducts. Noise barrier locations are shown on Volume 2: Map Book – Sound, noise and vibration Map series SV-05.

11.4.6 Generally, the assessment has been based on noise barriers having a noise reduction performance equivalent to a noise fence barrier with a top level 3m above the top of the rail, which is acoustically absorbent on the railway side, and which is located 5m to the side of the outer rail. In practice, barriers may differ from this description, but will provide the same acoustic performance. For example, where noise barriers are in the form of landscape earthworks they will need to be higher above rail level to achieve similar noise attenuation to a 3m barrier because the crest of the earthwork will be further than 5m from the outer rail.

11.4.7 The Proposed Scheme incorporates 'low-level' noise barriers into the design of viaducts. Where needed to avoid or reduce significant airborne noise effects, these barriers are designed to provide noise reduction that is equivalent to a 2m high absorptive noise barrier located on the parapet of the viaduct. Locating these 'low-level' barriers close to the rail also reduces visual impact and limits the mass of the viaduct itself.

11.4.8 The Proposed Scheme also includes sections of taller, 4m above rail, noise barriers to avoid or reduce significant effects at Newton Purcell, Finmere (around the residential

community area at Warren Farm) and Turweston. At Turweston the taller noise barrier continues as a parapet noise barrier on the west side of Turweston viaduct

- 11.4.9 Noise effects are reduced in other locations along the line by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise barriers are not required). The location of these barriers is shown on map series SV-05 (Volume 2, CFA 14 Map Book).
- 11.4.10 Significant noise effects from the operational static sources such as mechanical ventilation at tunnel portals and line-side equipment will be avoided through their design and the specification of noise emission requirements (for further information please see Volume 5: Appendix SV-001-000).
- 11.4.11 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996¹⁰⁸ (the Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Regulations. Qualification for noise insulation under the Regulations will be identified and noise insulation offered at the time that the Proposed Scheme becomes operational.
- 11.4.12 Where required, as well as improvements to noise insulation of windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.
- 11.4.13 Following Government's emerging National Planning Practice Guidance¹⁰⁹, where the noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the WHO Night Noise Guidelines for Europe¹¹⁰, residents are considered to be significantly affected by the resulting noise inside their dwelling. The effect on people at night due to the maximum sound level as each train passes has also been assessed¹¹¹. The Interim Target is a lower level of noise exposure than the Regulations trigger threshold for night noise. In these particular circumstances, where night-time noise levels for the use of new or additional railways authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB¹¹², or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion¹¹¹, noise insulation will be offered for these additional buildings.

Ground-borne noise and vibration

- 11.4.14 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

¹⁰⁸ The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (SI 1996 No. 428). London, Her Majesty's Stationery Office.

¹⁰⁹ National Planning Practice Guidance – Noise <http://planningguidance.planningportal.gov.uk>

¹¹⁰ World Health Organization (2010), Night-time Noise Guidelines for Europe.

¹¹¹ During the night (2300-0700) a significant effect is also identified where the Proposed Scheme results in a maximum sound level at the façade of a building at or above: 85 dB L_{pAF}max (where the number of train pass-bys exceeding this value is less than or equal to 20); or 80 dB L_{pAF}max (where the number of train pass-bys exceeding this value is greater than 20).

¹¹² Equivalent continuous level, L_{pAeq,23:00-07:00} measured without reflection from the front of buildings.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

- 11.4.15 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified one residential dwelling close to the Proposed Scheme, Oaks Farm, Banbury Road, Finmere, where noise would exceed the daytime trigger threshold set in the Regulations. It is therefore estimated that this building is likely to qualify for noise insulation under the Regulations. It is indicated on map series SV-05 (Volume 2, CFA 14 Map Book).
- 11.4.16 The mitigation measures including noise insulation will reduce noise inside all dwellings such that it will not reach a level where it would significantly affect residents.

Residential receptors: direct effects – communities

- 11.4.17 The mitigation measures in this area will avoid airborne noise adverse effects on the majority of receptors, and at the following residential communities:
- Newton Purcell;
 - Finmere (except as mentioned in Table 19);
 - Mixbury;
 - Westbury;
 - Turweston (except as mentioned in Table 19);
 - Whitfield; and
 - Brackley.
- 11.4.18 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2, CFA14 Map book) shows the long term 40dB¹¹³ night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level contour is equivalent to, or slightly larger than, the 50dB daytime contour¹¹⁴. In general, below these levels adverse effects are not expected.
- 11.4.19 Above 40dB during the night and 50dB during the day the effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the scheme are presented on Map Series SV-05 (Volume 2, CFA14 Map Book).
- 11.4.20 The changes in noise levels are likely to affect the acoustic character of the area such that there is a perceived change in the quality of life and are considered to be

¹¹³ Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$.

¹¹⁴ With the train flows described in the assumptions section of this CFA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

significant when assessed on a community basis¹¹⁵ taking account of the local context¹¹⁶.

11.4.21 In this study area, the direct adverse effects¹⁰³ on the areas of the residential communities identified in Table 19 are considered to be significant.

Table 19: Direct adverse effects on residential communities and shared open areas that are considered significant on a community basis

Significant effect number (see Map series SV-05)	Source of significant effect	Time of day	Location and details
OSV14-Co1	Airborne noise increase from new train services	Daytime and night-time	Finmere. Approximately 10 dwellings to the west of Finmere in the vicinity of the residential community area around Warren Farm on Banbury Road, and associated local community open areas. Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area.
OSV14-Co2	Airborne noise increase from new train services	Daytime and night-time	Turweston. Approximately 25 dwellings in the vicinity of Main Street and associated local community open areas. Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area around the five or so dwellings closest to the Proposed Route, and a minor adverse effect on the acoustic character around the remaining dwellings.
OSV14-Co3	Airborne noise increase from new train services	Daytime and night-time	Radstone. Approximately 15 dwellings and associated community open areas. Forecast increases in sound from the railway are likely to cause a major adverse effect on the acoustic character of the area around the dwellings closest to the Proposed Route reducing to a minor effect around the dwellings farthest away.

Residential receptors: indirect effects

11.4.22 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Non-residential receptors: direct effects

11.4.23 The assessment of operational noise and vibration indicates that significant effects are likely on the non-residential receptors identified in Table 20.

11.4.24 The assessment of effects on non-residential receptors has been undertaken on a worst case basis taking account of publicly available information about each receptor. Further information can be found in Volume 5: Appendix SV-004-014.

¹¹⁵ Further information is contained in Volume 1.

¹¹⁶ Further information is provided in SV-001-000 and SV-004-014.

Table 20: Likely significant noise or vibration effects on non-residential receptors arising from operation of the Proposed Scheme

Significant effect number (see Map series SV-05)	Type of significant effect and source	Time of day	Location and details
OSV14-No1	Major airborne noise effect on the acoustic character around the church and on a worst case basis there is a risk of disturbing activities ¹¹⁷ inside church buildings due to the operation of train services.	Daytime	St Lawrence's Church, Radstone

11.4.25 The assessment of any effect of noise inside St Lawrence's Church is on a worst case basis. It assumes that any activities that are more sensitive to noise take place in the internal areas of the church that have windows doors or other openings (for example on the bell tower) on the façade facing the route and that little sound insulation is provided by the windows, doors or other openings.

Non-residential receptors: indirect effects

11.4.26 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Cumulative effects from the Proposed Scheme and other committed development

11.4.27 This assessment has considered the potential cumulative operational noise effects of the proposed scheme and other committed developments¹¹⁸. In this area, operational noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

Summary of likely significant residual effects

11.4.28 The mitigation measures reduce noise inside all dwellings such that it does not reach a level where it would significantly affect¹⁰³ residents.

11.4.29 The avoidance and mitigation measures in this area will avoid noise and vibration adverse effects¹⁰³ on the majority of receptors and communities including shared open areas.

11.4.30 Taking account of the avoidance and mitigation measures and the local context, the residual permanent noise effects on the acoustic character of the communities at Finmere, Turweston and Radstone closest to the Proposed Route are considered significant.

11.4.31 On a reasonable worst case basis a significant noise effect has been identified on St Lawrence's Church, Radstone.

¹¹⁷ Potential risk of activity disturbance, especially for activities that require good conditions for verbal communication.

¹¹⁸ Refer to section 2 of this CFA Report.

- 11.4.32 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be reflected in the Environmental Minimum Requirements.

12 Traffic and transport

12.1 Introduction

- 12.1.1 This traffic and transport section describes the likely impacts on all forms of transport and the consequential effects on transport users arising from the construction and operation of the Proposed Scheme through the Newton Purcell to Brackley area.
- 12.1.2 With regards to traffic and transport, the main issues as a result of implementation of the Proposed Scheme are traffic generated during construction and the closure of both roads and PRoW, either temporarily or in some cases permanently, with associated diversions.
- 12.1.3 The effects on traffic and transport have been assessed quantitatively, based on baseline traffic conditions and future projection scenarios.
- 12.1.4 A detailed report on traffic and transport and surveys undertaken within the area is contained in the Volume 5: Appendix TR-001-000: Transport Assessment.
- 12.1.5 Figure 2 shows the location of existing key transport infrastructure in this area.
- 12.1.6 Engagement has been undertaken with the key transport authorities including the Highways Agency (HA), Buckinghamshire County Council (BCC), Northamptonshire County Council (NCC) and Oxfordshire County Council (OCC).

12.2 Scope, assumptions and limitations

- 12.2.1 The assessment scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, and in the SMR (see Volume 5: Appendix CT-001-000/1) and the SMR Addendum (see Volume 5: Appendix CT-001-000/2). This report follows the standard assessment methodology.
- 12.2.2 The study area includes the A43 Oxford Road, the A4421 Buckingham Road (Newton Purcell), the A421 London Road, the A422 Brackley Road, the B4525 Welsh Road and local roads that are affected by the Proposed Scheme.
- 12.2.3 The baseline forecast traffic flows for the future years of assessment have been derived using the Department for Transport's traffic forecasting tool, Trip End Model Presentation Program (TEMPRO), and adjusted where appropriate to take account of specific developments. The assessment covers morning (08:00-09:00) and evening (17:00-18:00) peak periods for an average weekday.
- 12.2.4 It has been assumed that bus services for the future years of assessment will be the same as those currently operating, since it is not possible to forecast how services may change in the future.
- 12.2.5 Forecast future year traffic flows with and without the Proposed Scheme are based on an approach that does not take account of wider effects, such as redistribution and reassignment of traffic, modal shift and peak spreading. As a consequence, adverse transport effects may be over-stated.

12.3 Environmental baseline

Existing baseline

- 12.3.1 Existing conditions in the Newton Purcell to Brackley area have been determined through site visits, specially commissioned transport surveys, and liaison with relevant transport authorities and stakeholders to source traffic data, information on public transport, PRow and accident data.
- 12.3.2 Traffic surveys were undertaken to establish current traffic flows on the road network subject to assessment during June and September 2012 and February 2013. The surveys comprised of automatic traffic counts, junction turning counts and queue surveys. This was supplemented by traffic and transport data obtained from other sources where available, including from the HA, BCC, NCC and OCC.
- 12.3.3 PRow surveys were undertaken in August and September 2012, to establish the nature of the PRow and their usage by pedestrians, cyclists and equestrians (non-motorised users). The surveys included all PRow and roads that will cross the Proposed Scheme, and any additional PRow that will be affected by the Proposed Scheme. The surveys indicated that the majority of PRow are used by no more than 30 people per day, apart from Bridleway 303/4/20 and Footpath TUW/4/1, which were used by no more than 70 and 150 people per day, respectively. The Proposed Scheme affects 20 PRow in this area and crosses 15 of these. In addition to the 15 PRow, the Proposed Scheme crosses six roads with potential for use by non-motorised users.
- 12.3.4 The main strategic roads and local roads affected by the Proposed Scheme are the A43 Oxford Road, A4421, Buckingham Road, A421 London Road, A422 Brackley Road, B4525 Welsh Road, Manor Farm Road, Featherbed Lane (also known as Fulwell Lane), Fulwell Road, Valley Road (Finmere), Mere Road, Sandpit Hill, Northampton Road, Turweston Road, Turweston Green, South Bank and Radstone Road.
- 12.3.5 Relevant accident data for the road network subject to assessment has been obtained from the HA for the five year period from 2007 to 2011, and BCC, NCC and OCC for the three year period from 2009 to 2011. This has been assessed and any significant clusters have been examined. No accident clusters have been identified in the area.
- 12.3.6 The following eight public bus services operate along roads that were subject to traffic and transport assessment:
- Route 499 – connecting Banbury to Brackley and serving Middleton Cheney, Bodicote, Twyford, Kings Sutton, Charlton, Aynho, Croughton, and Evenly;
 - Route B500 and C500 – demand responsive services covering the Northamptonshire and Oxfordshire areas;
 - Route 8 – connecting Weston Favell to Bicester and serving Northampton, Milton Malsor, Blisworth, Towcester, Syresham, and Whitfield;
 - Route T2A – connecting Banbury to Brackley;
 - Route 132 – connecting Buckingham to Brackley and serving Gawcott, Tingewick, Finmere, Westbury, and Turweston;

- Route 500 – connecting Banbury to Brackley and serving Chacombe, Middleton Cheney, and Farthinghoe; and
- Route 37 – connecting Bicester to Finmere and serving Fringford.

12.3.7 Two of these services operate along the A43 north of Brackley, at a peak frequency of up to four buses an hour. Three of these services operate along the A422 Brackley Road at a peak frequency of up to four buses an hour. Route 499 operates along the A43 south of Brackley, at a peak frequency of up to one bus an hour and Route 37 operates along the A4421 Buckingham Road at a peak frequency of up to one bus an hour.

12.3.8 In addition to the above, the demand responsive services B500 and C500 operate along the A43 south of Brackley and the A422 Brackley Road as required, with a potential maximum combined peak frequency of two buses an hour.

12.3.9 There are no rail services and no navigable waterways affected by the Proposed Scheme in this area and consequently these are not considered further in this assessment.

Future baseline

12.3.10 The future baseline traffic volumes have been calculated by applying growth factors derived from TEMPRO for the future years of 2021, 2026 and extrapolation to 2041. The factors have been derived for the individual road types and relevant wards. The baseline for the A43 Oxford Road also specifically takes account locally of the following developments:

- Radstone Fields, Brackley (status and ref for all);
- Sawmills Site, Northampton Road;
- Lane North of Turweston, Brackley;
- Lane South of Turweston, Brackley; and
- Silverstone.

12.3.11 No other changes to the traffic and transport baseline are anticipated in this area.

Construction

12.3.12 Construction activities have been assessed against 2021 baseline traffic flows, irrespective of when they occur during the construction period. Future baseline traffic volumes in the peak hours in this area are forecast to grow by between approximately 11% and 14% by 2021 compared to 2012 depending on road type.

Operation (2026)

12.3.13 Future baseline traffic volumes in the peak hours in this area are forecast to grow by between approximately 19% and 23% by 2026 compared to 2012 depending on road type.

Operation (2041)

- 12.3.14 Future baseline traffic volumes in the peak hours in this area are forecast to grow by between approximately 36% and 46% by 2041 compared to 2012 depending on road type.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The following measures (as described in Section 2) have been included as part of the engineering design of the Proposed Scheme and will avoid or reduce effects on transport users:
- transporting construction materials and equipment along haul roads adjacent to the route of the Proposed Scheme where reasonably practicable to reduce lorry movements on the public highway;
 - the majority of roads crossing the Proposed Scheme will be kept open during construction, resulting in reduced diversion of traffic onto alternative routes;
 - provision of temporary alternative routes and/or building structures early to maintain connectivity for PRow closed during construction to reduce loss of amenity;
 - HGV will be routed as far as reasonably practicable along the strategic road network and using designated routes for access, as shown on Maps TR-03-058 and TR-03-059 (Volume 5, Traffic and Transport Map Book); and
 - providing on-site accommodation and welfare facilities to reduce daily travel by site workers.
- 12.4.2 The draft CoCP (see Volume 5: Appendix CT-003-000/1) includes measures that seek to reduce the impacts and effects of deliveries of construction materials and equipment, including reducing construction lorry trips during peak background traffic periods. The draft CoCP includes HGV management and control measures.
- 12.4.3 Where reasonably practicable, the number of private car trips to and from the site (both workforce and visitors) will be reduced by encouraging alternative modes of transport or vehicle sharing. This will be supported by an over-arching framework travel plan¹¹⁹ that will require travel plans to be used along with a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme. As part of this, a construction workforce travel plan will be put into operation with the aim of reducing workforce commuting by private car, especially sole occupancy car travel. Where reasonably practicable, in the rural context, this will encourage the use of sustainable modes of transport or vehicle sharing.

¹¹⁹ Construction and operational travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

12.4.4 The measures in the draft CoCP (Section 14.2) include clear controls on vehicle types, hours of site operation, and routes for heavy goods vehicles to reduce the impact of road based construction traffic. In order to achieve this, generic and site specific management measures will be implemented during the construction of the Proposed Scheme on or adjacent to public roads, bridleways, footpaths and other PRow affected by the Proposed Scheme as necessary.

12.4.5 Specific measures will include:

- core site operating hours will be 08:00-18:00 on weekdays and 08:00-13:00 on Saturdays and site staff and workers will therefore generally arrive before the morning peak hour and depart after the evening peak hour (although the assessment has assumed that some work journeys to the construction sites take place within the morning and evening peak hours to reflect a reasonable worst case scenario) (draft CoCP, Section 5); and
- excavated material will be reused where reasonably practicable along the alignment of the Proposed Scheme which will reduce the effects of construction vehicles on the public highway (draft CoCP, Section 15).

Assessment of impacts and effects

Temporary effects

12.4.6 The following section considers the impacts on traffic and transport and the consequential effects resulting from construction of the Proposed Scheme.

12.4.7 The temporary traffic and transport impacts within the area will be:

- construction vehicle movements to/from the construction site compounds;
- a road closure and associated traffic diversion; and
- PRow closures and diversions.

12.4.8 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, route wide movement of excavated materials and site worker trips.

12.4.9 Details of construction compounds along with planned construction routes are provided in Section 2. The duration of when there will be busy transport activity at each site is shown in Table 21. This represents the periods when the construction traffic flows will be greater than 50% of the peak month flows. Also shown is the estimated number of daily vehicle trips during the peak month. The lower end of the range shows the average number of trips in the busy period and the upper end the average during the peak month.

Table 21: Typical vehicle trip generation for construction site compounds in this area

Compound type	Location	Access to/from compound	Indicative start/set up date	Estimated duration of use (years)	Estimated duration with busy vehicle movements (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars / LGV	HGV
Satellite	A4421 Buckingham Road overbridge	A4421 Buckingham Road, A421 London Road	2017	Three years	11 months	120-140	<10
Satellite	A421 London Road overbridge	A421 London Road	2018	One year and six months	Seven months	110-130	10-20
Satellite	Featherbed Lane overbridge	Featherbed Lane via A421 London Road, A43 Oxford Road	2017	Five years and three months	14 months	90-130	10-40
Satellite	Tibbetts Farm express feeder auto-transformer station						
Satellite	Westbury viaduct	Haul road via A422 Brackley Road, A43 Oxford Road	2017	Two years	19 months	100-120	10-20
Satellite	A422 Brackley Road overbridge	A422 Brackley Road, A43 Oxford Road	2017	Three years	17 months	30-50	850-1,430
Satellite	Turweston green overbridge	Oatleys road/private access from A43 Oxford Road	2017	One year	11 months	50-60	<10
Main	Brackley south cutting	A43 Oxford Road	2017	Five years and nine months	32 months	200-270	20-40
Satellite	Whitfield auto-transformer station						
Satellite	Radstone Road overbridge	Radstone Road via B4525, A43 Oxford Road	2017	Two years and six months	12 months	230-290	10-20

- 12.4.10 Information on the indicative construction programme and methodology is provided in Section 2 which illustrates how the phasing of activities at different compounds will generally be staggered and that construction activities at individual compounds may not occur over the whole duration presented in Table 21. Consequently the peak traffic movements will not generally occur at the same time, although in some instances there may be some overlap.
- 12.4.11 Where construction routes serve more than one construction compound, the combined vehicle movements have been assessed.
- 12.4.12 Construction of the Proposed Scheme is expected to result in changes in traffic flows and delays to vehicle users due to increased traffic flows from works and construction vehicles accessing compounds and also temporary road closures and diversions.
- 12.4.13 The construction activities will result in the closure of Featherbed Lane for a period of up to one year requiring a temporary traffic diversion of approximately 7.6km via Fulwell Road, Valley Road, Mere Road, Sandpit Hill and A421 London Road having a moderate adverse effect on road users.
- 12.4.14 The changes in traffic flows will lead to significant increases in delays to road users and congestion¹²⁰ at the following junctions:
- M40 J10 with A43 Oxford Road (major adverse effect);
 - A43 Oxford Road with B4100 (major adverse effect);
 - A43 Oxford Road with A421 London Road / B4031 (major adverse effect);
 - A43 Oxford Road with A422 Brackley Road (major adverse effect); and
 - A43 Oxford Road with A422 Brackley Road and A4421 Buckingham Road (major adverse effect).
- 12.4.15 Construction of the Proposed Scheme is forecast to result in substantial increases in daily flows (i.e. more than 30% for HGV or all vehicles) and these will cause a significant increase in traffic related severance for non-motorised users in the following locations:
- A43 Oxford Road, between A421 London Road and the A43 Oxford Road / A422 Brackley Road junction (moderate adverse effect) due to an increase in HGV flow;
 - A43 Oxford Road, between A422 Brackley Road (west) and A422 Brackley Road (east) (moderate adverse effect) due to an increase in HGV flow;

¹²⁰ In assessing significant effects of traffic changes on congestion and delays, a major adverse effect occurs where traffic flows at a junction will be beyond or very close to capacity with the Proposed Scheme and the increases in traffic due to the Proposed Scheme will be such as to substantially increase queues and delays on a routine basis at peak times. A moderate adverse effect will occur when traffic flows at a junction will be approaching or at capacity with the Proposed Scheme and modest increases in traffic will increase the frequency of queues and more substantial delays. A minor adverse effect occurs when traffic flows at a junction are not generally exceeding capacity with the Proposed Scheme but the increase in flows will result in occasional queues and delays or small increases in existing delays.

¹²⁰ In the context of this traffic and transport section, Severance is used to relate to a change in ease of non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed to access.

- A422 Brackley Road, between A43 Oxford Road and the A422 Brackley Road overbridge satellite compound (major adverse effect) due to an increase in HGV flow;
- Featherbed Lane, between the Proposed Scheme and A421 London Road, south of the location of the temporary closure (moderate adverse effect) due to an increase in HGV flow as well as all traffic flow;
- A421 London Road between the A43 and the A4421 (major adverse effect) due to an increase in HGV flow; and
- Fulwell Road/Valley Road/Mere Road/Sandpit Hill, between A421 London Road (Finmere) and Featherbed Lane (moderate adverse effect) due to an increase in all traffic flow.

12.4.16 These traffic flow increases do not result in significant increases in congestion and significant delays except those identified above.

12.4.17 Utilities works, including diversions, have been assessed in detail where they are major works and where the traffic and transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising within the area. Minor utilities works are expected to result in only localised traffic and pedestrian diversions, which will be of short duration. No additional significant effects are expected due to utilities works.

12.4.18 No significant effects on parking or loading have been identified during construction in this area.

12.4.19 The effect on accident and safety risk will not be significant as there are no locations where there are both accident clusters and substantial increases in traffic during construction.

12.4.20 There will be minor adverse effects on non-motorised users due to increased travel distance from eleven PRoW and three road diversions for a period of up to two years at AX14 (bridleway), TUW/5/1 (footpath), TUW/9/2 (footpath), TUW/4/2 (bridleway), 213/7/20 (bridleway), 308/2/10 (footpath), 308/3/20 (footpath), 303/7/10 (footpath), 303/5/10 (bridleway), AX19 (bridleway), BD8 (footpath), A421 London Road, A422 Brackley Road and Featherbed Lane. The majority of the diversions are between 100 and 300m in length, apart from AX19, where the diversion will be 600m, 308/2/10 and 308/3/20, where the diversions will be 700m, and BD8, where the diversion will be 800m. Apart from general congestion, there will be no effect on bus services, or disruption at stations or interchanges that will result from construction of the Proposed Scheme.

Cumulative effects

12.4.21 The assessment includes the cumulative effects of planned development during construction by taking this into account within the background traffic growth.

12.4.22 The assessment also takes into account the traffic and transport impacts of works for the Proposed Scheme being undertaken in neighbouring areas. From Greatworth and Lower Boddington (CFA15) to the north, cumulative construction traffic flows of up to

110 cars/LGV per day (two-way) and 50 HGV per day (two-way) have been included in the assessment for this area.

- 12.4.23 From the south, including Calvert, Steeple Claydon, Twyford and Chetwode (CFA13), construction traffic flows of approximately 35 cars/LGV per day (two-way) and 10 HGV per day (two-way) have been included.

Permanent effects

- 12.4.24 Any permanent effects of construction have been considered in the operation assessment for traffic and transport in Section 12.5. This is because the impacts and effects of ongoing increases in travel demand and the wider effects of operations need to be considered together.

Other mitigation measures

- 12.4.25 The implementation of the draft CoCP (see Volume 5: Appendix CT-003-000/1) in combination with the construction workforce travel plan will, to some degree, mitigate the transport related effects during construction of the Proposed Scheme. The reductions in effects arising from the travel plan measures have not been included in the assessment, which will mean the adverse effects may be over-stated.
- 12.4.26 No further traffic and transport mitigation measures during construction of the Proposed Scheme are considered necessary, based on the outcome of this assessment.

Summary of likely significant residual effects

- 12.4.27 Increased traffic during the most intensive periods of construction will potentially cause additional intermittent traffic congestion and delay at a number of junctions in the area including; M40 J10 with A43; A43 with B4100; A43 with A421 London Road and B4031; A43 with A422 and Oxford Road; and A43 with A422 Brackley Road and Buckingham Road.
- 12.4.28 Increased traffic during the most intensive periods of construction, particularly HGV traffic, will also affect non-motorised users crossing and using A43, between A421 London Road and the junction of A43 with A422 and Oxford Road; A43, between A422 (west) and A422 Brackley Road; A422 Brackley Road, between A43 and the A422 Brackley Road overbridge satellite compound; Featherbed Lane, between the Proposed Scheme and A421 London Road; A421 London Road, between the A43 and the A4421; and Fulwell Road/Valley Road/Mere Road/Sandpit Hill, between A421 London Road (Finmere) and Featherbed Lane.
- 12.4.29 Temporary closure of Featherbed Lane overbridge will cause additional delay for users due to the additional travel distance required.
- 12.4.30 Temporary closures and associated diversion of eleven PRoW and three roads (AX14, TUW/5/1, TUW/9/2, TUW/4/2, 213/7/20, 308/2/10, 308/3/20, 303/7/10, 303/5/10, AX19, BD8, A421 London Road, A422 Brackley Road and Featherbed Lane) during construction will affect non-motorised users due to the increased travel distances required by associated diversions.

12.4.31 The significant effects that result from the construction of the Proposed Scheme are shown in Maps TR-03-058 and TR-03-059 (Volume 5, Traffic and Transport Map Book).

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 The following measures have been included as part of the design of the Proposed Scheme and will avoid or reduce impacts on transport users:

- retaining all roads crossing the Proposed Scheme in, or very close to their current location resulting in no significant diversions of traffic onto alternative routes; and
- retaining all PRow crossing the Proposed Scheme, with localised realignments or diversions kept to a minimum.

Assessment of impacts and effects

12.5.2 The following section considers the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme (as described in Section 2.4 of this report).

12.5.3 The operational traffic and transport impacts within this area will be:

- permanent removal of bus stops; and
- PRow closures and associated realignments.

12.5.4 Occasional traffic may access areas of the Proposed Scheme for maintenance purposes. However, these infrequent vehicle movements are anticipated to be very low and will not have a significant effect. No other changes in traffic are expected and traffic flows in 2026 and 2041 are expected to be the same with the Proposed Scheme as in the future baseline. There will be no significant effects due to changes in traffic flows.

12.5.5 The effects on accident and safety risks will not be significant as there are no substantial increases in traffic due to the operation of the Proposed Scheme.

12.5.6 No significant effects on parking or loading have been identified resulting from the operation of the Proposed Scheme in this area.

12.5.7 There will be no significant effects on bus services resulting from the operation of the Proposed Scheme in the area.

12.5.8 The realignment of the A4421 Buckingham Road will result in a moderate adverse effect on the interchange due to the permanent removal of bus stops from outside Shelswell Inn, approximately 350m north of Newton Purcell, with bus users required to access bus services using alternative bus stops in Newton Purcell. HS2 Ltd will work with the local authorities and bus operators to seek to identify convenient alternative stop locations that will mitigate this effect

12.5.9 There will be minor adverse effects on non-motorised users as a result of increased travel distance due to permanent PRow and road realignments at AX19 (Bridleway),

Radstone Road, AX7 (Footpath), AX15 (Footpath), BD7 (Bridleway), A43 Oxford Road, BD10 (Bridleway), BD8 (Footpath), TUW/7/1 (Footpath), TUW/3/2 (Footpath), A422 Brackley Road, 303/4/10 (Bridleway), 303/5/10 (Bridleway), 303/7/10 (Footpath), 213/4/10 (Bridleway) and A4421 Buckingham Road. The majority of realignments are between 100 and 300 metres in length, apart from AX19 (Bridleway), which is approximately 500 metres, and BD8 (Footpath), which is approximately 700 metres.

Cumulative effects

- 12.5.10 The assessment includes cumulative effects of planned development during operation by taking into account background traffic growth.
- 12.5.11 There will be no additional traffic resulting from the operation of the Proposed Scheme in neighbouring areas.

Other mitigation measures

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

Summary of likely significant residual effects

- 12.5.13 Permanent removal of the bus stops on the A4421 Buckingham Road from outside Shelswell Inn, will affect bus passengers who will be required to use alternative stops.
- 12.5.14 Permanent realignment of 12 PRoW and four roads (AX19, Radstone Road, AX7, AX15, BD7, A43 Oxford Road, BD10, BD8, TUW/7/1, TUW/3/2, A422 Brackley Road, 303/4/10, 303/5/10, 303/7/10, 213/4/10 and A4421 Buckingham Road) will affect non-motorised users due to the increased travel distances.
- 12.5.15 The significant effects that result from the operation of the Proposed Scheme are shown in Map TR-04-069 (Volume 5, Traffic and Transport Map Book).

13 Water resources and flood risk assessment

13.1 Introduction

13.1.1 This section provides a description of the current baseline for water resources including surface water, groundwater and the baseline conditions for flood risk. It then reports on the likely impacts and significant effects on these aspects as a result of the construction and operation of the Proposed Scheme.

13.1.2 The main environmental features of relevance to water resources and flood risk include:

- the River Great Ouse, which is a main river, and associated drains and tributaries including the stream at Mixbury, the Radstone Brook and its tributaries, and tributaries of the Padbury Brook, which are ordinary watercourses;
- the floodplains of the aforementioned watercourses;
- the Principal aquifers of the White Limestone Formation, the Blisworth Limestone Formation and the Taynton Limestone Formation;
- a number of Secondary aquifers;
- an unlicensed groundwater abstraction at Mixbury Hall; and
- water dependent habitats: the Helmdon Disused Railway SSSI, the Turweston Manor Grassland LWS and Fox Covert (Whitfield) LWS.

13.1.3 Key environmental issues relating to water resources and flood risk include:

- the potential impacts of culvert and viaduct crossings on the flow and quality of watercourses, including the River Great Ouse, tributaries of Padbury Brook, the stream at Mixbury and the Radstone Brook and its tributaries;
- the need for channel diversions and/or minor realignments on the River Great Ouse and other watercourses;
- the lowering of local groundwater levels due to drainage of shallow groundwater by cuttings, such as the Barton to Mixbury cutting, Turweston cutting, Mixbury cutting and Brackley south and north cuttings;
- the interception of groundwater flowing towards the Turweston Manor Grassland LWS;
- potential impacts on the risk of river flooding from the River Great Ouse and its tributaries; and
- potential impacts on the risk of surface water flooding.

- 13.1.4 Volume 5: Appendix WR-001-000 contains a report on the route-wide effects including:
- generic assessments on a route-wide basis;
 - stakeholder engagement;
 - in combination effects;
 - a draft operation and maintenance plan for water resources and flood risk;
 - a Water Framework Directive¹²¹ (WFD) compliance assessment; and
 - a route-wide Flood Risk Assessment (FRA).
- 13.1.5 Detailed reports on water resources and flood risk within the study area are also contained in the Volume 5 Appendices. These include:
- Appendix WR-002-014 Water Resources Assessment report;
 - Appendix WR-003-014 Flood Risk Assessment; and
 - Appendix WR-004-005 Hydraulic Modelling Report for the River Great Ouse at Turweston.
- 13.1.6 Map Series WR-01 to WR-03 showing features referred to in this report and those in Volume 5 are all contained in the Volume 5, Water Resources and Flood Risk Assessment Map Book.
- 13.1.7 Discussions have been held with the Environment Agency, the Canal & River Trust (formerly British Waterways), Buckinghamshire County Council, Aylesbury Vale District Council (AVDC), and private holders of groundwater abstraction licenses.

13.2 Scope, assumptions and limitations

- 13.2.1 The assessment scope, key assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1 and in the SMR and its addendum (see Volume 5: Appendix CT-001-000/1 and Appendix CT-001-000/2). This report follows the standard assessment methodology.
- 13.2.2 The spatial scope of the assessment was based upon the identification of surface water and groundwater features within 1km of the centre line of the route, except where there is clearly no hydraulic connectivity. For surface water features in urban areas, the extent was reduced to 500m. Outside of these distances it is unlikely that direct impacts upon the water environment will be attributable to the Proposed Scheme. Where works extend more than 200m from the centre line, for example at stations and depots, professional judgement has been used in selecting the appropriate limit to the extension in spatial scope required. For the purposes of this assessment this spatial scope is defined as the study area.

¹²¹ *Water Framework Directive – Directive 2000/60/EC* of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, Strasbourg, European Parliament and European Council.

- 13.2.3 Site visits were carried out in May 2013 to inform the assessment of potential impacts to groundwater and surface water interactions at the following locations along the route in this study area, including:
- various groundwater springs and issues within the vicinity of Turweston, although due to land access not being granted, no access was available to the Turweston Manor Grassland LWS; and
 - the Helmdon Disused Railway SSSI near Radstone.
- 13.2.4 WFD classification data have been made available by the Environment Agency. For surface water bodies that do not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), the status class has been taken as the status class for the first downstream water body for which a status class is reported. Where groundwater does not have a WFD status class shown in the relevant RBMP, these are referred to as 'not assessed by the Environment Agency'.
- 13.2.5 Hydraulic modelling has been undertaken at the crossing of the River Great Ouse at Turweston. The limitations associated with flood risk within this study area are described in detail in the flood risk assessment in Volume 5: Appendix WR-003-014.

13.3 Environmental baseline

Existing baseline – Surface water resources

Surface water features

- 13.3.1 All water bodies in this area fall within the Upper and Bedford Ouse sub-catchment of the Anglian River Basin District (RBD) as set out within the RBMP¹²².
- 13.3.2 The current surface water baseline is shown on Maps WR-01-020 and WR-01-021 (Volume 5, Water Resources and Flood Risk Assessment Map Book) and all surface water features within the study area are assessed within Volume 5: Appendix WR-002-014. Table 22 includes features potentially affected by the Proposed Scheme.

¹²² Environment Agency (2009), *River Basin Management Plan, Anglian River Basin District*.

Table 22: Surface water features potentially affected by the Proposed Scheme

Water feature	Location description (Volume 5, Water Resources and Flood Risk Assessment Map Book map reference)	Watercourse classification ¹²³	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value ¹²⁴
Unnamed drains forming tributary of Padbury Brook.	<p>Unnamed tributaries will be crossed by the route north-east of Newton Purcell.</p> <p>Includes two culverted crossings that will be beneath existing rail embankment and A4421.</p> <p>(SWC-CFA14-01 and SWC-CFA14-02); and (SWC-CFA14-10 to SWC-CFA14-13).</p>	Ordinary watercourse	<p>No status class shown in RBMP – assumed status</p> <p>Moderate</p>	<p>No status class shown in RBMP – assumed status</p> <p>Good Potential</p>	Moderate
Five unnamed ponds near Barley Fields Barn Farm / Boundary Farm	<p>Five field ponds between Barley Fields Barn Farm will be to the west of the route and Boundary Farm to the east of the route.</p> <p>(SWC-CFA14-14)</p>	Not applicable	Not applicable	Not applicable	Low
Unnamed drain (stream at Mixbury)	<p>The stream at Mixbury is a drain that will be crossed by the route to the east of Mixbury.</p> <p>(SWC-CFA14-03)</p>	Ordinary watercourse	Not applicable	Not applicable	Moderate
River Great Ouse	<p>The River Great Ouse will be crossed by the route three times; one of these will be to the west of Westbury.</p> <p>(SWC-CFA14-04).</p>	Main river	<p>Ouse (GB105033037860)</p> <p>Moderate</p>	Good Potential	High
River Great Ouse	<p>The River Great Ouse will be crossed by the route three times; two of these will be to north of Turweston.</p> <p>(SWC-CFA14-05 and SWC-CFA14-06).</p>	Main river	<p>Ouse (GB105033037880)</p> <p>Good</p>	Good (by 2015)	High

¹²³ Water-feature classifications: Section 113 of the Water Resources Act 1991 defines a main river as a watercourse that is shown as such on a main river map. Section 72 of the Land Drainage Act 1991 defines an ordinary watercourse as 'a watercourse that is not part of a main river'. Section 221 of the Water Resources Act 1991 defines a watercourse as including 'all rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows'. Main rivers are larger rivers and streams designated by Defra on the main river map and are regulated by the Environment Agency.

¹²⁴ For examples of receptor value see Table 43 in the addendum to the SMR (see Volume 5: Appendix CT -001-000/2).

Water feature	Location description (Volume 5, Water Resources and Flood Risk Assessment Map Book map reference)	Watercourse classification ¹²³	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value ¹²⁴
Unnamed tributary of River Great Ouse	Unnamed drain running south from near Hall Farm, will be approximately 450 – 900m west of the route. (SWC-CFA14-15)	Ordinary watercourse	No status class in RBMP – assumed status Good	No status class in RBMP – assumed status Good	Moderate
Radstone Brook	Radstone Brook flows from the west to east and will be crossed by the route south of Radstone. (SWC-CFA14-07); and (SWC-CFA14-16 to SWC-CFA14-18)	Ordinary watercourse	Radstone Brook (GB105033037940) Moderate	Good Potential	High
Unnamed tributary of the Radstone Brook	Unnamed tributary of the Radstone Brook flows from the west to east and will be crossed by the route north west of Radstone. (SWC-CFA14-08 and SWC-CFA14-19)	Ordinary watercourse	No status class in RBMP – assumed status Moderate	No status class in RBMP – assumed status Good Potential	Moderate
Headwater channel of the Radstone Brook	Headwater channel of the Radstone Brook which is crossed by the route on the CFA14/CFA15 boundary, south of Halse Copse. (SWC-CFA14-09)	Ordinary watercourse	No status class in RBMP – assumed status Moderate	No status class in RBMP – assumed status Good Potential	Moderate
Numerous ponds within 1km of the Proposed Scheme	Various locations (see Volume 5: Appendix WR-002-014 for details).	Not applicable	Not applicable	Not applicable	Low

Water Framework Directive status

- 13.3.3 The 'Padbury Brook (The Twins)' is classified by the Environment Agency as a heavily modified water body currently of Moderate Status. The Environment Agency predicts that by 2027 the 'Padbury Brook (The Twins)' water body will be of Good Potential. The unnamed drains forming a tributary of the Padbury Brook to be crossed by the Proposed Scheme are assumed to have the same status.

- 13.3.4 In this area, the Environment Agency has classified two reaches of the River Great Ouse under the WFD. Between Brackley and Westbury, and where the river is crossed by the route (Map WR-01-021, SWC-CFA14-04, (Volume 5, Water Resources and Flood Risk Assessment Map Book), the Environment Agency predicts the overall ecological quality under the WFD by 2027 to be Good Potential, which is an improvement on the current status of Moderate Status. The current status is due to the general physico-chemical status and phosphate levels in the river. This section is designated by the Environment Agency as a heavily modified water body.
- 13.3.5 The second River Ouse WFD water body, from near Whitfield to Brackley, and where the river is crossed by the route north of Turweston (Map WR-01-021, SWC-CFA14-05 and SWC-CFA14-06, in Volume 5, Water Resources and Flood Risk Assessment Map Book), is currently Good Status, and by 2015, the Environment Agency predicts it will remain at Good Status.
- 13.3.6 The Radstone Brook is classified by the Environment Agency as a heavily modified water body at a current status of Moderate Status. The Environment Agency predicts that by 2027 the Radstone Brook will be of Good Potential.

Abstractions and permitted discharges

- 13.3.7 There are no licensed surface water abstractions¹²⁵ within 1km in the study area. There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.
- 13.3.8 The Environment Agency reports that there are 17 current consented surface water discharges within 1km of the route in the study area. Details are provided in Volume 5: Appendix WR-002-014.

Existing baseline – groundwater resources

Geology and hydrogeology

- 13.3.9 The location of abstractions, geological formations and indicative groundwater elevations are shown on Map WR-02-014 (Volume 5, Water Resources and Flood Risk Assessment Map Book).
- 13.3.10 The geological formations within this study area are described further in the Land quality section (Section 8) of this report and shown in a schematic geological cross-section in Volume 5: Appendix WR-002-014.
- 13.3.11 A summary of the superficial and bedrock geology and hydrogeology is presented in Table 23. Unless otherwise stated, the geological groups listed are all crossed by the route.

¹²⁵ Surface water abstractions for public supply are not included.

Table 23: Summary of geology and hydrogeology in CFA14

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value
Superficial deposits						
Till	Present on high ground across the area and along parts of the route	Sand and gravel in a clay matrix	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Alluvium	Present along the valley of the River Great Ouse and its tributaries	Clay, silt, sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial deposits	Generally present on high ground across the area, interbedded with Till in parts along the route	Sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head	Three small pockets south east of Brackley in the valley of the River Great Ouse, on the route	Clay silt sand and gravel	Secondary (undifferentiated) aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Cornbrash Formation (Great Oolite Group)	Outcrops in a 700m to 1200m wide band running south-west to north-east along the southern boundary of the area	Limestone	Secondary A aquifer	Upper Bedford Oolite Secondary Good status	Good status (by 2015)	Moderate
Forest Marble Formation (Great Oolite Group)	Outcrops in an approximately 400m wide band to the north-west of the Cornbrash Formation	Interbedded limestone and mudstone	Secondary A aquifer	Upper Bedford Oolite Secondary Good status	Good status (by 2015)	Moderate
White Limestone Formation (Great Oolite Group)	Outcrops across the centre of the area	Limestone	Principal aquifer	Upper Bedford Oolite Principal 1 Poor status	Good status	High

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value
Blisworth Limestone Formation (Great Oolite Group)	Outcrops on hilltops north of Brackley	Limestone	Principal aquifer	Upper Bedford Ouse Oolite Principal 1 Poor status	Good status	High
Rutland Formation (Great Oolite Group)	Outcrops on the valley sides north and east of Brackley	Mudstone	Secondary B aquifer	Upper Bedford Ouse Oolite Principal 1 Poor status	Good status	Moderate
Taynton Limestone Formation (Great Oolite Group)	Outcrops on the valley sides north and east of Brackley	Ooidal Limestone	Principal aquifer	Upper Bedford Ouse Oolite Principal 1 Poor status	Good status	High
Sharp's Hill Formation (Great Oolite Group)	Outcrops on the valley sides north and east of Brackley	Limestone and mudstone beds with some siltstone and sandstone towards the base	Secondary A aquifer	Upper Bedford Ouse Oolite Secondary Good status	Good status (by 2015)	Moderate
Horsehay Sand Formation (Great Oolite Group)	Outcrops on the valley sides north and east of Brackley	Sandstone	Secondary A aquifer	Upper Bedford Ouse Oolite Principal 1 Poor status	Good status	Moderate
Whitby Mudstone Formation	Outcrops in the base of the valley of the River Great Ouse and its tributaries	Mudstone	Unproductive strata	Upper Bedford Ouse Oolite Principal 1 Poor status	Good status	Low

Superficial deposits

- 13.3.12 Superficial deposits comprise Alluvium, Head and Glaciofluvial deposits in the valleys, where they are likely to be in hydraulic continuity with local watercourses. Outside of the valleys, the superficial deposits are composed of Till, which will contain very little groundwater.

Bedrock aquifers

- 13.3.13 Most of the route in this area traverses the Great Oolite Group, which largely comprises various limestone formations as shown in Table 23. The different formations within the Great Oolite Group are classified as Principal or Secondary aquifers. In the valley of the River Great Ouse, the Great Oolite formations are eroded

to expose the underlying Whitby Mudstone Formation of the Lias Group, which is classified as unproductive and not considered a groundwater receptor.

- 13.3.14 The 1:50,000 geological maps show three faults crossed by the route in this area. The first two faults are perpendicular to the route, west of Westbury and east of Brackley. The third is present to the north of Brackley. These do not appear to influence groundwater flow in the area (see Volume 5: Appendix WR-002-014).
- 13.3.15 The stratigraphy is generally horizontal, with some slight dip of the Whitby Mudstone towards the River Great Ouse. Groundwater flow is anticipated to follow topography, with flow towards the valleys and watercourses, such as the River Great Ouse. Where the Whitby Mudstone outcrops groundwater in the overlying aquifers will be forced to discharge as springs, issues or directly into the watercourses flowing over the Great Oolite Group formations.
- 13.3.16 BGS mapping at 1:50,000 scale indicates that the Inferior Oolite (a Secondary aquifer) does not outcrop within the study area. It would be expected in the River Great Ouse valleys above the Lias if it were present.
- 13.3.17 The geological formations within this study area are described in Land quality (Section 8) and further details are included in the Volume 5: Appendix WR-002-014.

Water Framework Directive status

- 13.3.18 No WFD classification has been given by the Environment Agency to the superficial deposits. The current overall WFD status of the bedrock deposits in the study area is summarised in Table 23 and are largely assessed to have a Poor Status.

Abstraction and permitted discharges

- 13.3.19 There are no public or private licensed abstractions that will be within 1km of the route. No Source Protection Zones (SPZ) will be traversed by the route.
- 13.3.20 A single private unlicensed groundwater abstraction has been identified at Mixbury Hall, as illustrated on Map WR-02-014 (Volume 5, Water Resources and Flood Risk Assessment Map Book). There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m³ per day.
- 13.3.21 There are no current groundwater discharge consents in this area.

Surface water/groundwater interaction

- 13.3.22 Several springs and issues rise from the White Limestone Formation and the Taynton Limestone Formation on the valley sides north and south of Turweston. Aerial photographs show evidence of one spring/issue in the Turweston Manor Grassland LWS north of Turweston. Minor springs and issues also feed into the Turweston Wetland and Turweston Carr to the south of Turweston. No access to the land within the vicinity of Turweston Manor Grassland LWS was available to confirm the presence or absence of spring locations and the approximate volumes of flows from any of the springs.
- 13.3.23 The bedrock geology near Brackley comprises the Blisworth Limestone Formation (Principal aquifer), the Rutland Formation mudstone (secondary type B aquifer) and the underlying Taynton Limestone (Principal aquifer). These form part of the Great

Oolite Group and feed a number of springs that issue from the hillsides in the Radstone area.

Water dependent habitats

13.3.24 In addition to the water bodies described in Table 22, the following potential water-dependant habitats have been identified in this study area:

- Helmdon Disused Railway SSSI;
- Turweston Manor Grassland LWS; and
- Fox Covert (Whitfield) LWS.

13.3.25 Further information on these habitats is included in the Ecology section (Section 7) of this report.

Existing baseline – flood risk

River flooding

13.3.26 The agreed data set for river flooding is the Environment Agency Flood Zone Mapping, as shown on Maps WR-01-020 and WR-01-021 (Volume 5, Water Resources and Flood Risk Assessment Map Book).

13.3.27 In the study area, the route will cross the River Great Ouse at two locations and a stream at Mixbury. More detailed information is contained within the flood risk assessment (Volume 5: Appendix WR-003-014).

13.3.28 The stream at Mixbury (see Map WR-01-020, SWC-CFA14-03, in Volume 5, Water Resources and Flood Risk Assessment Map Book) is a tributary of the River Great Ouse and is an ordinary watercourse. At the location of the crossing the stream has a catchment size of approximately 3km². The route will occupy approximately 1,000m² of Flood Zone 3. The land use in the floodplain immediately upstream of the crossing is woodland (Mossycorner Spinney).

13.3.29 The route will cross the River Great Ouse to the west of Westbury (Map WR-01-021, SWC-CFA14-04, in Volume 5, Water Resources and Flood Risk Assessment Map Book), where it has an upstream catchment size of 77km² and is a main river. The route will cross approximately 230m of Flood Zone 3 on viaduct. The land use within the floodplain in the vicinity of the Proposed Scheme is largely made up of agricultural land belonging to Westbury Farm (moderate value receptor). The southern extent of Westbury, including school playing fields (low value receptor) and leisure facilities (moderate value receptors), is located within the floodplain approximately 950m downstream of Westbury viaduct.

13.3.30 A second crossing of the River Great Ouse will be at Turweston. There are two channels to the River Great Ouse at this crossing location, both of which are main rivers. Approximately 50m upstream of the crossing location, a mill stream (see Map WR-01-021, SWC-CFA14-05 in Volume 5, Water Resources and Flood Risk Assessment Map Book) splits from the main channel of the River Great Ouse (see Map WR-01-021, SWC-CFA14-06 in Volume 5, Water Resources and Flood Risk Assessment Map Book). The River Great Ouse has an upstream catchment size of 38km², and the route will

cross 110m and occupy 1,600m² of Flood Zone 3. The land use within the floodplain around the Turweston viaduct is agricultural (moderate value receptor).

- 13.3.31 The River Great Ouse is shown on Environment Agency records to have historically flooded between the crossings of the Proposed Scheme at Westbury and Turweston in both April 1998 and July 2007. The historical extent of flooding is confined to the eastern side of Brackley, to the west of the A43 Oxford Road embankment, and is shown on Map WR-01-021, SWC-CFA14-04, in Volume 5, Water Resources and Flood Risk Assessment Map Book. In addition, the Buckinghamshire Preliminary Flood Risk Assessment¹²⁶ (PFRA) states that flooding from ordinary watercourses occurred in Westbury; however, no further information is provided.

Surface water flooding

- 13.3.32 The Oxfordshire¹²⁷, Buckinghamshire and Northamptonshire¹²⁸ PFRA reports state that the locally agreed surface water flooding dataset is the Environment Agency Flood Map for Surface Water (FMfSW), which is shown on Maps WR-01-020 and WR-01-021 (Volume 5, Water Resources and Flood Risk Assessment Map Book).
- 13.3.33 No historical records of surface water flooding have been located within the study area.
- 13.3.34 There are areas on the FMfSW within the study area that have a high risk of surface water flooding for rainfall events up to and including the 1 in 200 years (0.5% annual probability) rainfall event. These include tributaries of the Padbury Brook to the north of Newton Purcell (Map WR-01-020, SWC-CFA14-01 and SWC-CFA14-02, in Volume 5, Water Resources and Flood Risk Assessment Map Book), areas of surface water ponding at Finmere Quarry, dry valleys in the catchment of the River Great Ouse at Westbury and Turweston, a tributary of the River Great Ouse at the A43 Oxford Road, and the upper reaches of the tributary watercourses of the Radstone Brook. More detailed information is contained within the flood risk assessment (Volume 5: Appendix WR-003-014).

Sewer flooding

- 13.3.35 The agreed datasets for sewer flooding are records in the Oxfordshire, Buckinghamshire and Northamptonshire PFRA reports, as well as in the AVDC Strategic Flood Risk Assessment (SFRA), Cherwell District SFRA and the West Northamptonshire SFRA.
- 13.3.36 The West Northamptonshire SFRA notes that Brackley has a history of flooding due to insufficient capacity within the urban drainage system – the eastern outskirts of Brackley fall at the 1km limit of the study area. There are no further records of historic sewer flooding within the study area.
- 13.3.37 The route will not pass through any significantly urbanised areas within the study area. Consequently, there is currently a low risk of flooding from sewers.

¹²⁶ Jacobs (2011), *Buckinghamshire County Council Preliminary Flood Risk Assessment*.

¹²⁷ JBA (2011), *Oxfordshire Preliminary Flood Risk Assessment*.

¹²⁸ Northamptonshire County Council (2011), *Northamptonshire Preliminary Flood Risk Assessment*.

Artificial water bodies

- 13.3.38 The agreed dataset for flooding due to reservoir failure is the Environment Agency Reservoir Inundation Map.
- 13.3.39 Flooding from artificial water bodies, such as canals and reservoirs, although extremely unlikely, may occur as a result of failure of a retaining structure that impounds water. No artificial water bodies have been identified within the study area, and the route will not cross any predicted flooding on the Environment Agency Reservoir Inundation Map.

Groundwater flooding

- 13.3.40 The agreed datasets for groundwater flooding are the Oxfordshire, Buckinghamshire and Northamptonshire PFRA.
- 13.3.41 The Oxfordshire, Buckinghamshire and Northamptonshire PFRA reports do not report any historical incidents of groundwater flooding in the study area.

Future baseline

- 13.3.42 Appendix CT-004-000 identifies developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. These are termed 'committed developments' and will form part of the baseline for the operation of the Proposed Scheme. The potential cumulative effects arising from committed developments in relation to water resources and flood risk have been considered as part of this assessment of the construction and operation of the Proposed Scheme.
- 13.3.43 All developments are required to comply with the National Planning Policy Framework¹²⁹ (NPPF), development plans and other legislation and guidance. As such committed developments should have a neutral effect on the water resources and flood risk baseline. There are no committed developments that are likely to cause significant changes to the water resources and flood risk baseline prior to construction of the Proposed Scheme in this study area.
- 13.3.44 The WFD future status objectives are set out in Table 22 and Table 23 of this report. This potential change in baseline is not considered to result in the reported effects from the Proposed Scheme changing in significance.

Climate change

- 13.3.45 Current projections to the 2080s indicate that climate change may affect the future baseline against which the impacts of the Proposed Scheme on surface water and groundwater resources have been assessed. There may be changes in the flow and water quality characteristics of surface water and groundwater bodies as a result of changes in climate. However, except for flood flows described below, these changes are not considered to result in the reported effects from the Proposed Scheme changing in significance.

¹²⁹ Department for Communities and Local Government (2012), *National Planning Policy Framework Technical Guidance*.

- 13.3.46 Current projections indicate that there will be more frequent, higher intensity rainfall events in the future. The probability and severity of surface water flooding could therefore increase as surface water drainage systems fail to cope with more frequent, higher intensity storms. Peak river flows during flood events are expected to increase, potentially causing greater depths and extents of flooding.
- 13.3.47 When considering the influence that climate change may have on the future baseline, against which impacts from the Proposed Scheme on flood risk have been evaluated, the assessment has used the recommended precautionary sensitivity ranges of key parameters, as given in Table 5 in the Technical Guidance to the NPPF. The sensitivity testing undertaken allows for variations in climate change factors included in other national guidance.
- 13.3.48 Further information on the potential additional impacts of climate change for water resources and flood risk is provided in Sections 7 and 8 of Volume 1 and Table 13 of Volume 5: Appendix CT-009-000.

13.4 Effects arising during construction

Avoidance and mitigation measures

- 13.4.1 The general approach to mitigation is set out in Volume 1, Section 9.
- 13.4.2 The following measures will reduce potentially significant adverse effects on water resources and flood risk to levels that will not be significant. Further details are given in Volume 5: Appendix WR-002-014 and WR-003-014.
- 13.4.3 The two viaducts that will cross the River Great Ouse (see Map WR-01-021, SWC - CFA14-04 and SWC-CFA14-05/SWC-CFA14-06, in Volume 5, Water Resources and Flood Risk Assessment Map Book) will reduce to a reasonably practicable minimum the permanent built footprint within the floodplain. The pier footings have been located outside the main channel of the River Great Ouse reducing the potential for impact on flows.
- 13.4.4 The detailed design of all surface watercourse realignments and crossings will be completed in consultation with the Environment Agency to meet their objectives with respect to hydraulic capacity, flood risk, ecology and hydromorphology. Where reasonably practicable, the permanent channel realignments will be constructed in advance of other activities associated with the construction of the Proposed Scheme. The design mitigation, including consideration of design features aligned with the objectives of the WFD (for example use of soft engineering solutions, aquatic marginal planting and the inclusion of natural forms), will ensure that the channels and structures are sufficiently sized to avoid a permanent impact on flow. The following surface water crossings will be dealt with in this way, as discussed further in Volume 5: Appendix WR-002-014):
- unnamed tributary of Padbury Brook near Newton Purcell on Map WR-01-020, SWC-CFA14-01, SWC-CFA14-02 and SWC-CFA14-11 (Volume 5, Water Resources and Flood Risk Assessment Map Book);
 - the stream at Mixbury on Map WR-01-020, SWC-CFA14-03;

- the River Great Ouse mill race on Map WR-01-021, SWC-CFA14-05 (Volume 5, Water Resources and Flood Risk Assessment Map Book); and
- the Radstone Brook (and tributaries) on Map WR-01-021, SWC-CFA14-07, SWC-CFA14-08, SWC-CFA14-09 and SWC-CFA14-19.

- 13.4.5 Culvert length will be minimised wherever possible and will be designed with invert levels below the firm bed of the watercourse to negate the impact on flows and sediment transfer. Where possible, consideration will be given to provide mitigation for the loss of open channel by means of sensitive design at either end of the culvert in order to retain and, if possible, enhance the overall quality of the watercourse. Where there is loss of length due to straightening, the aim, where possible, will be to offset this by increasing channel length up or downstream of the culvert to at least match the lost length of channel. Culverts will be designed in line with Construction Industry Research and Information Association (CIRIA)¹³⁰ and Environment Agency guidance and in consultation with the Environment Agency. The mitigation specifically for the ecology of the watercourses is considered in Section 7, Ecology.
- 13.4.6 Drainage, including that from access roads and hard standings, will discharge, where reasonably practicable, to sustainable drainage systems (SuDS) balancing ponds, prior to subsequent discharge to watercourses or if necessary to sewer. The balancing ponds will provide mitigation to ensure that rainfall run-off from the route will be released in a controlled manner to the receiving watercourses reducing the potential for adverse impact on the water quality and flow of the receiving watercourse. The balancing ponds, shown on Maps CT-06-060 to CT-06-068 (Volume 2, CFA14 Map Book), will be designed where practicable to discharge at existing run-off rates and will accommodate for events up and including the 1 in 100 annual probability (1%) including an allowance for climate change.
- 13.4.7 Realignments of one minor road (Radstone Road) and four major roads (A4421 Buckingham Road, A421 London Road, A422 Brackley Road, and A43 Oxford Road), are required as part of the Proposed Scheme. Appropriate mitigation will be provided to address the risks to the receiving watercourses for both flow and water quality during the detailed design of the Proposed Scheme using the Design Manual for Roads and Bridges¹³¹ and CIRIA guidance¹³² to control the run-off rate and water quality in accordance with the necessary approvals.
- 13.4.8 With regard to groundwater, minor watercourses rise on the Glacial Till deposits to the south-west and north-west of Radstone. The topography indicates that there is likely to be a localised small groundwater divide between Hall Farm and Fox Covert, with groundwater flow to the south of the divide towards the River Great Ouse in the south and flow northwards to the watercourse flowing through Coldharbour Farm. Any groundwater intercepted by the track and land drainage from the Brackley north cutting will be discharged to the Coldharbour Farm watercourse (see Map WR-01-021, SWC-CFA14-07 in Volume 5, Water Resources and Flood Risk Assessment Map Book) and any groundwater intercepted by the track and land drainage for the Brackley

¹³⁰ CIRIA (2010), *C689 Culvert design and operation guide*, CIRIA, London, UK.

¹³¹ DMRB Volume 4 Section 2.

¹³² Murname, E., Heap, A. and Swain, A. (2006), *C648 Control of Water Pollution from Linear Construction Sites*, CIRIA, London, UK.

south cutting will be discharged to the River Great Ouse. This arrangement will ensure that, whilst there may be localised changes to the hydrogeological regime, impacts on the flow regime of the minor watercourses will be reduced.

- 13.4.9 Replacement floodplain storage will be provided at the edge of the modelled floodplain of the stream at Mixbury and at the two crossings of the River Great Ouse to mitigate for loss of floodplain storage resulting from permanent structures in the floodplain such as viaduct piers. The replacement floodplain storage areas are shown on Maps CT-06-060 to CT-06-068 (Volume 2, CFA14 Map Book). The replacement floodplain storage areas will mitigate for any minor temporary loss of floodplain storage resulting from the construction works in the floodplain.
- 13.4.10 Culverts for watercourses and land drains, such as at the tributary of the Padbury Brook at Newton Purcell (Map WR-01-20, SWC-CFA14-1), the stream at Mixbury (Map WR-01-020, SWC-CFA14-03, and the tributaries of the Radstone Brook (Map WR-01-021, SWC-CFA14-7 and 9), have been designed to at least convey the 1 in 100 year return period (1% annual probability) flood flows including an allowance for climate change. This has ensured continued conveyance (flow) and no increase in downstream flood risk.
- 13.4.11 The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme (see Volume 5: Appendix CT-003-000/1). These will provide effective management and control of the impacts during the construction period.
- 13.4.12 The following examples illustrate how measures in the draft CoCP will reduce potentially significant adverse effects arising during construction on water resources and flood risk.
- 13.4.13 In accordance with the draft CoCP, Section 16, monitoring will be undertaken in consultation with the Environment Agency prior to, during and post construction, if required, to establish baseline conditions for surface water and groundwater and to confirm the effectiveness of agreed temporary and permanent mitigation measures.
- 13.4.14 With respect to surface water, Section 16 of the draft CoCP stipulates measures that will apply to works in or near the watercourses at the crossings and realignments of the unnamed drains near Newton Purcell (see Map WR-01-020, SWC-CFA14-1 and SWC-CFA14-2, in Volume 5, Water Resources and Flood Risk Assessment Map Book), the stream at Mixbury (see Map WR-01-020, SWC-CFA14-3), the River Great Ouse (see Map WR-01-021, SWC-CFA14-5), and the Radstone Brook and tributaries (see Map WR-01-021, SWC-CFA14-7, 8 and 9), which will be designed in consultation with the Environment Agency, so that sediment mobilisation is managed, the potential for contamination from fuel spills is minimised and the works are timed to minimise the impact on water quality and water dependent habitats and species.
- 13.4.15 In accordance with Section 16 of the draft CoCP, temporary excavated material stockpiles, construction compounds and site offices will be located outside of areas at risk of flooding where reasonably practicable, including the floodplain of the River Great Ouse and the tributary of the Padbury Brook at Newton Purcell, to avoid having an impact on the risk of flooding elsewhere. Where construction compounds cannot

be located outside flood risk areas, there will be a site specific flood risk management plan prepared prior to construction to manage the potential risks.

- 13.4.16 Section 16 of the draft CoCP requires contractors to obtain the necessary approvals to enable discharge of surface water run-off at a controlled rate to the public sewer network or watercourses from construction compounds, such as at the Westbury viaduct satellite compound, preventing an increase in the risk of sewer or watercourse flooding.

Assessment of impacts and effects

- 13.4.17 This section describes the significant effects following the implementation of avoidance and mitigation measures.
- 13.4.18 Further details of the potential impacts that will not have significant effects are provided in the Water Resources Assessment report in Volume 5: Appendix WR-002-014 and Flood Risk Assessment in Volume 5: Appendix WR-003-014.
- 13.4.19 An assessment of the impact on the WFD status is detailed within the WFD Compliance Assessment, contained within the route-wide Water Resources appendix (Volume 5: Appendix WR-001-000).
- 13.4.20 It is not considered that projected climate change effects, combined with the effects from the construction of the Proposed Scheme, will alter the significance of any of the reported effects on surface water and groundwater resources (see Volume 3: Route-wide Effects Assessment for further information).

Temporary effects

Surface water

- 13.4.21 The assessment indicates that there will be no significant temporary adverse effects on surface water resources during the construction period.

Groundwater

- 13.4.22 The assessment shows that there will be no significant temporary adverse effects on groundwater resources or water dependent habitats during the construction period.

Flood risk

- 13.4.23 The assessment has identified no significant increase in risks resulting from all sources of flooding during the construction process and therefore no significant temporary adverse effects.

Cumulative effects

- 13.4.24 There are no committed developments that have been identified which will result in significant cumulative temporary effects.

Permanent effects

Surface water

- 13.4.25 The assessment shows that there will be no significant permanent adverse effects on surface water resources.

Groundwater

- 13.4.26 The assessment shows that there will be no permanent significant adverse effects on groundwater resources or water dependent habitats.

Flood risk

- 13.4.27 The assessment shows that there will be no significant permanent effects on flood risk resulting from all sources of flooding. More detail is provided in the Flood Risk Assessment (Volume 5: Appendix WR-003-014).

Cumulative effects

- 13.4.28 There are no committed developments that have been identified which will result in significant cumulative permanent effects.

Other mitigation measures

- 13.4.29 No other mitigation measures are required.

Summary of likely significant residual effects

- 13.4.30 Following mitigation, no significant residual adverse effects to water resources and flood risk have been identified within the assessment.

13.5 Effects arising from operation

Avoidance and mitigation measures

- 13.5.1 Generic examples of design measures that will mitigate impacts so that there will be no significant adverse effects on the quality and flow characteristics of surface watercourses and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1, Section 8.
- 13.5.2 Site specific examples of design measures that will mitigate impact include the drainage arrangements for the Proposed Scheme in the study area. This comprises a number of balancing ponds for either railway or highway drainage and land drainage areas. These ponds and their associated access tracks are shown in Maps CT-06-060 to CT-06-068 (Volume 2, CFA14 Map Book).
- 13.5.3 Generic examples of management measures during operation and management of the Proposed Scheme that will mitigate impacts so that there are no significant adverse effects on the quality and flow characteristics of surface watercourses and groundwater bodies are described in Volume 1, Section 9, and in the draft operation and maintenance plan for water resources and flood risk included in Volume 5: Appendix WR-001-000.
- 13.5.4 As noted in the generic assessment in Volume 3, the risk of pollution from accidental spillage is considered to be extremely low. Incorporation of appropriate spillage control measures within the drainage of the three viaducts will reduce this risk further.
- 13.5.5 Operation and management of the Proposed Scheme is not likely to have a significant adverse effect on flood risk anywhere in the catchments through which it will pass. Generic examples of management measures that may mitigate flood risk are described in Volume 1, Section 6.g.

Assessment of impacts and effects

- 13.5.6 There are considered to be no significant adverse effects to surface water, groundwater or flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

- 13.5.7 There are considered to be no further measures required to mitigate adverse effects on surface water resources or groundwater resources or flood risk.

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