LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 2 | Community Forum Area report

CFA1 | Euston - Station and Approach

November 2013

VOL 2

ES 3.2.1.1

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Department for Transport

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

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Structure of the HS2 Phase One Environmental Statement

The Environmental Statement (ES) documentation comprises:

- Non-technical summary (NTS) – which provides a summary in non-technical language of the Proposed Scheme, the likely significant environmental effects of the Proposed Scheme, both beneficial and adverse, and the means to avoid or reduce the adverse effects;
- Volume 1: Introduction to the Environmental Statement 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

1.2 Introduction to HS2

1.2.1 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).

1.2.2 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 of the principal works 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.

1.2.3 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.

1.2.4 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.

1.2.5 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 two operational frequency has been used. For further detail of the anticipated operation of the Proposed Scheme in the Euston – station and approach (CFA1), see Section 2.5.

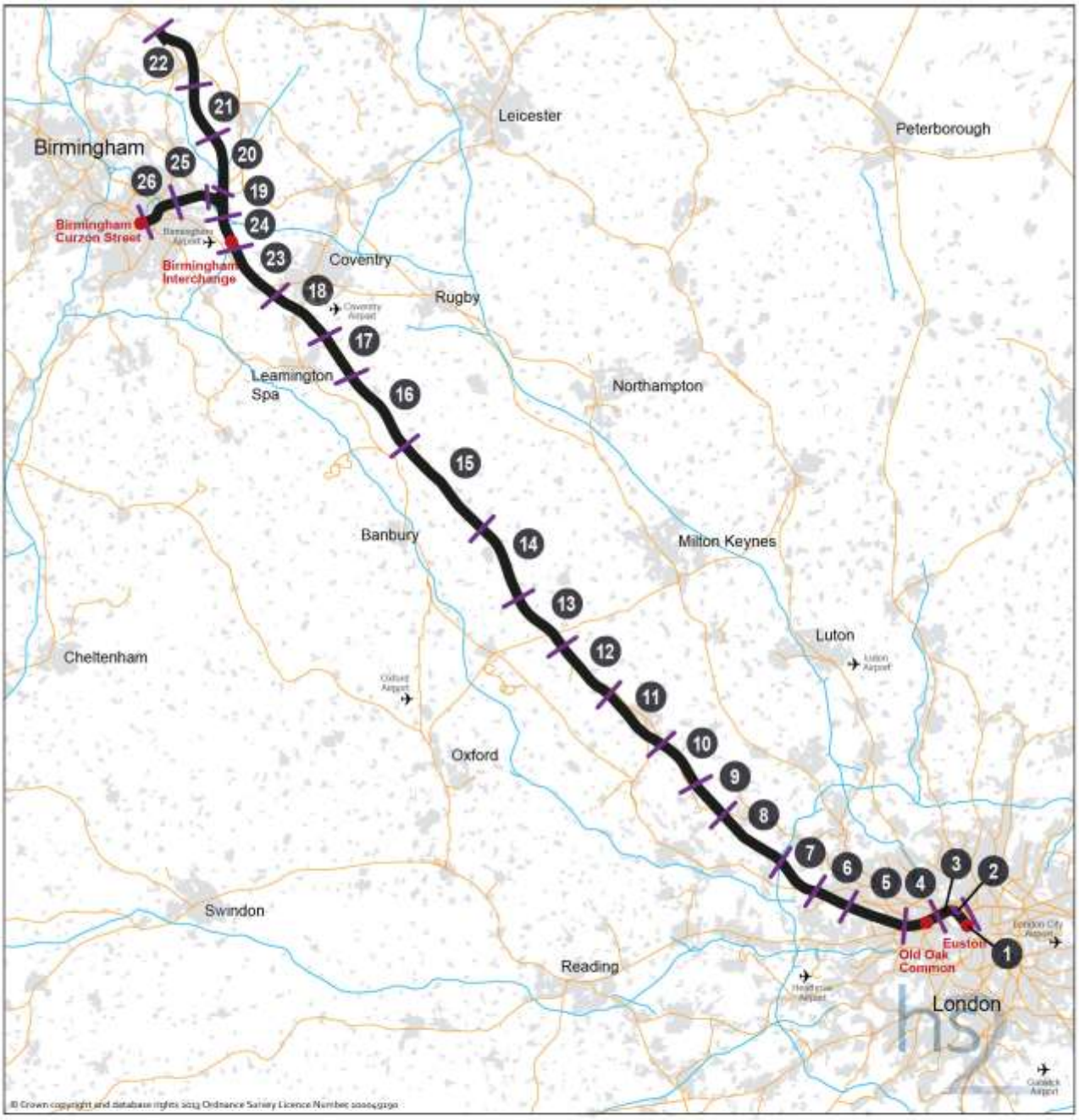
1.2.6 The Government believes that the HS2 network should link to Heathrow and its preferred option is for this to be built as part of Phase Two. However, the Government has since taken the decision to pause work on the Heathrow link until after 2015 when it expects the Airports Commission to publish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

1.2.7 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 scheme design and on the likely adverse and beneficial effects.

1.3 Purpose of this report

1.3.1 This report presents the likely significant effects of the construction and operation of Phase One of HS2 (referred to throughout the ES as the 'Proposed Scheme') on the environment within CFA1 (Euston – Station and Approach). The report describes the mitigation measures that are proposed for the purpose of avoiding, reducing, or managing the likely significant adverse effects of the Proposed Scheme on the environment within CFA1.

Figure 1: HS2 Phase One route and community forum areas



Community forum areas

1. Euston - Station and Approach
2. Camden Town and HS1 Link
3. Primrose Hill to Kilburn (Camden)
4. Kilburn (Brent) to Old Oak Common
5. Northolt Corridor
6. South Ruislip to Ickenham
7. Colne Valley
8. The Chalfonts and Amersham
9. Central Chilterns
10. Dunsmore, Wendover and Halton
11. Stoke Mandeville and Aylesbury
12. Waddesdon and Quainton
13. Calvert, Steeple Claydon, Twyford and Chetwode
14. Newton Purcell to Brackley
15. Greatworth to Lower Boddington
16. Ladbroke and Southam
17. Offchurch and Cubbington
18. Stoneleigh, Kenilworth and Burton Green
19. Coleshill Junction
20. Curdworth to Middleton
21. Drayton Bassett, Hints and Weeford
22. Whittington to Handsacre
23. Balsall Common and Hampton-in-Arden
24. Birmingham Interchange and Chelmsley Wood
25. Castle Bromwich and Bromford
26. Washwood Heath to Curzon Street

- HS2 station
- Proposed Phase One route
- CFA boundary
- Existing railways
- Motorways
- Airports

N

0 — 20 km approx

1.4 Structure of this report

1.4.1 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).
- Section 14 – an assessment of the potential ancillary works at Euston.

1.4.2 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.

1.4.3 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).

1.4.4 Volume 1 and Section 6A of the SMR Addendum provide information about climate change adaptation and resilience.

1.4.5 The maps relevant to Euston – Station and Approach are provided in a separate corresponding document entitled Volume 2: CFA1 Map Book, which should be read in conjunction with this report.

1.4.6 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) (Volume 2, CFA1 Map Book) and CT-06 (operation) (Volume 2, CFA1 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections

submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.4.

1.4.7 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 'off-route' environmental effects has also been undertaken and is reported in Volume 4.

2 Overview of the area and description of the Proposed Scheme

2.1 The case for Euston as the London terminus for HS2

2.1.1 The case for HS2, with a terminus at Euston, is well established within the national and regional policy context.

2.1.2 The Department for Transport's publication ' High Speed Rail: Investing in Britain's Future'[1] confirmed the choice of Euston as the right location for the London terminus for HS2, best serving passenger requirements, including onwards travel.

2.1.3 Key regional policies are set out in the London Plan 2011[2], the Mayor's Transport Strategy[3], and the emerging Euston Area Plan (EAP)[4]. The London Plan seeks to integrate transport and development throughout London, particularly at locations such as Euston, which already have high public transport accessibility. HS2 is a key scheme in the London Plan's Indicative List of Transport Schemes and is identified as a strategic priority which will "support future development and regeneration priority areas, and increase public transport capacity". The Mayor's Transport Strategy supports the development of a national high speed network. It seeks to ensure that the main London terminus for a high speed line is centrally located, well connected to existing public transport network and widely accessible to maximise access to jobs and London's population. The Transport Strategy identifies Euston as being best placed to "meet these criteria".

2.1.4 The Euston area is identified in the London Plan as an 'opportunity area' with significant capacity to accommodate new housing, commercial and other development linked to existing or potential improvements to public transport accessibility.

2.1.5 The vision statement in the London Borough of Camden's (LBC) Adopted Core Strategy[5] identifies Euston as an 'area of growth'. A strategic objective of the Core Strategy is to support the successful development of the Euston growth area and ensure that development is supported by necessary infrastructure. It is also identified as an area where major redevelopment is expected to occur in association with planned improvements to the station to relieve overcrowding.

2.1.6 Similarly, the adopted LBC Site Allocations Plan 2013[6] seeks to ensure that the redevelopment of Euston station meets a number of objectives and addresses identified issues that would be expected to be addressed. These include significant improvements to the way in which the station relates to the surrounding area, to the

[1] Department for Transport (2012), *High Speed Rail: Investing in Britain's Future – Decisions and Next steps.* London, The Stationery Office.
[2] Mayor of London (2011), The London Plan – Spatial Development Strategy for Greater London.
[3] Greater London Authority (2010), Mayor's Transport Strategy.
[4] Euston Area Plan, *Draft EAP: A new plan for the Euston Area http://www.eustonareaplan.info/wp-content/uploads/2012/09/Draft-EAP-for-consultation-July-2013-wforewords.pdf*; Accessed 14 October 2013.
[5] London Borough of Camden, (2010), Adopted Core Strategy.

[6] London Borough of Camden, (2013) *Adopted Site Allocations Local Development Document.*

need to improve connections to and through the site, and the need to improve interchange and onward movement from the station. The provision of a mix of uses above a station development would be supported, in order to make the most of its key Central London location and to deliver the new homes and jobs in the Euston area, as set out in the London Plan.

2.1.7 LB Camden, the Greater London Authority (GLA) and Transport for London (TfL), supported by HS2 Ltd, are now jointly producing the EAP, which will provide a single strategic planning document for the Euston Opportunity Area, taking forward previous plans and aspirations for the integrated development of the station and the surrounding area. The HS2 station will provide a key driver in realising the regeneration and development opportunities in the Euston area.

2.1.8 Transport assessment has shown that the majority of the passengers travelling to and from London on the Proposed Scheme would wish to travel to and from the central London terminus at Euston, even with the option to interchange at Old Oak Common. An interchange with Crossrail at Old Oak Common will provide opportunity for quicker access to parts of the West End, the City and Canary Wharf than changing at Euston. However, passengers wishing to access north, south and most central London areas would be better served from Euston.

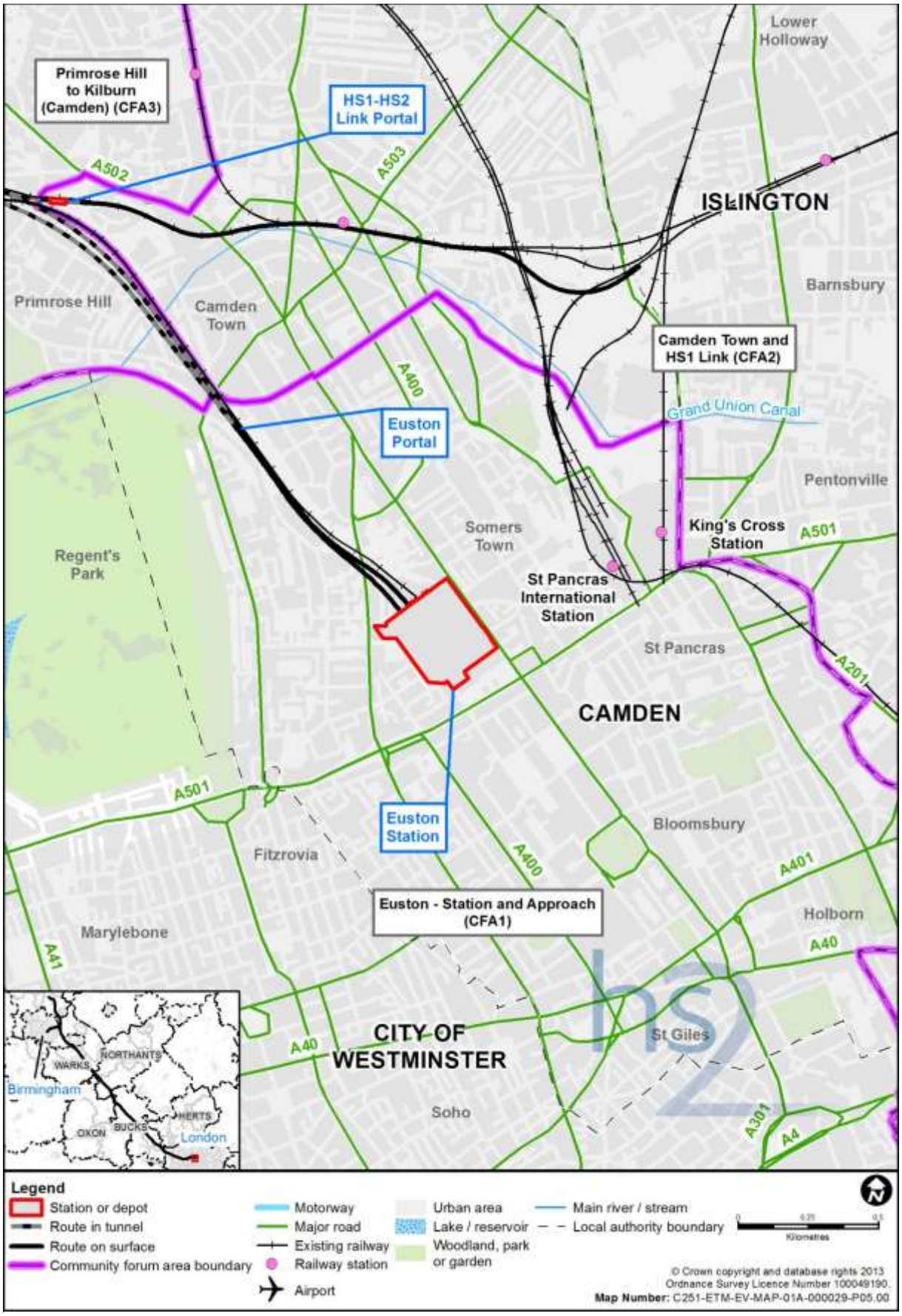
2.1.9 To avoid further disruption in the future, the proposed scheme at Euston is planned to accommodate high speed train service levels up to 18 trains per hour operating in and out of the station. The assessment shows that 11 dedicated platforms are required to support this level of operation and any fewer could cause regular delays. A similar number of classic trains will continue to operate as today. To accommodate this, an additional 6 platforms will be provided, making a total of 24 platforms, with 11 used by high speed trains and 13 by classic trains. All platforms will allow longer trains to operate.

2.1.10 The Proposed Scheme provides the opportunity to make major improvements to the operation of Euston as a whole. The existing concourse would be rebuilt with an improved layout. Euston is well-served by the existing underground network with the Victoria Line and both branches of the Northern Line and is close to Euston Square underground station, served by the Metropolitan, Circle and Hammersmith & City Lines. Euston would be improved as an interchange through the provision of expanded London Underground Limited (LUL) ticket hall facilities, additional access to the underground platforms, a new subsurface connection between Euston and Euston Square underground stations, direct pedestrian access to the south side of Euston Road, and improved bus, taxi and cycle facilities.

2.2 Overview of the area

2.2.1 This part of the Proposed Scheme comprises Euston station and a 1.3km section of the route from Euston station, north of the Euston Road to the Park Street Tunnels, where Parkway crosses the existing railway. This area is adjacent to Primrose Hill to Kilburn (Camden) (CFA3) to the immediate north-west and Camden Town and HS1 Link (CFA2) to the north. It is entirely within the London Borough of Camden (LBC) (see Figure 2).

Figure 2: Area context map



Land use

2.2.2 Euston station, the West Coast Main Line (WCML), and associated operational and maintenance facilities are key elements of the urban environment in the area. The existing railway corridor runs north-west in retained cutting from Euston station, through the districts of Somers Town to the east and Regent's Park to the west.

2.2.3 Eversholt Street bounds the east side of the existing station and has local shops, restaurants and public houses. To the west of the existing station there is a mixed business and residential community including shops, restaurants and hotels around Drummond Street. Further north the Regent's Park district, between Hampstead Road and Albany Street, consists mainly of social housing, including the Regent's Park Estate. In the northern part of this area, adjacent to Regent's Park, there is Georgian housing on Park Village East and Park Village West.

2.2.4 To the east of the existing railway corridor, Somers Town is characterised by blocks of social housing including the high rise Ampthill Estate and medium rise Churchway Estate. Further north, towards Camden Town, there is Georgian terraced housing, including on Mornington Terrace and Mornington Crescent.

2.2.5 The topography is relatively flat. However, there is a gentle rise of about 15m from Euston station to Parkway.

Existing transport infrastructure

2.2.6 Euston station is a major transport interchange and a terminus for both intercity and local trains. The station is served by two London Underground Limited (LUL) lines. These are the Victoria line and the Northern line (both Charing Cross and Bank branches). Euston Square underground station, which is served by the Circle, Hammersmith & City and Metropolitan lines, is about 300m from Euston station, west along Euston Road. There is a bus station served by 12 bus routes at the front of the station and a taxi rank under the station. Euston station also acts as a local centre with restaurants, cafes and shops.

2.2.7 The station faces towards A501 Euston Road, which is lined with offices, university buildings, hotels, the British Library, Camden Town Hall, University College London Hospital (UCLH) and other London mainline and underground stations (e.g. St Pancras International station and King's Cross St Pancras underground station, to the east). Euston station and the existing railway corridor form a physical barrier separating the communities to the east and west.

2.2.8 There are four pedestrian routes, which have been treated in the same way as public rights of way (PRoW) for the purposes of the ES: a path leading from Hampstead Road through St James's Gardens; the pedestrian section of Harrington Street where it passes under Ainsdale (a residential block) on the Regent's Park Estate and two paths that cross Euston Square Gardens. There are a number of London Cycle Network (LCN) routes on the streets around Euston. There are five cycle hire docking stations close to Euston station on: Drummond Street; Doric Way; Endsleigh Gardens; Hampstead Road and Euston Road, close to its junction with Melton Street.

Socio-economic profile

2.2.9 To provide a socio-economic context for the area, data for the demographic character areas (DCA) of: Regent's Park; Euston Square; Somers Town and Regent's Park Estate is used[7]. In total, the population of the DCA is approximately 26,300. Unemployment at 12.0% is higher than the national level in England of 7.4%, while 54.9% of the population aged 16-74 is economically active compared to the national figure of 69.9%[8]. There are approximately 54,800 people who work within the area[9].

Community facilities

2.2.10 There are a number of community facilities in the Euston area. There are numerous shops and services located throughout the area, with centres at Camden High Street, King's Cross station, St Pancras International station and the Brunswick Centre. These include a good range of retail services, including banks, cinemas and post offices. There are also smaller groups of shops, restaurants, public houses and other services, including those on Euston Road, Euston Street, Drummond Street and Eversholt Street. Euston station has shops and services that serve both passengers and the local community. Somers Town street market also serves the area around Euston station.

2.2.11 There are three early-years educational facilities, six primary schools and two secondary schools in the area, the nearest being Maria Fidelis Convent (Lower) School. University College London (UCL) occupies many buildings in the area, the closest to Euston station being on Stephenson Way. UCL also uses office space in The Podium and One Euston Square, both immediately south of the station, and 132 to 140 Hampstead Road.

2.2.12 There are nine religious facilities and/or places of worship in the area which include St Aloysius' campus (with a convent, a church, two schools and a social club), St Pancras Church, the Friends House (incorporating the Quaker Centre) and the Kingdom Hall of Jehovah's Witnesses.

2.2.13 There are four doctors' and five dentists' surgeries in the area around Euston station. University College London Hospital (UCLH) is 250m from Euston station.

Recreation, leisure and open space

2.2.14 The British Library, The Dr Williams's Library (Congregational Library), The Wellcome Foundation, Regent's Park and the Petrie Museum are all located in close proximity to Euston station.

2.2.15 There are six community/youth centres in the Euston area. These include a community hall located on the Ampthill Estate and The Old Tenants Hall on Harrington Street that serves the Regent's Park Estate. These facilities provide venues for recreation and leisure activities. The Somers Town Community Sports Centre offers a wide range of recreation activities and is approximately 300m north from Euston station.

[7] A DCA represents a community that, depending on the area, may consist of a local ward, neighbourhood or village(s).
[8] Data comes from the 2011 Population Census.
[9] Data comes from the 2011 business register and employment survey.

2.2.16 The principal open spaces adjacent to Euston station are Euston Square Gardens and St James's Gardens. Regent's Park lies approximately 200m west of the existing railway corridor at its closest point. There are local play spaces interspersed throughout the housing estates and community allotments located between Redhill Street and Augustus Street.

2.2.17 The Zoological Society of London (ZSL) London Zoo is located in Regent's Park, approximately 800m west of the Euston portal.

Policy and planning context

Strategic and local planning policy for the Euston area

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

2.2.19 The principal regional and local policy documents for Euston comprise The London Plan 2011, the Mayor's Transport Strategy, the LBC Local Development Framework[10] (LDF), Camden's Transport Strategy[11] and the draft EAP.

2.2.20 The Mayor's Transport Strategy sets out a transport vision for London and describes how TfL and partners, including the London boroughs, will deliver that vision. It identifies a number of overarching transport priorities that are relevant to the Proposed Scheme:

- Policy 2 sets out the Mayor's support for sustainable capacity enhancements to interregional, national and international rail and coach services, high-speed rail hubs and the strategic road network serving London;
- Policy 4 seeks to improve people's access to jobs, business access to employment markets, and business to business access. The Proposed Scheme will provide a sustainable means of access to jobs and business across the country, reducing the need for internal business air travel and business related road travel;
- Policy 5 seeks to ensure efficient and effective access for people and goods in central London through providing improved central London connectivity and appropriate capacity. This will include improving access to major public transport interchanges such as Euston for pedestrians, cyclists and by public transport;
- Policy 13 seeks to expand the capacity and quality of public transport services, improve passenger comfort and customer satisfaction, reduce crowding, and improve road user satisfaction. The Proposed Scheme will improve Euston station as a major terminal interchange and will increase capacity of rail

[10] London Borough of Camden, Local Development Framework; http://www.camden.gov.uk/ccm/navigation/environment/planning-and-built-environment/planning-policy/local-development-framework--ldf-/; Accessed: 7 February 2013.
[11] London Borough of Camden (2011) *Camden's Transport Strategy*.

journeys to ease overcrowding and capacity issues on other rail routes serving the Midlands and beyond; and

- Policy 24 seeks to deliver the required contribution from ground-based transport to achieve a 60 per cent reduction in London's carbon dioxide (CO_2) emissions by 2025. The integrated development around Euston station will encourage the use of sustainable rail travel reducing the number of vehicle trips.

2.2.21 Euston is identified under Policy 2.13 of the London Plan as an 'opportunity area' with significant capacity to accommodate new housing, commercial and other development linked to existing or potential improvements to public transport accessibility. The opportunity area includes the land bounded by Hampstead Road, Euston Road and Eversholt Street, including the station and Ampthill Estate; the Euston Plaza and Regent's Park Estate area to the west of Hampstead Road; the Chataway Estate lying to the east of Eversholt Street; and the southern frontage of Euston Road, between Fitzroy Street in the west to Mabledon Road in the east. Annex 1 of the London Plan outlined the broad principles for the opportunity area's development, and estimated that the area has potential to provide for an additional 5,000 jobs and a minimum of 1,000 new homes in the period to 2031.

2.2.22 The vision statement underpinning the LBC adopted Core Strategy (paragraph 31)[12] identifies Euston as a growth area, defined as: land bounded by Hampstead Road to the west; Harrington Square to the north; Eversholt Street to the east; and Euston Road to the south. A strategic objective of the Core Strategy is to support the successful development of the Euston growth area and ensure that development is supported by necessary infrastructure (paragraph 32).

2.2.23 Policy CS2: 'Growth Areas' of the Core Strategy identifies Euston as a major growth area, where extensive redevelopment is expected to occur in association with Network Rail's planned improvements to the station to relieve overcrowding (the development of which is promoted in Policy CS11). The Core Strategy notes that the scope of change in the Euston growth area will "depend on operational rail requirements, how (proposed Network Rail) station improvements are financed, the degree of station renewal, transport capacity, use of space over the station, strategic viewing corridors and other considerations". The Core Strategy, in Policies CS7 and CS8, estimates that around 1,500 homes, 70,000m^2 of business floorspace and a significant amount of retail floorspace could be provided, which is a greater amount of development than is suggested in the London Plan.

2.2.24 The LBC Site Allocations Development Plan was adopted in September 2013. The plan recognises that the Proposed Scheme will include an expanded station footprint to the west affecting potential development sites. There are three sites identified which fall within the footprint of the Proposed Scheme, namely:

- Site 9: Euston station;
- Site 10: Numbers 132 to 140 and number 142 Hampstead Road; and

[12] London Borough of Camden (2010) Adopted Camden Core Strategy 2010 – 2025.

- Site 11: Granby Terrace depot.

2.2.25 The consultation draft of the EAP was published in July 2013. A pre-submission draft EAP is likely to be published at the end of 2013, for further comment in advance of examination by a planning inspector. It is anticipated that the EAP will be adopted in late 2014.

2.2.26 HS2 Ltd is closely involved in the preparation of the EAP and is represented on the Strategic Board. The draft EAP takes account of the Euston station and approach proposals, as set out in the draft ES consultation, but does not endorse or "wholly reflect the HS2 design" and is seeking to "ensure that, if this scheme is progressed, the station design responds to EAP and community objectives as much as possible".

2.2.27 The EAP sets 10 strategic objectives, which include objective 3 "making the best use of new space above the station and tracks and opportunities for regeneration in the wider area". The development strategy in the EAP is promoting a larger scale of development than the nominal capacities in the London Plan for 2031, looking for at least 2,800 additional homes, 180,000m^2 of employment space, as well as new retail, leisure and social infrastructure, to serve the station and reinforce local facilities. It is estimated that this will provide for over 7,700 additional jobs.

2.2.28 The land use strategy also proposes new east west and north south routes across the station. It identifies opportunities for over site development (OSD) above the entire station, extending over the high speed tracks to Hampstead Road Bridge and over both the high speed and the existing railway from Hampstead Road Bridge to a point south of Mornington Street Bridge.

2.2.29 Following publication of the draft EAP, HS2 Ltd will continue to work closely with the Camden Council, the GLA and other stakeholders, including Network Rail and other landowners, to explore the opportunities for development above and around the station that will arise from the Proposed Scheme. This includes the potential use of the provisions in the hybrid Bill for the construction of ancillary works to facilitate OSD (see Section 14 for further information).

2.2.30 Other adopted local policies have been considered and referred to where appropriate in particular topic sections of this assessment. These include:

- London Borough of Camden Adopted Development Management Policies (2010)[13];
- Westminster City Council Adopted Core Strategy (2010)[14];
- Westminster City Council Adopted Unitary Development Plan, Saved Policies (2010)[15];

[13] London Borough of Camden, (2010), London Borough of Camden *Adopted Camden Development Polices 2010 – 2025.*
[14] Westminster City Council, (2011), City of Westminster *Adopted Core Strategy 2011.*
[15] Westminster City Council, (2007), City of Westminster *Adopted Unitary Development Plan, Saved Policies.*

- Westminster City Council Westminster's City Plan: Strategic Policies, November 2013[16];
- London Borough of Islington Adopted Core Strategy (2011)[17];
- London Borough of Islington Finsbury Local Plan (2013)[18];
- London Borough of Islington Development Management Policies (2013)[19];
- London Borough of Islington Local Plan Site Allocations (2013)[20]; and
- London Borough of Islington Submission Development Management Policies (2012)[21].

Planning and environmental designations

2.2.31 There are three conservation areas in close proximity to the Proposed Scheme (see Map CT-10-001, Volume 2, CFA1 Map Book): Bloomsbury; Regent's Park and Camden Town. Regent's Park Conservation Area is located adjacent to the west of the existing railway in this area, along Park Village East, and Camden Town Conservation Area is located to the east of the existing railway and it extends broadly from Granby Terrace Bridge to Parkway. Euston station is also crossed by the protected view from Primrose Hill to the Houses of Parliament and St Paul's Cathedral (see Map LV-05-001, Volume 5, Landscape and Visual Assessment Map Book).

2.2.32 Euston Square Gardens is protected under the London Squares Preservation Act, 1931 and St James's Gardens are designated as a Site of Local Importance (SLI) for nature conservation. Heritage assets in the Euston area are numerous and include Grade I, Grade II and Grade II* listed buildings (see Map CT-10-001, Volume 2, CFA1 Map Book).

Committed development and future baseline

2.2.33 Developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme, are shown on Maps CT-13-001, CT-13-002 and CT-13-003 (Volume 5, Cross Topic Appendix 1 Map Book) and listed in Volume 5 Appendix CT-004-000. Except where noted otherwise in the Appendix, it has been assumed that these developments will have been completed before the main works for the Proposed Scheme commence. This date is shown in Sections 3 to 13 as 2017, for consistency with the rest of the ES. At Euston, certain enabling works are assumed to take place from 2015, subject to any necessary agreements and consents. This difference in dates does not affect the robustness of the assessment.

2.2.34 These permissions and allocations are termed 'committed developments' and are treated as potential receptors from the Proposed Scheme. However, where such developments lie wholly or partly within the land required for the Proposed Scheme, it

16 Westminster City Council, Westminster's City Plan: Strategic Policies November 2013 (agreed 23 August 2013 with changes requested by the Inspector incorporated).
17 London Borough of Islington (2011), Adopted Core Strategy.
18 London Borough of Islington (June 2013), Finsbury Local Plan Part of Islington's Local Plan Area Action Plan for Bunhill & Clerkenwell.
19 London Borough of Islington (June 2013), Development Management Policies.
20 London Borough of Islington (June 2013), Islington's Local Plan: Site Allocations.
21 London Borough of Islington (2012), Development Management Policies Submission Version.

is assumed that these will not be commenced or completed in their proposed form. Such developments are noted in Volume 5: Appendix CT-004-000.

2.2.35 There are two major committed developments in the Euston area as shown on Map CT-13-001, which are likely to take place after 2017, i.e. at the same time as the principal works for the Proposed Scheme. As such they are considered to be a receptor for the operation of HS2, but also potentially to give rise to cumulative construction impacts with the Proposed Scheme on its neighbours. Where these developments have a particular relevance to an assessment topic, this is noted in the future baseline section for that topic and any cumulative effects have been assessed:

- CFA1/4 Camden Replacement Unitary Development Plan (UDP) Policy 17 – Odeon Cinema Site, Grafton Way. The preferred uses for this site are medical/healthcare use. If not required for medical/health care uses, a mixed use development, including housing, will be permitted; and
- CFA1/21 Camden Replacement UDP Policy 26 – King's Cross Railway Lands. Major mixed use development including residential.

2.2.36 CFA1/4 has not been subject to any recent planning applications. The relevant NHS Trust estate strategy notes that further phases of medical related development are planned for this site and that the adjoining UCLH has been selected as the first preferred delivery site for Proton Beam Therapy services in the UK. The development may not occur until 2016 to 2020.

2.2.37 Major developments are already in progress or planned at King's Cross, including offices, bio-medical research, residential, retail and student housing. Later phases of the development may not occur until after 2016 and could continue until late in the construction period for the Proposed Scheme.

2.2.38 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, but are not included in the assessment. The progress of these proposals is being monitored by HS2 Ltd.

Potential ancillary works for over site development

2.2.39 The hybrid Bill does not include powers for the construction of any over site development (OSD), above the station or the approach, because these are not part of the Proposed Scheme. Any such development will need to be dealt with through the normal local planning process, with any planning application being determined by the relevant planning authority. There are provisions in the hybrid Bill which ensure that any separate planning application for OSD will have to be accompanied by an Environmental Statement.

2.2.40 The Proposed Scheme, as assessed in this ES, does not, however, preclude the future planning, design and construction of OSD. The hybrid Bill, which will allow certain ancillary works to facilitate OSD to be provided by HS2 Ltd, where the ancillary works can only practicably be undertaken at the same time as the high speed railway and station works.

2.2.41 It has been considered sensible to undertake a separate assessment of the likely environmental effects of incorporating ancillary works for OSD into the construction of the Proposed Scheme to ensure that, should OSD prove viable, powers obtained through the hybrid Bill do not preclude it. This environmental assessment is reported in Section 14 of this report.

2.2.42 HS2 Ltd supports many of the objectives of the draft EAP and will seek to agree with LBC, the GLA and other relevant stakeholders, in due course, which, if any, of these ancillary works is to be taken forward to assist in achieving those development objectives. A development options study, which is exploring the financial viability of OSD, in different parts of the station and approach, has been commissioned by HS2 Ltd. This will help inform those further discussions and agreements with stakeholders.

2.2.43 HS2 Ltd's requirements in relation to these ancillary works have been used to inform the environmental assessment and are that:

- the ancillary works will only proceed if the OSD proposals are financially viable and appropriate funding is available for the ancillary works;
- any provision for the construction of ancillary works must be made without affecting the date of commencement for Phase One HS2 services; and
- any provision for the construction of ancillary works can be made without serious adverse effects on the programmes to deliver the classic rail and London Underground facilities, which are to be provided in the Proposed Scheme.

Land Required for the Proposed Scheme

2.2.44 In addition to the land that will be required permanently by the Proposed Scheme, land will be required on a temporary basis for construction, as illustrated on the Map CT-05-001, Volume 2 CFA1 Map Book. Land temporarily occupied for construction works will be restored or prepared for suitable alternative uses after construction, following the procedures set out in the hybrid Bill.

2.3 Description of the Proposed Scheme

2.3.1 The general design of the Proposed Scheme is described in Volume 1. The following section describes the main features of the Proposed Scheme in the Euston area, including the main environmental mitigation measures.

Overview

2.3.2 Euston will be the London terminus for the Proposed Scheme. The existing station will be expanded and remodelled to accommodate high speed train services as well as the existing WCML and local classic rail services. The combined station will become the centrepiece and catalyst for the regeneration and development of the Euston area.

2.3.3 Much of the existing station used by classic trains will be retained and refurbished. The concourse and platforms for high speed trains will replace the western part of the existing station and extend further to the west than the existing station. The new concourse will operate as one combined space (see illustrative block plans in Figures 3-5 in this report and Map CT-06-001, Volume 2 CFA1 Map Book). Improvements will be made to Euston underground station and a subsurface connection built to

Euston Square underground station, including a pedestrian subway under the A501 Euston Road.

2.3.4 The provision of platforms for high speed trains at Euston will require widening of the existing railway retained cutting to the north of Euston station, to the west of the existing tracks. The high speed railway will enter tunnel at the Euston portal about 100m south of Parkway. The portal will be close to the entrances to the existing railway Park Street Tunnels (see Map CT-06-001, Volume 2 CFA1 Map Book).

2.3.5 The high speed tracks will enter the proposed twin bore tunnel at a deeper level than the existing railway. This will require the reconstruction of retaining walls on the western side of the existing cutting. All three of the existing road bridges across the railway between Euston station and Parkway will be demolished and reconstructed. The listed elements of Mornington Street Bridge will be removed and reinstated as part of the new bridge structure. The Network Rail railway will remain on or close to its current alignment and levels, but two tracks will be removed requiring rearrangement of signalling and overhead line equipment.

2.3.6 Construction of the high speed railway, expansion and remodelling of the station will take a considerable time, even compared to other London infrastructure projects, in part because Euston station has to remain operational during the construction period. Construction work will commence in 2016, with some early enabling works required in 2015. Works in the station approach will be completed in 2026 and station remodelling completed in time for high speed passenger services to commence in 2026.

Euston station

2.3.7 This section describes the proposed station and works north of the station, to a point south of the Hampstead Road Bridge. The illustrations and visualisations are provided to assist the understanding of the Proposed Scheme. The detailed design of the station will be subject to the approval process, in accordance with the planning conditions set out in the hybrid Bill.

2.3.8 Key features of the functional design and layout of the Proposed Scheme are also shown on Map CT-06-001 (Volume 2, CFA1 Map Book) and include:

- creation of 11 new, 415m long, high speed platforms below street level (with a new concourse at street level) to accommodate high speed services. This will involve the demolition of the existing station west of platform 15;
- removal of the existing classic platforms 9, 10, 16,17 and 18, retention of the remaining 13 platforms, including extensions of platforms 8 and 11, and remodelling of the associated existing station structure;
- substantial reconstruction and refitting of the existing station concourse, which will be integrated with the new high speed concourse to the west;
- a new northern entrance to the station close to the A400 Hampstead Road on the extended Cobourg Street; a new entrance on Cobourg Street opposite Drummond Street; a new entrance on Eversholt Street opposite Doric Way and an improved street level entrance to the front of the station;

- creation of a new ticket hall and retail units on the extended concourse. The retail units will vary in size and include customer support and facilities, cafes, restaurants and shops to serve passengers and the local community;
- new escalators and lifts to provide access between the high speed part of the concourse and high speed platforms. Access to the classic platforms will be improved to cater for an increased number of passengers including direct subsurface exits to the underground station;
- an extended and remodelled Euston underground station ticket hall, expanded from the current location, beneath the existing station concourse, into the existing underground car park. This will include the provision of new escalators serving both branches of the Northern line and the Victoria line;
- new entrances to Euston underground station will be provided from the station forecourt and a pedestrian subway will be built under Euston Square Gardens and the A501 Euston Road, with an additional entrance and ticket hall for Euston Square underground station in Gordon Street;
- facilities for step free and fire brigade access to the concourse, platforms and Euston underground station;
- the existing station retail units use a service basement under the station that will have limited capacity following alteration of the station. Retail and train servicing for all services will be provided from an improved service area on the former parcels deck, above the northern part of the existing station. Vehicles will access this service area via an access road from Eversholt Street; and
- offices and welfare facilities for railway/station staff, a British Transport Police station and maintenance facilities. For example, there will also be plant rooms for heating and ventilation equipment, electricity substations, information technology and telecommunications equipment.

2.3.9 Illustrative block plans of the three main levels of the proposed station show: the lower below ground level with the high speed and classic platforms and underground station connections (Figure 3); the concourse at street level (Figure 4) and the first floor level showing passenger facilities and the proposed service deck (Figure 5)

Figure 3: Euston station block plan: Below ground platforms and underground connections

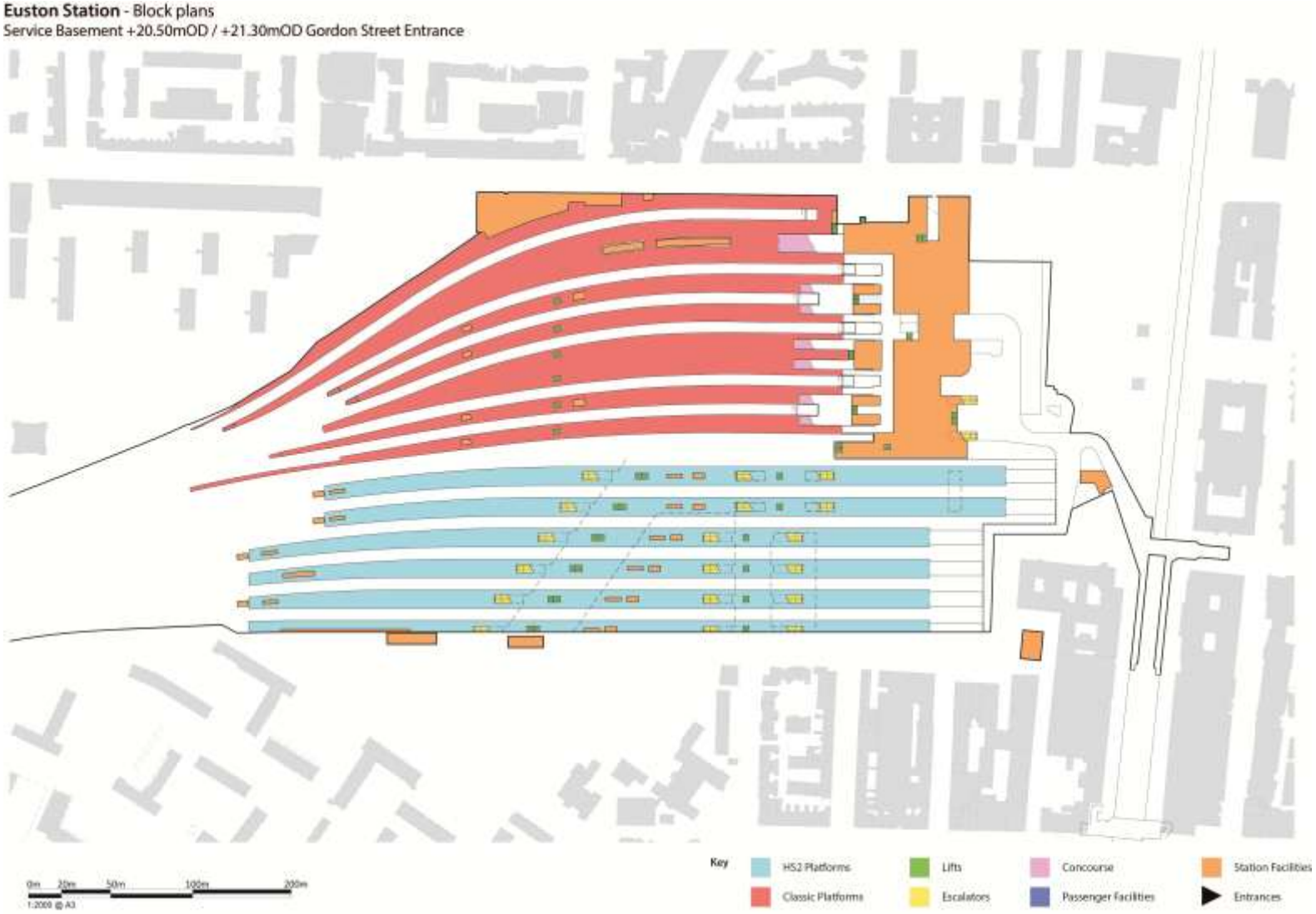
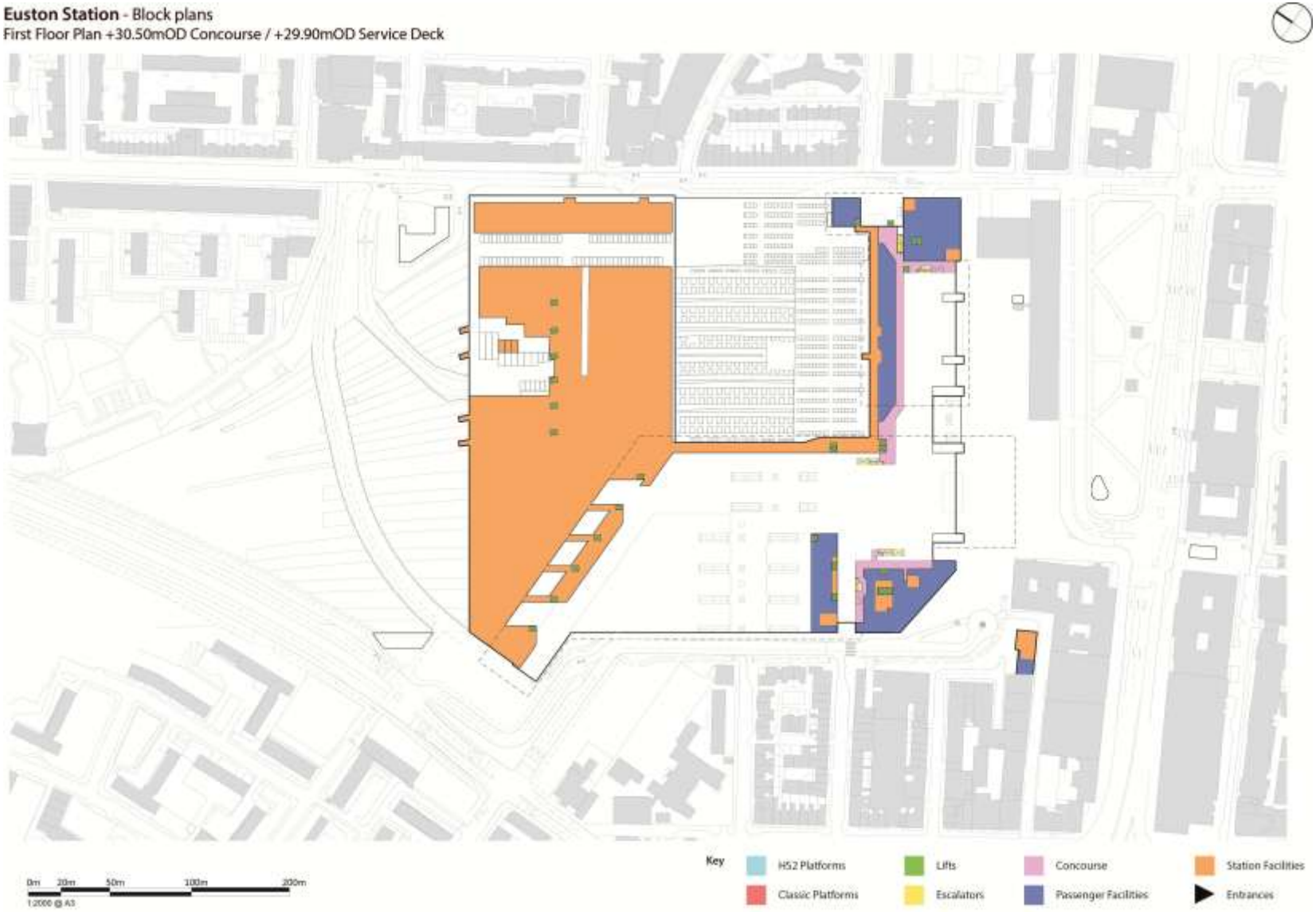


Figure 4: Euston station block plan: Ground floor concourse

Figure 5: Euston block plan: First floor passenger facilities and service deck



2.3.10 Illustrative cross sections and elevations of the remodelled station are shown in figures CT-20-001, CT-20-002 and CT-20-003 (Volume 2, CFA1 Map Book).

2.3.11 Artist's sketches (see LV-14-001 to LV-14-004, Volume 2, CFA1 Map Book) illustrate how the completed station could appear from key viewpoints.

2.3.12 The four principal entrances to the station will ensure that it can be accessed, step free, from the surrounding area and will encourage pedestrian use, particularly along Drummond Street, Cobourg Street and Eversholt Street.

2.3.13 The Proposed Scheme will increase the overall size of Euston station. Its footprint will be about a third greater than at present. The station building will remain about the same length as at present, but the width between Eversholt Street and Cobourg Street will increase to about 275m.

2.3.14 For the high speed station and the existing concourse, the new building heights will not exceed a maximum of 60m above Ordnance Datum (AOD), between 35m and 40m above existing ground levels. This maximum height also applies to the side of the station along Cobourg Street, although the height of the façade is likely to be lower and not of uniform height. The façade facing Euston Road will have elements of differing heights including the roofs over the high speed and classic parts of the station and the eastern and western accommodation buildings. The retained platforms and external fabric of the existing station, north of the concourse, will generally be unaltered, including much of the Eversholt Street frontage. The concourse and accommodation building on Eversholt Street will not exceed 60m AOD, while any alterations to the existing station north of this building will be within a maximum height of 45m AOD, which is similar to the existing station. A ventilation shaft serving the Euston underground station is to be rebuilt at the southern end of Cobourg Street. Its height will not exceed 45m AOD, about 20m above the existing ground level.

Public realm

2.3.15 The Proposed Scheme includes public realm improvements and reinstatement, including the main entrance forecourt, the bus station and Euston Square Gardens and a landscaped public forecourt to the northern entrance, incorporating part of the existing St James's Gardens. All of these areas are indicated as 'public realm' on Map CT-06-001, Volume 2 CFA1 Map Book.

2.3.16 Euston Square Gardens will be reinstated and unified by moving the bus station access to Melton Street instead of the present location, between the lodges, where it effectively bisects the gardens. Broadly, there will be a balance between the area of soft landscaping removed and that gained from removing the existing bus access. Pedestrian routes through the gardens will be realigned. The linear bus station will allow pedestrians to cross easily at surface level from the gardens and Euston Road onto the station forecourt.

2.3.17 The main station forecourt will be larger and no longer dominated by Grant Thornton House and One Euston Square, which are to be demolished. The forecourt will include areas of hard and soft landscaping. At the northern entrance there will also be a new forecourt with hard and soft landscaping. This will incorporate the remaining part of St James's Gardens, which will be returned to public use.

2.3.18 A new public open space will be created at the northern end of the Regent's Park Estate, between the railway and Langdale ('proposed open space north of Langdale'). It will incorporate land that is at present part of Hampstead Road Open Space, Eskdale play area and other land on the Regent's Park Estate. The space will include grass, planting, children's play areas and a multi-use games area.

2.3.19 A small area of landscaped public space to the east of the railway will be created at the junction of Eversholt Street and Barnby Street, where the new east west overbridge will land.

2.3.20 Opportunities for other landscaping will be explored during detailed design, where land is used during construction, but is not occupied by permanent works or buildings.

2.3.21 Significant changes and improvements to surface access in and around the station will include:

- a new east west bridge across the railway north of the station from Eversholt Street to the A400 Hampstead Road. This will be a pedestrian and cycle bridge;
- Cobourg Street, which will be realigned and extended north to the A400 Hampstead Road, and will include a segregated cycleway. There will be a pedestrian priority area, at the southern end of Melton Street to the A501 Euston Road;
- the northern end of Gordon Street, which will be permanently closed to vehicles, but will retain pedestrian and cycle connections;
- the bus station, which will remain south of the station and north of Euston Square Gardens will be reconfigured as a two-way, linear bus station extending from Melton Street to Eversholt Street. The existing access for eastbound buses from the A501 Euston Road will be closed and moved to Melton Street;
- most of the public parking, car hire facilities and care hire pick up/drop off in the existing station will be removed. Disabled parking bays will be provided close to the station entrance;
- improved cycle parking for commuters will be provided, with approximately 2,000 cycle spaces at a number of locations round the station;
- it is expected that 200 additional Barclays cycle docking stations will be provided, dispersed in streets around the station;
- improved east-west and north-south cycle routes around the station;
- provision for taxis and private cars to drop off, in Eversholt Street and at the northern entrance in Cobourg Street, and to pick up at the southern end of Cobourg Street; and
- a dedicated access for service vehicles to the service area on the parcels deck from Eversholt Street.

2.3.22 The high speed and classic parts of the station will operate as one entity, with easy connections to other transport modes, as shown in Figure 6.

Figure 6: Euston station: intermodal connections

2.3.23 The main concourse will be extended to provide sufficient space for passengers on planned high speed train services, conventional services and for other users, with appropriate links to platform levels and the underground stations. It will extend across the whole southern part of the station to include the existing concourse, and will include a shopping arcade that leads to the northern entrance. The concourse will be at the level of the existing Cobourg Street. It will have waiting areas and lounges, passenger information and ticketing facilities, retail outlets, cafes and restaurants and public conveniences.

2.3.24 Access to and from high speed trains and platforms will be via access bridges, with banks of escalators and lifts. Passengers on high speed trains will arrive at the lower level and can either remain at the same level in order to directly access the underground station or take escalators up to the concourse at street level. From the concourse, there will be pedestrian routes down to Euston underground station, to the bus station and the taxi rank on Cobourg Street.

2.3.25 The main concourse will have a direct connection to the Euston underground station ticket hall beneath the existing street level. A new access to the underground station from outside the station will also be provided from the station forecourt. The Euston Road subway will provide a direct subsurface link to a new entrance for Euston Square underground station in Gordon Street, as well as access to the Euston Square underground station platforms.

Station and highway drainage

2.3.26 Gravity collection, attenuation tanks and pumping systems are proposed for management of surface water from the high speed part of the station, including its roof. The tanks will be located beneath the high speed platforms and water will be discharged by pumping to the Thames Water Utilities Limited (TWUL) combined Fleet Sewer, located in Euston Road.

2.3.27 Surface water drainage for the remaining part of the classic station will be largely unaltered. However, attenuation may be required for the refurbished station concourse roof and eastern part of the station forecourt. In this case, it would be necessary to construct attenuation tanks in Euston Square Gardens positioned to avoid existing trees and their roots, as far as is reasonably practicable. Water will be discharged to the Fleet Sewer.

2.3.28 Attenuation tanks will also be required for new private roads and paved areas to the south and west side of the station. These will be provided below these areas close to the point of collection with either gravity or pumped discharge to adjacent TWUL sewers.

2.3.29 Toilets and other facilities in Euston station will also discharge to the Fleet Sewer.

Station approach

2.3.30 This section describes the station approach, between Hampstead Road Bridge and Parkway, where the high speed railway will enter tunnel, as shown on Map CT-06-001 (Volume 2, CFA1 Map Book). Three bridges are to be rebuilt:

- Hampstead Road Bridge (elevations and cross sections can be seen in Figure CT-20-004, Volume 2 Map Book), which currently carries a six-lane road, will be demolished and rebuilt on its current alignment. It will be extended to a span of about 190m. The carriageway level of the replacement bridge will be up to 4m higher than at present to allow for longer bridge spans and sufficient clearance for high speed trains to pass underneath;
- Granby Terrace Bridge, which will be demolished and rebuilt on a slightly altered alignment. The bridge will be extended to a length of about 90m and the carriageway level of the replacement bridge will be up to 1.6m higher at the eastern end than at present, to tie in to the raised levels along Hampstead Road; and
- Mornington Street Bridge, which will be demolished and rebuilt in its current position reinstating the listed elements of the structure.

2.3.31 Other key features of the design of this section include:

- a new dive under[22], to serve high speed trains, will be constructed north of Granby Terrace Bridge;

[22] A dive under is an underpass that allows trains to pass beneath other tracks. This maximises the number of platforms that can be accessed from an individual track without conflicting train movements.

- the existing dive under which carries the existing rail tracks, located on either side of Mornington Street Bridge will be infilled;
- the twin bore Euston Tunnel portal will be constructed between a point 150m south of Parkway and the existing Park Street Tunnels on the alignment of the western pair of existing railway tracks. The two tunnel entrances at the portal will be separated, with one entrance about 60m north of the other. The tracks will also be at different levels as the railway enters the tunnels;
- currently there are two Park Street Tunnels that are used by classic trains approaching and departing Euston. The western (two track) tunnel will be permanently closed to allow construction of the new high speed rail tunnel, while the eastern tunnel is retained; and
- a headhouse will be constructed at the high speed tunnel portal. It will be a multi-storey structure, with the main structure below street level, which will straddle the western high speed track immediately south of the tunnel entrance. The structure will contain mechanical, electrical and safety equipment to serve the tunnel. There will also be an auto-transformer station. Its roof will be at approximately street level, though there will be an entrance building up to 8m in height above street level for access and egress.

2.3.32 The existing retained cutting between Euston station and Granby Terrace Bridge will be widened to the west, over much of its length, to accommodate the Proposed Scheme. Between Euston station and Parkway, new retaining walls will be constructed along much of the west side of the cutting and some existing walls may be strengthened if necessary. The high speed tracks will be at a lower level than the existing and about 9m below existing street level at Hampstead Road Bridge. At the tunnel portal, the eastern and western high speed tracks will be at about 30m and 23m below existing street level, respectively. The existing railway will generally remain on the existing vertical alignment and, except where the existing bridges are to be rebuilt, the existing eastern retaining walls and parapets will remain.

2.3.33 High containment parapets 1.8m high will be constructed along the edge of the cutting, where retaining walls are rebuilt, and on either side of the bridges across the railway. Where this would be beneficial, the parapets will be clad in brick and planting will be used to create a screen in front of the parapets, provided there is space and security will not be compromised.

Railway drainage

2.3.34 Surface water from the high speed railway approach at Euston will either drain towards collection points at the station or near the tunnel portal. The majority of water will drain towards the station, where there will be attenuation tanks beneath the high speed platforms. Water will be discharged to the Fleet Sewer.

2.3.35 A smaller volume of water will drain towards the tunnel where it will be collected in an attenuation tank at the northern end of the dive under. Water will either be pumped to a sewer in Park Village East or be directed to the attenuation tanks beneath the high speed platforms for discharge to the Fleet Sewer.

2.3.36 Drainage of the existing tracks will remain largely unaltered. To ensure segregation of the high speed railway and classic railway drainage, a wall will be constructed between the two. In the event that the classic railway is flooded, this wall will prevent flooding of the high speed railway.

2.4 Construction of the Proposed Scheme

2.4.1 This section sets out the strategy for construction of the Proposed Scheme in the Euston area, including:

- overview of the construction process and programme;
- a guide to general construction control provisions;
- a description of the enabling works, including demolitions and utility works, most of which will be undertaken in advance of the main works;
- details of the construction site compounds;
- a description of the main railway and station engineering, construction and highway works;
- construction waste and material resources;
- commissioning of the station and railway; and
- further details of the construction programme.

2.4.2 The assessment in this report assumes that the construction will be carried out as set out in this section, using the techniques described. A guide to standard construction techniques is provided in Volume 1, Section 6.

2.4.3 In addition to the land that will be required permanently by the Proposed Scheme, 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, CFA1 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.

Overview of the construction process and programme

2.4.4 Construction of the station and railway will comprise the following general stages:

- advanced works, including: site investigations; preliminary mitigation works; preliminary enabling works; demolitions and utility diversions;
- civil engineering works, including: establishment of site compounds; site preparation and enabling works; main earthworks and structure works; station fit out; site restoration; and removal of site compounds; and
- railway installation works, including: establishment of site compounds; railway infrastructure installation; fit out of tunnels, vent shafts or other buildings; connections to utilities; changes to the existing railway network; removal of site compounds; and railway testing and commissioning.

2.4.5 The construction programme for the Proposed Scheme at Euston is complex and will be subject to further detailed refinement. Certain advance works, mainly utility diversions and enabling works on the existing railway, are planned to start in 2015, subject to any necessary agreements and consents, with the main works taking place from 2016 to completion of the station and opening of high speed services in 2026.

Code of Construction Practice

2.4.6 General provisions of the draft Code of Construction Practice relating to the construction process are set out in more detail in Volume 1 and the draft CoCP (see Volume 5: Appendix CT-0003-000/1). Key provisions of relevance to this report include:

- environmental management and the draft Code of Construction Practice (draft CoCP, Section 2);
- working hours – see Volume 1, Section 6.3, and the draft CoCP, Section 5;
- operation of site compounds – see Volume 1, Section 6.6, and the draft CoCP, Section 5;
- management of utilities diversions – see Volume 1, Section 6.4, and the draft CoCP, Section 14;
- management of construction traffic – see Volume 1, Section 5, and the draft CoCP, Section 14; and
- handling of construction materials – see Volume 1, Section 6.3, and the draft CoCP, Section 15.

Working hours

2.4.7 Core working hours will be from 08:00 to 18:00 on weekdays (excluding bank holidays) and from 08:00 to 13:00 on Saturdays. The following elements of construction of the Proposed Scheme at Euston will generally take place during the core working hours:

- the majority of station works including site preparation and enabling works, main earthworks, structured works, building works and fit out;
- the majority of enabling works, including utility works in the wider area;
- most demolitions, but excluding parts of the station structure and the carriage shed as well as some demolition activities associated with railway possessions;
- excavation of the station and high speed station approach;
- the southern section of the dive under;
- the majority of the tunnel portal construction;
- construction of the high speed side of the station;
- high speed railway systems fit-out;
- elements of conventional station refurbishment; and
- elements of the Euston underground station remodelling.

2.4.8 However, at Euston, part of the construction will take place on or immediately adjacent to the existing operational railway where safety considerations for the workforce mean that work has to be completed during possessions or blockades of the railway. Possessions close or limit the use of the railway for trains, so normally take place at night, weekends or during bank holidays, so that there is less disruption to services.

2.4.9 In consequence, the working hours at Euston will not be confined to the core hours. Site specific variations to core hours and/or additional hours that will be required will be included within a local environmental management plan (LEMP) that will be produced in response to the draft CoCP, following consultation with LBC. The following activities are likely to require work to be undertaken outside core working hours:

- demolition of bridges over the existing railway;
- works on the classic railway track, signalling and other railway systems;
- subsurface tunnelling, excavations and civil engineering works associated with the underground stations;
- elements of the construction of road and other bridges over the conventional railway;
- construction of elements of the retaining structures at Park Village East and those between the classic and high speed railways;
- deliveries of large components, such as bridge beams, heavy plant and equipment;
- elements of the utility diversions in Euston Road and elsewhere in order to avoid daytime traffic disruption;
- the northern section of the high speed dive under;
- building fit-out of the classic and underground stations;
- mechanical, electrical, public health and station systems relocations in the classic and underground stations; and
- setting up temporary vehicle and pedestrian diversions.

Enabling works

2.4.10 General information about enabling or advance works can be found in Volume 1, Section 6.5.The following activities, which will commence in advance of the main engineering works, will be required in the Euston area:

- utility surveys and diversions;
- site investigations and surveys;
- establishment of construction compounds and worksites;
- archaeological investigations and grave clearance in St James's Gardens;

- building surveys and demolitions; and
- the classic railway enabling works.

Classic railway enabling works

2.4.11 The conventional railway enabling works at Euston station will retain a substantial proportion of the existing station up to and including Platform 15. The platforms will be reconfigured to provide 13 platforms for classic services. Platforms 16 to 18 and facilities, such as the Power Signal Box and associated facilities to the west, will be removed to create space for the high speed platforms. The works required extend into the approach including changes to track layouts in order to access the platforms and enable the existing dive under structure to be decommissioned.

2.4.12 The classic railway enabling works will comprise the removal, replacement and reconfiguration of track; reconfiguration of the overhead line equipment and signalling and communication systems; demolition of existing railway lineside infrastructure equipment/buildings; installation of new railway lineside infrastructure equipment/buildings and alterations to existing platforms.

2.4.13 The ramps from Barnby Street to the parcels deck and to platform 2/3 will be removed and modifications made to the parcels deck to facilitate a new loading dock arrangement. Existing accommodation within Hardwick House and on the parcels deck will be reconfigured to allow for facilities displaced from the concourse building. Foundations and sub-structure for the new access bridge to the service deck and for the new east west overbridge will be installed.

2.4.14 In the concourse building, accommodation will be removed from the west wing to enable demolition. Some facilities will be displaced to the service deck and some reconfiguration of the concourse and the basement will also be required. Access to platforms 1-3 will be improved as well as routes to the Euston underground station.

2.4.15 Temporary taxi facilities will be provided on Eversholt Street to enable closure of the existing underground rank.

Demolition works

2.4.16 The Proposed Scheme will require the demolition of buildings and structures in the area, which are listed in Table 1. The Secretary of State is working in partnership with LBC to agree arrangements for the replacement of the social rented housing that will need to be demolished for the Proposed Scheme. This is discussed further in Section 5.

Table 1: Demolition works in the Euston area

Description of structure	**Location**	**Likely timing for demolition**
Residential and community buildings		
3 storey masonry terraced houses (3 flats)	14-15 Melton Street	2016
3 storey masonry residential building	58 Euston Street	2016

Description of structure	Location	Likely timing for demolition
3 storey masonry residential building	60 Euston Street	2016
3 storey masonry residential building	62 Euston Street	2016
3 storey masonry residential building	64 Euston Street	2016
3 storey masonry building (lower floor used as a retail unit, upper floor has 1 flat)	77-79 Euston Street	2016
4 storey steel/masonry building. (Lower floors used as offices, upper floors includes 7 flats)	1 and 3 Cobourg Street	2016
3 storey masonry residential building (3 flats)	59 Cobourg Street	2016
3 storey masonry residential building	Flats A-C, 61 Cobourg Street	2016
3 storey masonry residential building	Flats A & B, 65 Cobourg Street	2016
3 storey masonry residential building (3 flats)	67 Cobourg Street	2016
3 storey masonry public house	Bree Louise public house, 69 Cobourg Street	2016
7 storey residential building 69 dwellings	Silverdale, Regent's Park Estate	2017
4 storey residential building and garages 39 dwellings	Ainsdale, Regent's Park Estate	2017
9 storey residential building 60 dwellings	Eskdale, Regent's Park Estate	2017
Single storey community hall	Old Tenants Hall, Harrington Street, Regent's Park Estate	2017
5 storey brick residential building 20 dwellings	Stalbridge House, 231 Hampstead Road	2016
Commercial buildings		
Single storey restaurants and cafes (2 units)	Food outlets etc. on station forecourt	2020
10 storey office building, unknown construction	Grant Thornton House, 22 Melton Street	2016

Description of structure	Location	Likely timing for demolition
16 storey office building, unknown construction	One Euston Square (also known as 40 Melton Street and formerly Railtrack House)	2016
6 storey building including laboratory and technical support facility, unknown construction	Wolfson House, 4 Stephenson Way	2016
5/6 storey office building, unknown construction	Walkden House, 10 Melton Street	2016
4 storey showroom and office building	11-13 Melton Street	2016
3 storey office building, construction unknown	54-56 Euston Street	2016
3 storey masonry building	The Cottage Hotel, 67-75 Euston Street	2016
3 storey shop/office/warehouse	93-103 Drummond Street	2016
4/5 storey masonry building	Ibis Hotel Euston, 3 Cardington Street including underground car park	2016
5/6 storey building, construction unknown	Thistle Euston Hotel, Cardington Street	2016
4/6 storey brick warehouse building	Offices, 132-140 Hampstead Road	2016
Single storey portable buildings	Addison Lee car park, Hampstead Road	2016
4 storey office with single storey warehouse	Royal Mail Delivery Office, 1 Barnby Street	2016
Single storey masonry building	Building between station and Royal Mail Delivery Office	2016
Railway buildings and structures		
Euston station, construction various	Parcels deck and part of station roof Parcels deck access ramp (east) Station west of platform 15 Parcels deck access ramp (west) Forecourt slab and subsurface car park Existing concourse, east side	2016 2016 2017 2017 2020 2022
4 storey concrete/masonry building	Euston power signal box, Cardington Street	2017
Train shed with steel truss roof	Carriage Shed (adjacent to Park Village East)	2016
4 span pre stressed concrete bridge	Hampstead Road Bridge (will be rebuilt)	2018

Description of structure	Location	Likely timing for demolition
4 span pre stressed concrete bridge	Granby Terrace Bridge (will be rebuilt)	2016
4 span steel and masonry bridge	Mornington Street Bridge (will be rebuilt)	2017
Single storey substations	Redundant substations in railway cutting west of Mornington Crescent	2016
Single storey hut	Portable building at northern end of Mornington Terrace sidings	2016
Single storey masonry building with basement	Former underground station entrance on corner of Melton Street and Drummond Street	2019
Vacant buildings		
6 storey masonry building	National Temperance Hospital (South Wing), Hampstead Road	2016
4/5 storey masonry building	National Temperance Hospital (North Wing), Hampstead Road	2016
Single storey petrol station with canopy	Petrol station, 142 Hampstead Road	2016

Utility works

2.4.17 The general locations of proposed utility works are shown in Maps CT-05-001 and CT-05-002 (Volume 2 CFA1 Map Book). All of these are underground services, except where they cross bridges. The impacts of these utility works have been assessed, although the detailed arrangements for implementing them are still to be refined.

2.4.18 The refinements relate to:

- how individual utility works may need to be packaged at any one location so that environmental effects are minimised by avoiding repeated excavations;
- the density of utilities in London streets and the potential need to move existing utilities on diversion routes to create space for the diverted utilities; and
- certain utilities that have been identified from records, but site investigations will be necessary to verify their position on the ground.

2.4.19 In order to assess the environmental effects of utility works at Euston, a number of general assumptions have been made. Where there are exceptions to these assumptions, these are noted in the assessment (see Sections 3 to 13). The general assumptions are:

- the majority of utility works will take place during core working hours; and there will be some night-time working;

- the works will generally take the form of a 'rolling work' site that will be moved along the utility diversion route over time, though at some locations pits may remain open for considerable periods of time to allow for existing utilities, connections and disconnections. The maximum length of a worksite, at any one time, will typically be no more than 50m;
- there will be partial closure of roads resulting in traffic controls with shuttle working; and
- where multiple diversions need to take place in the same street, it has been assumed that the works will be arranged to avoid multiple openings.

2.4.20 Utility works generally involve the following activities:

- trenching and excavation;
- laying of pipe or ducts;
- construction of chambers;
- cable pulling and jointing;
- connecting, testing and commissioning; and
- reinstatement.

2.4.21 In summary, the main proposed utility diversions required in the area will be:

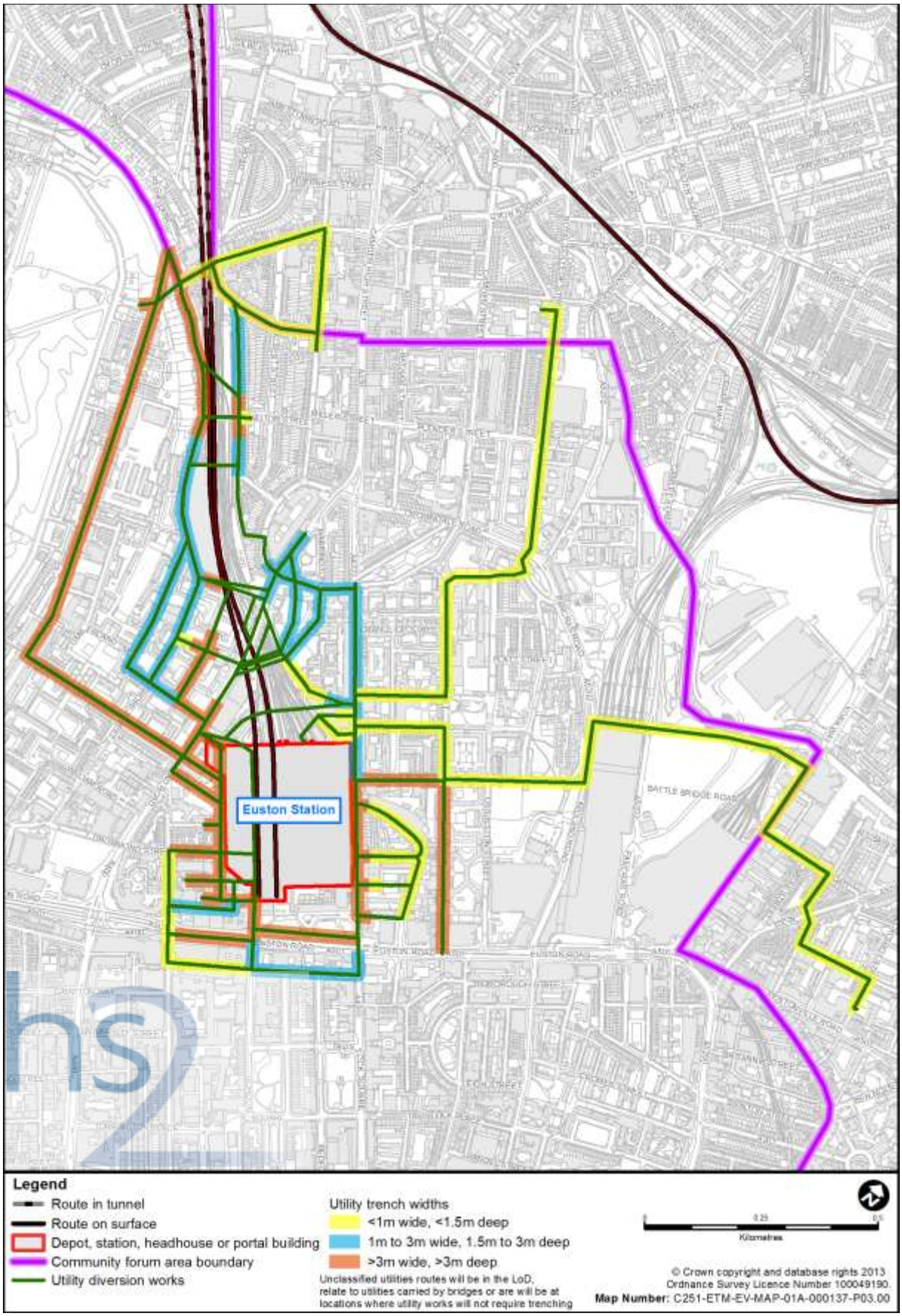
- temporary diversion of various services carried on Hampstead Road Bridge onto temporary utilities bridges alongside the existing road bridge and then back onto the permanent replacement Hampstead Road Bridge. There are four potential locations, all in close proximity to the road bridge;
- permanent and temporary diversions of 66kV medium high voltage and high voltage cables across the station approach;
- permanent and temporary diversions of various services carried on Granby Terrace Bridge;
- temporary diversion of various services carried on Mornington Street Bridge onto a temporary utilities bridge that will be constructed south of the existing bridge. Some telecommunications cables may be permanently diverted via Albert Street, Parkway and Prince Albert Road;
- in Hampstead Road, Mornington Crescent and Lidlington Place, where raising of the carriageway will require some utilities to be raised;
- permanent diversion of a sewer in Eversholt Street, via Phoenix Road and Chalton Street;
- permanent diversion of a 36-inch low pressure gas main that crosses Euston Square Gardens from Drummond Street to Eversholt Street. The current design proposes that the diversion will remain in Euston Square Gardens, but on a different alignment;

- various utilities on Regent's Park Estate will be permanently diverted. Diversion routes may include Stanhope Street, Augustus Street, Varndell Street, Cumberland Market, Robert Street, Harrington Street and Mackworth Street;
- various permanent utility diversions in the vicinity of Starcross Street, Drummond Street, Euston Street, Cobourg Street, North Gower Street, Regnart Buildings and Stephenson Way, to allow extension of the station footprint westwards;
- permanent diversion of an 132kV extra high voltage electricity cable in Euston Street, Melton Street and Gordon Street, possibly via North Gower Street, across Euston Road, Gower Street and Gower Place;
- permanent diversion of a 42-inch water main from Park Village East via Prince Albert Road, Parkway and Regent's Park (for a short distance alongside Gloucester Gate Bridge), Albany Street, Robert Street across Hampstead Road;
- sewer works, probably re-lining, in the grounds of Maria Fidelis Convent (Lower) School with localised excavations to install the liner and make connections to the sewer network;
- permanent diversion of various utilities in Euston Road and Gordon Street to allow construction of the pedestrian subway under Euston Road, including the realignment of the Fleet Sewer along Euston Road; and
- temporary diversion of utilities from Hampstead Road Bridge into a corridor through Ampthill Estate, across Lidlington Place and Harrington Square Gardens and back into Hampstead Road.

2.4.22 There will also be works to provide power supplies to the station from two substations. The proposed electricity substations are at Calshot Street off Pentonville Road, to the east of King's Cross station, and the St Pancras substation on Royal College Street.

2.4.23 In order to assess likely significant environmental affects, estimates have been made of the size of excavations necessary to complete the utility diversions and power reinforcements for the station. These are presented in Figure 7. This classifies the streets in which utility works will take place into three categories, according to the scale of trenching needed. Large excavations are classed as those greater than 3m wide or greater than 3m deep. Medium excavations are those between 1-3m wide and 1.5-3m deep. Small excavations are those less than 1m wide and less than 1.5m deep.

Figure 7: Proposed utility diversions – size of trenches assumed for assessment



2.4.24 Discussions with utility providers are continuing to confirm whether other utilities in these streets will need to be realigned away from the area of work, protected from the

works by means of a concrete slab or similar or will have sufficient clearance from the proposed works that they will not be affected.

2.4.25 The assessment of utility diversions is based on mapped records. Uncharted utilities may be discovered during the works, and those known may not necessarily be in the location mapped. In both situations, additional diversion works may be required.

2.4.26 Wherever reasonably practicable, temporary connections for construction compounds will be made to existing utility services (i.e. electricity, water, data, sewerage and surface water drainage) to reduce the need for generators, storage tanks and associated traffic movements for fuel, water or sewage tankers.

Engineering and Building Works Compounds

2.4.27 Works will be coordinated from site compounds, which will include two main construction compounds in this area: the National Temperance Hospital main compound and The Podium main compound, supported by satellite compounds.

2.4.28 Main compounds will be used for core project management (engineering, planning and construction delivery), commercial and administrative staff.

2.4.29 Satellite compounds will provide office accommodation and welfare facilities for smaller numbers of staff.

2.4.30 General arrangements for the operation of site compounds, including security fencing, lighting, utilities supply, site drainage and codes of worker behaviour are set out in Volume 1, Section 6.6, and the draft CoCP, Section 5.

2.4.31 The establishment of construction compounds will be one of the first activities to take place. Hardstanding will be laid in all compounds. Security fencing and gates will be provided on the perimeter of each construction compound and around much of the site perimeter. Fence type and construction will be appropriate to the level of security required, and visual impact.

2.4.32 The site perimeter will generally be fenced with 2.4m high solid hoardings, appropriately decorated. Hoardings up to 3.6m high may, on occasions, be used to control construction noise. At locations where existing fencing might need to be removed, temporary wire mesh fencing or other suitable alternatives will be used.

2.4.33 All of the construction compounds and sites will be manned by security personnel and will be lit during the hours of darkness in accordance with the requirements of the CoCP and where reasonably practicable to minimise light pollution to the surrounding area.

2.4.34 Site buildings for offices and welfare will generally be of a temporary modular type and may be stacked up to four storeys to limit the area of land required. For works to the existing station and underground stations, it is proposed that an existing office building, The Podium, is used, which will minimise the number of temporary buildings for offices and welfare required in Euston Square Gardens.

2.4.35 There will only be limited space available at construction compounds for the storage of bulk materials (aggregates, structural steel and steel reinforcement), fabrication of temporary works equipment, finished goods, utilities equipment, plant and machinery and fuel.

2.4.36 The peak number of construction personnel at all construction sites at Euston is estimated to be approximately 2,100 between 2020 and 2023, of which 610 will be office-based staff. Numbers will decrease to approximately 1125 personnel by around 2024.

2.4.37 It is likely that two specialised concrete plants will be required at Euston. Normal concrete for construction will be supplied from commercial concrete plants in London. One specialised facility will be located in the existing station underground car park and will supply sprayed concrete for lining of subsurface pedestrian links associated with the underground station. A second plant will be used to supply sprayed concrete for facing the barrette retaining walls that will be constructed at Park Village East and the retaining walls along the west side of the extended Euston station. This is likely to be located at track level.

2.4.38 Mobile facilities for recycling demolition materials and aggregates for re-use (e.g. crushing, screening and grading plants) will be located adjacent to buildings during their demolition and moved as necessary to reduce on-site haulage.

2.4.39 The locations of site compounds are shown on Map CT-05-001 (Volume 2, CFA1 Map Book). The proposed use of each site compound is described below with an estimated duration of use, peak staff numbers and proposed vehicle access points. The highway access routes that will be used are addressed in Section 12.

National Temperance Hospital main compound

2.4.40 This compound will:

- be used from 2015 to 2026;
- have peak construction personnel numbers of approximately 1,800; and
- vehicle access from A400 Hampstead Road.

2.4.41 This construction compound will be a strategic hub for core project management, technical, commercial and administrative staff for the high speed part of the expanded Euston station and high speed station approach. Some personnel working on the proposed works to the classic railway and station and the underground station will also be located here.

2.4.42 Initial set up of the compound, supporting about 20 personnel, will start prior to the demolition of the National Temperance Hospital in 2016. It will be constructed using stacking modular buildings, and may be increased or decreased in size or configuration during the construction period, as necessary. On completion of the works, this construction compound will become part of the permanent works.

2.4.43 The compound will be the principal access point to the high speed station works, with a temporary ramp to the high speed track level. There will be some limited space for storage and lay down of materials, plant, machinery, small tools and equipment. Towards the end of the construction period it will be used for storage of materials, plant and equipment for classic and underground station construction, and high speed railway systems. This compound will also provide administrative and site management support to the railway installation works in the Camden Town and HS1 Link area (CFA2) and Primrose Hill to Kilburn (Camden) area (CFA3).

2.4.44 On-site car parking will be provided only for a small number of essential light goods vehicles (LGVs).

2.4.45 The compound and associated offices will principally be used during core working hours but will be open 24 hours per day to support any working in the Euston area outside core working hours.

Granby Terrace overbridge satellite compound

2.4.46 This compound will:

- be used from 2016 to 2026;
- support up to 30 construction personnel;
- initially have two vehicle accesses from A400 Hampstead Road via Robert Street and Stanhope Street, and Hampstead Road via Robert Street, Stanhope Street, Mackworth Street and Harrington Street; and
- after mid-2018, the majority of vehicle access will be from A400 Hampstead Road via Granby Terrace Bridge, until late 2021, when the bridge will open to the general public, but will still be used for construction traffic.

2.4.47 The compound will support the following works:

- demolition of the three Regent's Park Estate residential blocks;
- construction of the west side retaining wall around Hampstead Road Bridge; and
- demolition and reconstruction of Hampstead Road and Granby Terrace Bridges as well as associated utilities and highway works.

2.4.48 The construction compound will be partially operational from 2016 to facilitate access to the Carriage Shed and Park Village East satellite compound, before becoming fully operational in 2017 when the residential blocks on the Regent's Park Estate will be demolished. By 2021 the retaining wall will have been built and the bridges reconstructed. However, the compound will remain in operation until 2026 for storage of materials, plant and equipment for construction of Euston station and underground station together with high speed railway systems fit out.

2.4.49 There will be bentonite silos on site, along with associated cleaning and pumping plant, for installing the Park Village East barrette retaining wall.

2.4.50 The compound will operate predominantly during core working hours but will, on occasion, operate 24 hours per day for railway possession dependent works.

Carriage shed and Park Village East satellite compound

2.4.51 This compound will:

- be used from 2016 to 2026;
- support approximately 60 construction personnel;

- have initially vehicle access from A400 Hampstead Road via Robert Street and Stanhope Street; and
- after mid-2018, the majority of vehicle access will be from A400 Hampstead Road via Granby Terrace Bridge. The bridge will open to all traffic in late 2021.

2.4.52 The compound will support:

- demolition of the carriage sheds and siding;
- classic railway enabling works;
- demolition and reconstruction of Mornington Street Bridge;
- construction of the Park Village East retaining wall;
- removal of excavated material from the station and station approach, portal and high speed dive under;
- tunnel portal and headhouse works, including installation of the auto-transformer station; and
- high speed railway systems fit out.

2.4.53 The compound will be established in 2016 in order to demolish the carriage shed. There will be space for materials, plant and equipment storage, and fabrication of reinforcement cages used in barrette construction. Bentonite silos will be present and associated cleaning and pumping plant for the Park Village East barrette retaining wall construction. A temporary ramp for vehicles will be built from road level to track level.

2.4.54 The compound will operate predominantly during core working hours but will, on occasions, operate 24 hours per day for works dependent on railway possessions.

Mornington Terrace sidings satellite compound

2.4.55 This compound will:

- be used from 2015 to 2017;
- support approximately 25 construction personnel; and
- vehicle access from A400 Hampstead Road via Mornington Crescent, Clarkson Row and Mornington Terrace or via Mornington Crescent, Mornington Place and Mornington Terrace.

2.4.56 The compound will specifically support the classic railway enabling works including:

- reconfiguration of the classic railway approach by decommissioning two western lines to recreate a four track approach;
- vertical and horizontal realignment of track;
- removal, replacement and reconfiguration of rail switches and crossings;

- reconfiguring overhead line equipment, signalling and communications systems; and
- decommissioning and closure of the existing railway dive under.

2.4.57 Plant, equipment and material will mostly be delivered and removed via the classic railway corridor using road-rail plant and equipment. There will be minimal deliveries via Mornington Terrace. Pedestrian access to the site will be via an existing Network Rail pedestrian access gate off Mornington Terrace.

2.4.58 The majority of works will be carried out outside core working hours in railway possessions.

Mornington Street overbridge satellite compound

2.4.59 This compound will:

- be used overall for four years, in two phases 2016 to 2017 and 2018 to 2020;
- support approximately 10 construction personnel; and
- have vehicle access from A400 Hampstead Road via Mornington Crescent, Clarkson Row and Mornington Terrace or via Mornington Crescent, Mornington Place and Mornington Terrace.

2.4.60 The compound will support:

- construction of a temporary pedestrian and utilities bridge south of Mornington Street Bridge;
- relocation of utilities from the existing bridge to the temporary bridge;
- demolition of the existing bridge;
- reconstruction of Mornington Street Bridge; and
- transfer of utilities back to the permanent bridge and removal of the temporary bridge.

2.4.61 The compound will occupy the western footway and half the width of the existing road adjacent to Mornington Street Bridge and the proposed temporary utilities bridge. During the bridge demolition and construction, the compound will be larger.

2.4.62 For most of the period it is in use, the compound will operate during core working hours, but there may be occasional short periods when it operates at other times. It will have limited space for offices, welfare facilities and storage.

A400 Hampstead Road overbridge (north) satellite compound

2.4.63 This compound will:

- be used from 2016 to 2026;
- support approximately 20 construction personnel; and
- have vehicle access from A400 Hampstead Road.

2.4.64 The compound will support works to Hampstead Road Bridge and Granby Terrace Bridge including:

- construction of the temporary combined pedestrian and utilities bridges to north and south of Hampstead Road Bridge;
- relocation of utilities to the temporary bridges;
- demolition of Hampstead Road Bridge and Granby Terrace Bridge;
- reconstruction of Hampstead Road Bridge and Granby Terrace Bridge; and
- transfer of utilities back to Hampstead Road Bridge and removal of temporary bridges.

2.4.65 Apart from these works, the compound will also be used for storing materials, plant and equipment during the entire construction period in the Euston area. The compound will operate during core working hours, but on occasion there will be work outside of these hours for rail possession when construction activities are on or adjacent to the conventional railway.

A400 Hampstead Road overbridge (south) satellite compound

2.4.66 This compound will:

- be used from 2016 to 2021;
- support approximately 20 construction personnel; and
- vehicle access from A4200 Eversholt Street via Barnby Street and Ampthill Estate car park.

2.4.67 The purpose and operation of this compound is very similar to the compound north of Hampstead Road, described previously. The compound may reduce in size on completion of the temporary utility bridges and then be re-established for their removal.

Royal Mail NW1 delivery office satellite compound

2.4.68 This compound will:

- be used from 2016 to 2026;
- support approximately 20 construction personnel; and
- have vehicle access from A4200 Eversholt Street.

2.4.69 The compound will support works including:

- demolition of the Royal Mail NW1 delivery office;
- construction of temporary combined cyclist and utilities bridges, south of Hampstead Road Bridge;
- relocation of utilities in Eversholt Street and surrounding streets;
- demolition and reconstruction of the parcel deck access bridge;

- construction of the east west bridge for use by pedestrians and cyclists only;
- the partial demolition and reconstruction of the parcels deck;
- construction of a bus stand;
- construction of an electricity substation
- relocation of utilities to Hampstead Road Bridge and removal of the temporary bridge; and
- fit-out of the classic part of Euston station.

2.4.70 The compound will operate during core working hours, as well outside of these hours, on occasion, when railway possessions take place for works to bridges and to reduce daytime traffic congestion during utilities and road works.

Lancing Street satellite compound

2.4.71 This compound will:

- be used from 2020 to 2026;
- support approximately five construction personnel; and
- have vehicle access from A4200 Eversholt Street via Lancing Street.

2.4.72 The compound will support ground settlement compensation works in advance of and during and tunnelling activities beneath and around Euston station. A grouting shaft will be constructed to allow injection of grout from an array of horizontal tubes should ground settlement be detected. Storage on site will be limited but will include grouting materials.

2.4.73 The compound will operate during core working hours, prior to tunnelling works commencing. Subsequently, grouting will need to respond to settlement, as it occurs, which could be during the day or night, until the risk of settlement has been removed.

The Podium main compound

2.4.74 This compound will:

- be used from 2020 to 2026;
- support approximately 800 construction personnel; and
- have no vehicle access except for existing building servicing and maintenance.

2.4.75 The Podium main compound will be a strategic hub for core project management (engineering, planning and construction delivery), commercial management and administrative staff for the works. The building may need to be refitted to provide better pedestrian access and facilities suitable for construction management. The Tower has also been included within limits to allow access and modification to building facilities and equipment that may be shared with The Podium. Otherwise, The Tower will not be directly affected by the Proposed Scheme.

2.4.76 The main office will manage refurbishing of the classic station and remodelling of the underground station and include:

- demolishing, reconstructing and fitting out the existing classic station concourse, platforms and service areas;
- constructing pedestrian links from the classic platforms to the underground station ticket hall;
- demolishing the plaza slab, constructing the underground station ticket hall, escalator declines, lifts shafts and passages to underground platforms;
- systems and architectural fit out of the underground station;
- constructing the Euston Road subway, Gordon Street entrance and access to Euston Square underground station;
- constructing the bus station; and
- restoring and landscaping Euston Square Gardens.

2.4.77 The building will be in use for 24 hours per day, to support works outside core working hours.

Euston Square Gardens (east) satellite compound

2.4.78 This compound will:

- be used for utility works from 2016 to 2017 and construction works from 2020 to 2026;
- support approximately 15 construction personnel; and
- have vehicle access from A4200 Eversholt Street.

2.4.79 This compound will principally be used for the local storage of materials, plant and equipment associated with the works to the high speed and classic parts of Euston station, Euston underground station, Euston Road subway and Euston Square underground station connection. Between 2017 and 2020, the eastern part of Euston Square Gardens will be temporarily reinstated as a public open space. From 2020 to 2026, the compound will support refurbishment of the classic part of the station and works to the underground station.

2.4.80 The compound will also support the following works within its footprint:

- diversion of several utilities including a 36-inch gas main, 42-inch water main, 6-inch water main, communication and power cables, a 1.5m diameter foul sewer and a 1200mm by 800mm foul sewer; and
- construction of surface water drainage attenuation tanks for classic part of station in Euston Square Gardens.

2.4.81 The bus station remodelling will be supported from the construction compound as will external works to the Euston station entrance and landscaping of the station forecourt and gardens.

2.4.82 The compound will operate during core working hours, as well as outside these hours for supporting tunnelling, station possession and Euston Road highway works.

Euston Square Gardens (west) satellite compound

2.4.83 This compound will:

- be used from 2016 to 2026;
- support approximately 15 construction personnel; and
- have vehicle access from Euston Road or Melton Street.

2.4.84 The compound will be established for early utilities advance works in 2015 and then works to the high speed (western end) and classic parts of Euston station, Euston underground station, Euston Road subway and Euston Square underground station connection. The compound will change in size and footprint throughout the construction period depending on the nature of the works being undertaken. It will be in use until completion of external works in 2026.

2.4.85 The compound will provide:

- limited facilities for staff, security personnel and site operatives;
- construction access into the high speed and classic parts of Euston station, and Euston underground station; and
- a hub for managing material removal from the excavations associated with the downward escalators, the Euston Road subway and underground stations passages, links and connections.

2.4.86 The compound will also support the following works:

- utility works in Euston Road;
- utility works in Euston Square Gardens including, 1.5m diameter foul sewer, 42 inch water main, 36 inch gas main, and telecommunications and power cables;
- demolition of Grant Thornton House and One Euston Square;
- piling, construction and fit-out of the high speed part of Euston station including retaining walls, concourse and subsurface links between high speed platforms and underground station ticket hall;
- reconfiguration of the bus station; and
- external works to the Euston station entrance and landscaping of the station forecourt and Euston Square Gardens.

2.4.87 The compound will operate during core working hours, as well as outside these hours for supporting tunnelling, station possession and Euston Road highway works.

Gordon Street satellite compound

2.4.88 This compound will:

- be used from 2016 to 2026;

- support approximately 15 construction personnel;
- have a vehicle entrance from A501 Euston Road, Endsleigh Gardens or Gordon Street; and
- have a vehicle exit to A501 Euston Road, Endsleigh Gardens or Gower Place.

2.4.89 The compound will support the following works:

- utility works in Euston Road and surrounding roads; and
- construction of the Euston Road subway, Gordon Street entrance and access to Euston Square underground station.

2.4.90 The compound will be established for utilities advance works in 2015 and used between 2022 to 2024 for construction of subways and accesses to Euston Square underground station. The compound will be used for storage throughout the entire construction period at Euston.

2.4.91 The compound will operate during core working hours as well as outside of these hours for tunnelling works and Euston Road highway and utility works.

Euston station satellite compound

2.4.92 This compound will:

- be used from 2015 to 2017;
- be located in the proximity of platforms 8 to 11 of the classic rail station, which will be moved to platform 15 when works are undertaken to this platform; and
- support approximately 25 construction personnel.

2.4.93 The compound will provide:

- limited offices and facilities for staff, security personnel and site operatives; and
- storage of small plant and equipment.

2.4.94 It will support the following railway systems enabling works to the existing track alignment:

- realignment of track vertically and horizontally;
- reconfiguration of overhead line equipment, signalling and communications systems; and
- platform works.

2.4.95 Pedestrian access to the site would be through the station concourse.

2.4.96 Establishment and removal of the site compound and portable buildings would be via Barnby Street, off Eversholt Street, with plant, equipment and material delivered via the existing railway using road-rail plant and equipment.

2.4.97 The compound will operate during core working hours, as well as outside these hours during railway possessions.

Willesden Euroterminal main compound

2.4.98 This compound is in the Kilburn (Brent) to Old Oak Common area (CFA4), but will be used to support classic railway enabling works in the Euston area from 2016 to 2017. See Volume 2, CFA report 4 for more information about this compound.

F Sidings satellite compound

2.4.99 This construction compound is in the Northolt Corridor area (CFA5), but it will be used to support classic railway enabling works in the Euston area from 2016 to 2017. See CFA report 5 for more information about the compound.

Permanent and temporary highway closures

2.4.100 The Proposed Scheme will result in permanent road closures as a result of an extended station footprint or permanent highway works as set out in Table 2.

Table 2: Permanent road closures without replacement

Location	Description of closure
Cardington Street	Permanently closed for its entire length
Melton Street (south of Cardington Street)	Permanently closed from the junction with Euston Street to new bus station access.
Stephenson Way (eastern end)	Northern end permanently closed at the junction with Euston Street. Connection may be maintained with realigned Cobourg Street.
Drummond Street (eastern end)	Permanently closed between Cardington Street and Cobourg Street. Connection may be maintained with realigned Cobourg Street.
Euston Street (eastern end)	Permanently closed between Cardington Street and Cobourg Street.
Varndell Street (eastern end)	Permanently closed to vehicles at the junction with A400 Hampstead Road, because of level changes. Pedestrian and cycle access may be maintained.
Harrington Street (northern end)	Permanently closed at the junction with Granby Terrace.
Hampstead Road (not the A400 Hampstead Road)	A minor road called Hampstead Road which is not the A400 Hampstead Road, permanently closed between junction with Cardington Street and A400 Hampstead Road.
Bus station access	Permanently closed from the junction with Euston Road across Euston Square Gardens to the bus station.
Gordon Street (northern end)	Permanently closed to vehicles between Euston Road and Endsleigh Gardens. Pedestrian and cycle access will be maintained.

2.4.101 The Proposed Scheme will result in the following permanent road closures and diversions to new alignments as a result of the enlarged station footprint or railway works as set out in Table 3.

Table 3: Permanent road closures with replacement

Location	Description of closure	Approximate duration of closure
Cobourg Street	Permanently closed for its entire length and rebuilt on a widened alignment.	2016-2026
A400 Hampstead Road	Existing bridge is to be demolished. Bridge to be rebuilt on an altered vertical alignment.	2016-2021
Granby Terrace Bridge	Existing bridge is to be demolished. Bridge to be rebuilt on a slightly altered alignment.	2016-2018

2.4.102 The A400 Hampstead Road Bridge currently carries a six lane road. Reconstruction will involve removing one half of the width and replacing that, before repeating for the other half. Throughout reconstruction, it will be possible to keep one lane of traffic open in each direction including access for pedestrians. Two temporary utilities bridges will be provided during construction, one of which will provide for cyclists.

2.4.103 Generally, where roads will be affected by the construction of the Proposed Scheme, the strategy to mitigate this will be to reduce disruption resulting from highway works by implementing well managed, phased construction involving either permanent or temporary realignments or temporary diversions.

2.4.104 Construction of the Proposed Scheme will result in long period temporary road closures as shown in Table 4. The closure of roads will be kept to as short a duration as reasonably practicable and arrangements will be made to provide satisfactory alternative access arrangements during closures.

Table 4: Long period temporary road closures

Location	Description of closure	Approximate duration of closure
Mornington Street Bridge	To be demolished and rebuilt on its current alignment. A temporary shared utilities, pedestrian and cycle bridge will be installed during construction	2016-2020
Park Village East	Closed to vehicles in sections between its junction with Parkway to about 30m south of Mornington Street Bridge.	2016-2020[23]
Drummond Street	Closed at the junction with Cobourg Street	2016-2022
Euston Street	Closed at the junction with Cobourg Street	2016-2026
Starcross Street	Closed at the junction with Cobourg Street	2016-2022
Stephenson Way	Closed from the junction with Euston Street for part of its length	2016-2022

2.4.105 Works to construct the subsurface link will require the permanent diversion of various utilities in Euston Road. The proposed pedestrian routes under Euston Square

[23] It is likely to be possible to phase restrictions of access to the frontages of particular properties.

Gardens and across Euston Road and the connections to the Euston Square underground station platforms will be constructed using open cut excavation techniques. Construction will be in phases moving across the road, in order to maintain two lanes of traffic in each direction.

Footpath, cycleway and bridleway diversions

2.4.106 There are four paths[24] in the Euston area which will be permanently affected by the Proposed Scheme:

- the path leading into St James's Gardens from Hampstead Road will be permanently closed and then replaced through the forecourt at the northern station entrance;
- part of the pedestrian section of Harrington Street will be permanently closed and then become part of a new area of public open space; and
- two paths across Euston Square Gardens, (one to the east and one to the west) will be permanently closed and then reprovided as new routes but with slightly altered alignments.

Construction traffic and access

2.4.107 Access points to each of the compounds have been described in relation to each compound. The traffic flows and routes that will be used to and from these access points are assessed in Section 12.

2.4.108 At Euston, it has been assumed in the ES, as a reasonable worst case, that all excavated material and demolition arisings will be transported by road to existing landfill sites with permitted capacity. However, there may be opportunities for a limited volume of excavated material to be transported by rail, but this is constrained by lack of space for sidings and available train paths. The area to the south-west of Hampstead Road Bridge offers the most potential for sidings from where up to 25% of excavated material could be removed by rail. It is also likely that some material and equipment for rail construction and systems will be brought in by rail, but the majority of building materials for the station and other works will have to be brought in by road.

2.4.109 Off-site lorry holding areas are likely to be required to marshal lorries. These will be well connected to the major roads and could be at some distance from Euston. Subject to agreement, the ZSL London Zoo coach park in Regent's Park, immediately north of Gloucester Gate Bridge will be used for lorry holding.

Station and approach construction

Euston station– High speed rail

2.4.110 In order to construct the high speed part of the station it will be necessary to demolish the western section of the existing building including the basement and foundation structures. Prior to this, existing facilities from the basement will be relocated

[24] These have been treated in the same way as PRoW, since there is no definitive map of public rights of way in London.

primarily to the existing parcels deck at the north end of the classic station. At concourse level, the British Transport Police station will be relocated and the ticket office, left luggage and mobility assistance facilities remodelled. Some retail units and storage space on the concourse will be removed. The western part of the parcels deck will be removed and access to the service area reconfigured to allow access and egress to Eversholt Street. Mechanical and electrical plant will be modified or relocated as required.

2.4.111 It will be necessary to undertake other advance works including:

- demolition of the buildings between the western edge of the existing station and the western edge of the high speed part of the station;
- diversion of utilities from within the high speed station footprint;
- construction of a piled retaining wall alongside platform 15 and provide ground support along this line, and form foundation support to the existing station roof and parcel deck; and
- transfer of activities from the western part of the existing station and demolishing the existing station building and concourse west of platform 15.

2.4.112 The works for the high speed platforms will be managed to provide for pedestrian movements through and around the works. There will be ongoing changes to passenger routes through and around the station to meet the requirements for phased construction of the Proposed Scheme. It is envisaged that all areas of the station west of platform 15 will be closed off to the public (using hoardings) from the start of construction of the high speed part of the station. There will be some initial work to improve access to platforms 1 to 3 and the underground ticket hall which is anticipated to be carried out during 2016. The concourse will then continue to operate without further major change until late 2022, when the high speed concourse is available for use. Some of the existing station facilities will be relocated into the high speed concourse area and work will then commence on remodelling of the existing concourse building.

2.4.113 The track level for the high speed part of the station will be about 8m below the existing adjacent ground levels. A piled retaining wall will be installed along the western and southern boundaries of the high speed station to allow excavation to track level. Foundations will be constructed beneath the platforms to support the concourse and roof structure. There will also be some excavation beneath the track level to create emergency escape routes from the platforms. These excavations will also be used to accommodate tanks for track and station surface water attenuation and related plant. There will be excavations across Euston Square Gardens and Euston Road to provide the subsurface link from the Euston underground station ticket hall to the west end of the Northern line (Charing Cross branch), along with fire access/escape provisions and the provision of a new ventilation building at the south end of Cobourg Street.

2.4.114 It is likely that the station structure up to and including concourse level will be built from concrete. Pre-cast concrete beams will be adopted where possible to simplify construction. The structures above concourse level are likely to be steel-framed and will include the station facilities and retail areas. Roofs over the concourse and

platform areas will be partly glazed to provide appropriate levels of natural light. The station will have substantial plant to be installed for escalators and lifts, heating, cooling and other services, to be followed by building fit-out.

Euston station – Classic rail

2.4.115 Modification of the 13 platforms that will be retained in the classic part of the station, including replacement of the ground level slab, is likely to be completed in phases during the enabling works period, while maintaining access to the platforms. The platform access ramps will be modified and a new separating wall will be constructed between the high speed and classic platforms, with modifications to the existing roof and drainage.

2.4.116 The parcels deck spans the north end of the platforms at Euston station. It will be demolished along the eastern edge of the high speed platforms to form a new service deck. The existing ramps that allow vehicle entry and exit, via Barnby Street and Cardington Street respectively, will both be demolished, along with the existing vehicle ramp from Barnby Street to platforms 2/3. A new vehicle access bridge will be built which will provide vehicle access to the new service deck from Eversholt Street.

2.4.117 Other than the works described previously, reconfiguration and refurbishment of the classic rail part of the station will take place once the high speed station concourse becomes available to accommodate passengers from the classic station. This will permit removal of the remaining first floor and ground level facilities in the eastern part of the station concourse.

2.4.118 In the eastern part of the existing station concourse, the existing building structure will be taken down to generally ground level. A new roof and walls will be built for the classic station concourse. An improved station entrance will be built on Eversholt Street.

2.4.119 In the basement, work will include strengthening of the existing structure, with additional foundations where required, and the construction of passages to connect to the underground station.

2.4.120 There will be careful co-ordination of the works in the existing station, in the new high speed section of the station and to the Euston underground station. In particular, the flow of passengers between classic and underground trains will be rerouted on a number of occasions to allow works to progress. For instance, the existing main escalators into the existing ticket hall will be closed after eight years from the start of construction works, when the new permanent entrance has been completed. At this point, new subsurface links will be also available between the ends of classic platforms and the underground station. Completion of the classic part of the station, including refurbishment of the concourse, will be concurrent with the commencement of high speed services.

Euston and Euston Square underground stations

2.4.121 The ticket hall for the improved Euston underground station will be constructed by extending into the existing basement car park. Passenger access will be improved to the Victoria line and both branches of the Northern line. Subsurface connections with escalators will be made to the rail concourse, platforms and the eastern ends of the Victoria line and Northern line (Bank branch). The latter will be at a deep level beneath

buildings on Eversholt Street, including Euston House. A compensation grouting shaft is proposed in Lancing Street to control settlement associated with these works.

2.4.122 The proposed pedestrian subways under Euston Square Gardens and Euston Road, and the connections to the Euston Square underground station and platforms will be constructed using open cut excavation techniques. These works will be carried out in phases without the need for total daytime road closures, although there will be partial and overnight closures of Euston Road.

2.4.123 London Underground passengers will be rerouted on a number of occasions during the works at Euston underground station. The first eight years of works are expected to retain operation of most of the existing underground station ticket hall. After that, passengers will be temporarily diverted through new walkways while the station is completed. A key consideration will be to maintain suitable above ground routes to be used by pedestrians entering or leaving the Euston underground station. Works to the Euston Square underground station will disrupt vehicular traffic flows on Euston Road during construction, more than it will affect pedestrians. There will also be disruption to some London Underground services, mostly at weekends, to allow some works to progress. There will temporary platform closures affecting the both branches of the Northern line and Victoria line requiring through running of underground trains. The longest closure will be a five month simultaneous closure of the Victoria line and Bank branch of the Northern line for a five month period starting in early 2022.

Bridges

2.4.124 The locations for bridge works are shown on Map CT-05-001 (Volume 2, CFA1 Map Book).

2.4.125 Two new bridges will be constructed at the north end of the station:

- the east west bridge will span the classic and high speed tracks and provide a pedestrian and cycle route between Eversholt Street and Hampstead Road; and
- the service deck access bridge will provide vehicle access from Eversholt Street to the service deck.

2.4.126 It will be necessary to demolish the existing highway bridges that cross the station approach where:

- there will be insufficient clearance for high speed trains under the existing bridge;
- realignment of the classic railway will conflict with existing bridge piers; and/or
- the length of spans need to be increased to bridge the high speed railway.

2.4.127 The existing bridges, which are beam bridges[25], will be demolished. These are:

- Hampstead Road Bridge, which will be rebuilt as a truss bridge[26], as illustrated in LV-14-005, Volume 2 CFA1 Map Book;
- Granby Terrace Bridge, which will be rebuilt as a truss bridge; and
- Mornington Street Bridge, which will be rebuilt as a beam bridge with reinstatement of the listed piers at either end.

2.4.128 Demolition and reconstruction of the bridges will follow the general sequence below, which may differ depending on the particular structural form employed:

- construct temporary utility bridges;
- divert utilities;
- demolish bridge including piers and foundations;
- construct new bridge piers and abutments;
- install trusses or beams and cross girders;
- install utilities; and
- cast concrete deck slab, build parapet, install road finishes, lighting and signage.

Park Village East: Retaining walls, dive under and portal

2.4.129 A new retaining wall will be built from the north-west corner of the station northwards past Granby Terrace and through the site of the existing carriage shed. A high containment parapet, 1.8m in height, will be constructed above the retaining walls, wherever necessary.

2.4.130 An embedded retaining wall in the form of a barrette wall will be installed to replace the existing retaining wall and help to prevent any future movement of the Park Village East carriageway and the adjacent properties. This wall will be constructed from just south of Mornington Street Bridge northwards for 150m. These barrettes will be approximately 1.2m wide by 4.5m deep and will be constructed at 4.5m centres. The existing brick parapet wall will be replaced with a high containment parapet.

2.4.131 The twin bore tunnel between Old Oak Common (in Kilburn (Brent) to Old Oak Common, CFA4) and Euston portal will be bored from Old Oak Common using two tunnel boring machines (TBM). On completing the tunnels, the majority of the TBM equipment will be drawn back down the tunnels for recovery at Old Oak Common. At the Euston tunnel portal, reception chambers to accommodate the TBM equipment will be constructed using piled walls. Some of the TBM equipment will need to be dismantled to allow it to be drawn back down the tunnels.

[25] A beam bridge consists of structural elements below deck level, spanning longitudinally between piers or abutments.
[26] A truss bridge has main structural elements along each side projecting above deck level. These are the trusses, which are formed of top and bottom chords with braces between them in a triangular pattern. The deck spans transversely between the trusses.

2.4.132 A headhouse will be constructed at the tunnel portal. It will be a multi-storey structure, with the main structure below street level, and will straddle the western high speed track immediately south of the tunnel entrance. The structure will contain mechanical, electrical and safety equipment to serve the tunnel.

Construction waste and material resources

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

2.4.134 The majority of excavated material generated across the Proposed Scheme will be re-used as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, either with or without treatment. However, the excavated material generated from the Euston area will require off-site disposal to permitted landfill sites. Geographical and logistical constraints mean that this material cannot be re-used elsewhere on the Proposed Scheme. The excavated material from Euston represents a proportion of the total quantity of surplus excavated material that will require off-site disposal, which is reported on a route-wide basis in Volume 3, Section 14.

2.4.135 Table 5 shows the quantity of excavation waste to be disposed to landfill as zero, since this table is only intended to report contaminated excavated material that is chemically unsuitable for re-use within the Proposed Scheme. No such material will be generated in the Euston area.

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

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

2.4.137 The quantities of demolition, construction and work accommodation wastes that will require off-site disposal to landfill, based on these assumptions, are shown in Table 5.

Table 5: Estimated construction, demolition and excavation waste

Waste type	Estimated material quantities that will be generated (tonnes)	Estimated quantity of waste for off-site disposal to landfill (tonnes)
Excavation	2,042,874	0
Demolition	306,925	30,693
Construction	465,520	46,552
Worker accommodation	0	0
TOTAL	**2,815,319**	**77,245**

2.4.138 The assessment of the likely significant environmental effects associated with the disposal of CDEW and worker accommodation waste has been undertaken for the Proposed Scheme as a whole and is reported in Volume 3, Section 14.

High speed rail infrastructure fit-out

2.4.139 The principal elements of rail infrastructure to be constructed will be track, overhead line equipment, communications equipment and power supply. The high speed track in the station approach and station will be slab track, where the rails are supported on a continuous concrete structure, rather than ballasted track. Further details are set out in Volume 1, Section 6.22.

2.4.140 High speed trains will draw power from overhead line equipment, requiring feeder stations and connections to the 400kV National Grid network. There are no feeder stations within the local area. In addition to feeder stations, smaller auto-transformer stations will be required at more frequent intervals. The location of the proposed auto-transformer station is adjacent to the tunnel portal headhouse, at track level. This location is shown on Map CT-06-002 (Volume 2, CFA1 Map Book).

Commissioning of the railway

2.4.141 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

2.4.142 A construction programme that illustrates indicative periods for each core construction activity in this area is provided in Figure 8.

2.4.143 A sequence of annual construction phasing diagrams is provided in Figures CT-20-005 to CT-20-008 (Volume 2, CFA1 Map Book). The diagrams illustrate how works activities will be distributed spatially across the Euston area during the construction programme. These provide a clearer indication of the pattern of construction work and confirm that, in most parts of the area, works will not be continuous throughout the construction period.

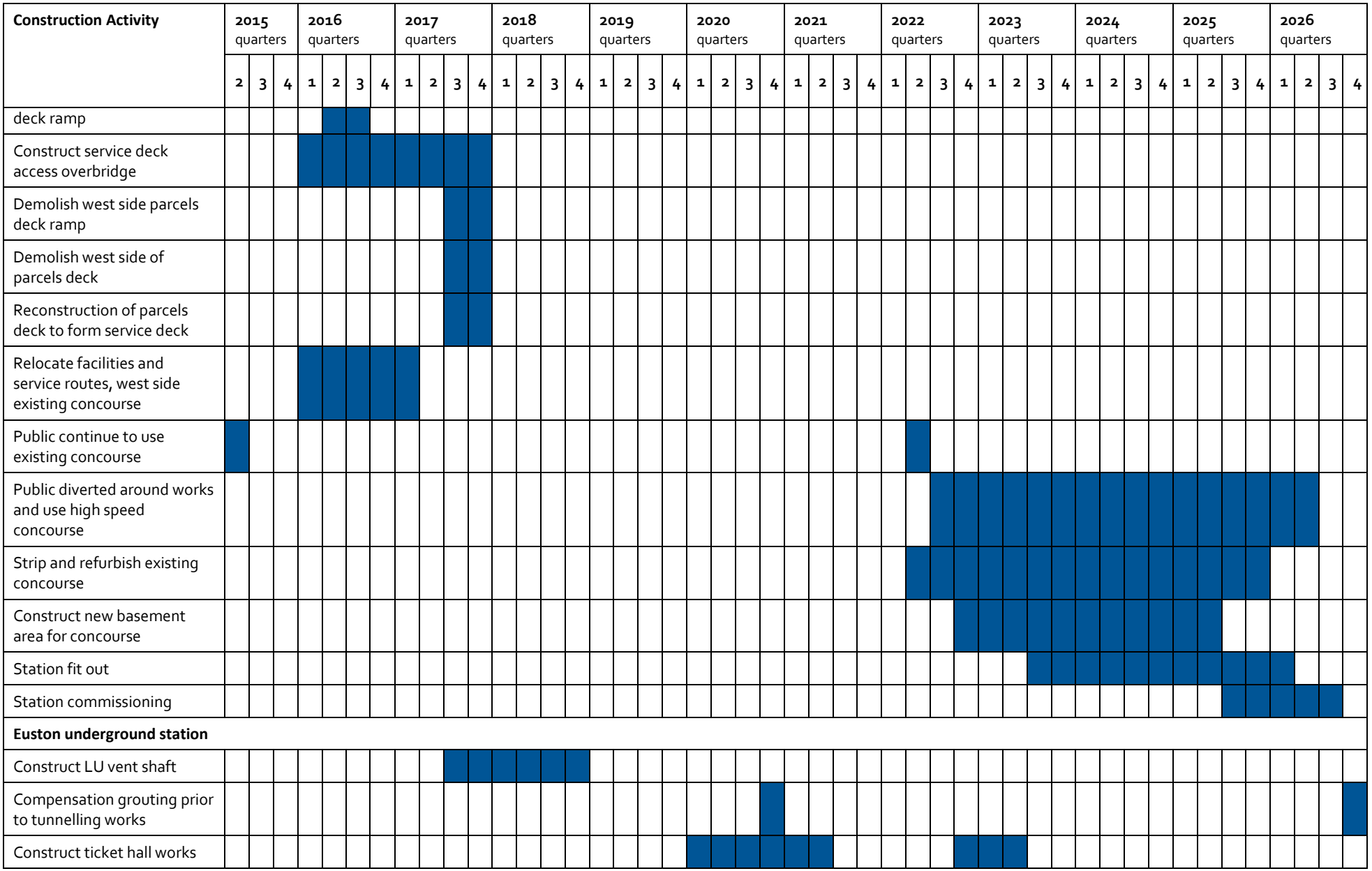
Figure 8: Activity based construction programme

Construction Activity	2015 quarters			2016 quarters				2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advance Works																																														
Demolitions				■	■	■	■	■	■	■	■																																			
Demolish LUL vent shaft and substation															■	■																															
Remove graves from St James's Gardens				■	■	■	■	■	■																																					
Classic railway enabling works	■	■	■	■	■	■	■																																							
Utilities diversions																																														
Cobourg Street				■	■	■	■	■	■	■	■	■	■	■																																	
Park Village East and Mornington Street		■	■	■	■	■	■	■	■	■					■	■	■	■	■																											
Albany Street				■	■	■	■	■	■	■																																					
Eversholt Street				■	■	■	■	■	■	■																																					
Euston Square Gardens						■	■																																							
Gower Place/Gower Street										■	■	■	■																																			
Cardington Street	■	■	■	■	■	■																																									
Melton Street			■	■	■	■	■	■	■	■	■	■	■	■	■																															
Starcross Street				■	■	■	■																																								
Ampthill Estate						■	■																								■	■																
Euston Road (132kv diversion from Gower Street)										■	■	■	■																																			
Euston Road (connections out of Melton Street and utility diversions)														■	■	■	■	■	■	■																											

Construction Activity	2015 quarters			2016 quarters				2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Euston Road (subway and Euston Square connection)																																														
Civil engineering works																																														
Main excavations																																														
Excavation of high speed station area																																														
High speed railway north of Granby Terrace Bridge																																														
High speed railway between Hampstead Road and Granby Terrace bridges																																														
Hampstead Road Bridge																																														
Construct utility/cycle bridges																																														
Divert utilities																																														
Construct west side retaining wall between Granby Terrace and Hampstead Road bridges																																														
Demolish north side of Hampstead Road Bridge																																														
Reconstruct north side of Hampstead Road Bridge																																														
Demolish south side of Hampstead Road Bridge																																														
Reconstruct south side of Hampstead Road Bridge																																														
Remove temporary utility/cycle bridges																																														

Construction Activity	2015 quarters			2016 quarters				2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Granby Terrace Bridge																																														
Divert utilities onto temporary utilities bridge																																														
Demolish Granby Terrace Bridge																																														
Construct bridge abutments																																														
Reconstruct Granby Terrace Bridge																																														
Mornington Street Bridge																																														
Construct utility/pedestrian/cycle bridge																																														
Dismantle and store listed lamps and pillars																																														
Demolish Mornington Street Bridge																																														
Construct bridge abutments																																														
Reconstruct Mornington Street Bridge																																														
Reinstate listed lamps and pillars																																														
Remove utility/pedestrian/cycle bridge																																														
Retaining walls, high speed railway structures and portal north of Granby Terrace Bridge																																														
Fill existing conventional railway dive under																																														
Demolish central retaining wall																																														

Construction Activity	2015 quarters			2016 quarters				2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Park Village East retaining wall and associated works																																														
Civils for portal and high speed railway																																														
Construct Euston portal headhouse																																														
Construct auto transformer station at portal																																														
Receive TBMs																																														
East west overbridge																																														
Construct east west overbridge																																														
High speed part of Euston station																																														
Clearance and demolition																																														
Piling of retaining walls for high speed station																																														
Construct substructure																																														
Construct concourse level and above																																														
Construct roof covering and facade																																														
Station fit out																																														
Station commissioning																																														
Classic rail part of Euston station																																														
Parcels deck preparatory structural works and reconfiguration																																														
Demolish east side parcels																																														


Construction Activity
2015 quarters
2016 quarters
2017 quarters
2018 quarters
2019 quarters
2020 quarters
2021 quarters
2022 quarters
2023 quarters
2024 quarters
2025 quarters
2026 quarters
2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
deck ramp
Construct service deck access overbridge
Demolish west side parcels deck ramp
Demolish west side of parcels deck
Reconstruction of parcels deck to form service deck
Relocate facilities and service routes, west side existing concourse
Public continue to use existing concourse
Public diverted around works and use high speed concourse
Strip and refurbish existing concourse
Construct new basement area for concourse
Station fit out
Station commissioning
Euston underground station
Construct LU vent shaft
Compensation grouting prior to tunnelling works
Construct ticket hall works

Construction Activity	2015 quarters			2016 quarters				2017 quarters				2018 quarters				2019 quarters				2020 quarters				2021 quarters				2022 quarters				2023 quarters				2024 quarters				2025 quarters				2026 quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fit out and commission ticket hall																																														
Excavate escalator declines and associated tunnels																																														
Construct LU passage links																																														
Commission LUL ticket hall and passage links																																														
Euston Road subway and Euston Square connection																																														
Construct Euston Road subway																																														
Construct link between subway and main ticket hall																																														
Construct tunnels linking Euston Square underground station																																														
Construct entrance to underground in Gordon Street																																														
Other works																																														
Bus station																																														
Reinstate Euston Square Gardens																																														
Create open space north of Langdale																																														
Rail infrastructure and systems works																																														
Classic rail systems fit out in station																																														
High speed rail systems fit out in station																																														

Construction Activity	**2015** quarters			**2016** quarters				**2017** quarters				**2018** quarters				**2019** quarters				**2020** quarters				**2021** quarters				**2022** quarters				**2023** quarters				**2024** quarters				**2025** quarters				**2026** quarters			
	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Lay high speed rail tracks, overhead line equipment and signalling																																														
Commissioning																																														

2.5 Operation of the Proposed Scheme

Operational specification

2.5.1 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.

2.5.2 High speed trains will either be accelerating away from or decelerating as they approach, the station. Between the station and Granby Terrace Bridge, trains will travel at less than 60kph and at up to 110kph between Granby Terrace Bridge and the tunnel portal. Classic trains will operate at similar speeds to those at present.

2.5.3 During Phase One, up to 14 high speed trains per hour (tph) will arrive or depart from Euston in each direction. This will increase to a potential maximum of 18tph in each direction, when Phase Two becomes fully operational.

2.5.4 The high speed trains will be either 200m (one-unit train) or 400m (two-unit trains) long. Each train could hold up to 550 people (one-unit train) or 1100 people (two-unit trains). They will run between the hours of 05:00 and 24:00 (Monday to Saturday) and between 08:00 and 24:00 (Sunday).

2.5.5 The operation of the Proposed Scheme is described further in Volume 1, Section 4.3.

Operational waste and material resources

2.5.6 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.

2.5.7 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.

2.5.8 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.

2.5.9 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.

2.5.10 The quantity of operational waste that will be re-used, 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%.

2.5.11 On this basis, approximately 737 tonnes of operational waste will be re-used, recycled and recovered during each year of operation of the Proposed Scheme in the Euston area. Approximately 481 tonnes will require disposal to landfill (see Table 6).

Table 6: Operational waste forecast for the Proposed Scheme

Waste source	Estimated quantity of waste generated per annum (tonnes)	Estimated quantity of waste for disposal to landfill per annum (tonnes)
Railway station and trains	1,193	477
Rolling stock maintenance	0	0
Track maintenance	23	3
Ancillary infrastructure	2	1
TOTAL	**1,218**	**481**

2.5.12 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).

2.6 Community forum engagement

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

2.6.2 The engagement undertaken within this community forum area is summarised below. A series of community forum meetings as well as discussions with individual landowners, organisations and action groups were undertaken. Meetings of the Euston community forum have been held on:

- 19 March 2012 at Cumberland Market Community Hall;
- 12 June 2012 at Christchurch School Hall;
- 22 November 2012 at Maria Fidelis Convent School;
- 24 January 2013 at Maria Fidelis Convent School;
- 18 April 2013 at Maria Fidelis Convent School;
- 11 June 2013 at Maria Fidelis Convent School;
- 3 July 2013, a workshop, at Cumberland Markets Tenants Hall;
- 5 September 2013 at Maria Fidelis Convent School; and
- 29 October 2013 at Maria Fidelis Convent School

2.6.3 In addition to HS2 Ltd representatives, attendees at these community forum meetings typically included local residents and residents' groups, public representatives, representatives from LBC, action groups, affected landowners and other interested stakeholders.

2.6.4 The main issues and concerns to emerge from these meetings included:

- the design of Euston station and opportunities for over site development (OSD);
- potential environmental effects including noise and air pollution, asbestos risks, the depth of the new track in the Camden cuttings and the impact of this on the Park Village East, including demolition of the western retaining wall and existing central retaining wall south of Parkway. Residents of Park Village East have particular concerns over access and egress to properties during construction;
- support for a double deck station to minimise the amount of land required;
- a need for wider engagement and accessibility for the community in Camden;
- the loss of three social housing blocks on the Regent's Park Estate and the effects of the displacement of the residents of these housing blocks on the wider community, as well as the need for replacement social housing;
- safeguarding the boundary around Euston station;
- employment for local people throughout construction;
- the effects on the Maria Fidelis Convent (Lower) School during construction if the school remains on its present site in North Gower Street; the community's preference for the National Temperance Hospital buildings to be used after construction as social housing;
- the construction and operational effects for Drummond Street businesses;
- 'blight' on the area for more than ten years and loss of a tight knit community because of the effects of HS2 on housing, businesses and schools;
- the community's concern that HS2 Ltd will be taking unnecessary powers to acquire land and the loss of LBC's planning powers;
- loss and replacement of public space at St James's Gardens;
- request for guarantees for all tenants, leaseholders and property owners that they will receive compensation and that residents will not have to move more than once;
- the community's preference for Old Oak Common as the London terminus for HS2;
- concerns about the extent of evening and night-time construction works;
- local residents' reluctance to have a taxi rank in Cobourg Street;
- impacts on Hampstead Road due to increased construction traffic and the wider impacts on bus routes and services;
- concerns about air quality and pollution; and
- concerns about construction traffic within the Regent's Park Estate.

2.6.5 In addition to this engagement, the draft Environmental Statement and Design Refinement consultations took place from 16 May 2013 for a period of eight weeks. 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 Proposed Scheme. Details of the local consultation events were provided on HS2 Ltd website, social media, posters at local venues, national and regional advertising and to properties within 1km of the Proposed Scheme. In the Euston area, consultation on the draft Environmental Statement and on the Design Refinement (which included Euston station) was held on 24 May 2013 at the Bengali Workers Association in Robert Street. There was also a Camden Town event on 22 June 2013, at Castlehaven Community Centre, which covered the Euston area.

2.6.6 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).

2.7 Route section main alternatives

2.7.1 The main strategic alternatives to the Proposed Scheme and local alternatives considered up to January 2012 are presented in Volume 1, Section 10. The main local alternatives to the Proposed Scheme since January 2012 considered in CFA1 are set out in this section.

2.7.2 Since April 2012, as part of the design development process, a series of local alternatives for Euston station and the station approach have been reviewed in 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 achieves the appropriate balance between engineering requirements, cost and the likely environmental effects.

Euston station

2.7.3 A systematic examination of potential configurations for Euston station has been undertaken since April 2012. Six configuration options, which are described below, have been subject to appraisal. Following further stakeholder engagement, additional work was undertaken to appraise a variant of one of these configuration options (double deck) and this variant (double deck down) is also reported below.

2.7.4 In the January 2012 announced scheme and in the subsequent appraisal against other options, it was assumed the high speed services at Euston would require 10 dedicated high speed platforms, two hybrid platforms shared with classic trains and 12 classic platforms. Platform numbers were calculated using proposed service patterns for both high speed and classic services. Further review of operational requirements has removed the need to provide two hybrid platforms, but increased the number of high speed platforms to 11 in the Proposed Scheme.

Add to existing platforms (now the Proposed Scheme)

2.7.5 This option was selected as the preferred option and following further refinement of the station design has been incorporated into the Proposed Scheme.

2.7.6 In this option, the majority of the existing station track and platform layout will be retained. The three, westernmost platforms of the existing station will be removed and 11 high speed platforms will be built to the west below existing ground level. At the time of the options appraisal, it was assumed there would be 10 high speed and two hybrid platforms. Two of the existing office buildings in front of the station will be retained and a high speed concourse will be built at street level. As part of the design, the existing station will be remodelled and an integrated station concourse provided for both high speed and classic services. The Euston underground station concourse will be enlarged at its existing level.

2.7.7 To accommodate the extension of the station, the station approach tracks will need to be widened, which will require land outside the current operational railway boundary.

2.7.8 The works require demolition of residential and commercial property to the west of the existing station, including three residential blocks on the Regent's Park Estate.

2.7.9 Most of the public open space at St James's Gardens is within the land required permanently.

2.7.10 Euston Square Gardens would be reinstated following construction. The bus station north of Euston Square Gardens will be modified. A new pedestrian subway from the station under Euston Road will link to Euston Square underground station and an entrance in Gordon Street.

2.7.11 The Proposed Scheme will allow the construction of the east west overbridge, providing a route over the tracks to the north of the station.

2.7.12 Excavation will only be necessary for the high speed part of the station, unlike the January 2012 announced scheme The volume of material excavated in this 'add to existing platforms' option was estimated to be less than half that of the January 2012 announced scheme.

2.7.13 This option was selected because it satisfied the defined future transport requirements for capacity, interchange and dispersal while meeting the HS2 Ltd schedule for commencement of service in 2026. The overall costs and construction programme for this option will be significantly less than the January 2012 announced scheme, because elements of the existing operational infrastructure, e.g. including most platforms, can be retained. The reduced extent and duration of construction, when compared with the January 2012 announced scheme, also reduces some of the construction related environmental effects.

January 2012 announced scheme

2.7.14 The January 2012 announced scheme was based on the station concept design put forward during consultation in 2011, which proposed the rebuilding of all of the existing station as a single high speed and classic station. This included a combined concourse at existing ground level. Both high speed and classic platforms would be built below the concourse with ten high speed platforms, twelve classic platforms and

two central hybrid platforms. The Euston underground station concourse would be rebuilt at a lower level beneath the platforms.

2.7.15 Similar to the 'add to existing platforms' option above, this option would require demolition of residential and commercial property to the west of the existing station including three residential blocks on the Regent's Park Estate and widening of the station approach tracks.

2.7.16 The east west overbridge would be provided to the north of the station.

2.7.17 Most of the public open space at St James's Gardens would be within the land required permanently. Euston Square Gardens would be retained and would not be affected by any permanent land requirement for the new station or the bus station, which would move north from its existing position.

2.7.18 The appraisal assumed that the Grade II* listed 1923 annex of 1-9 Melton Street would need to be demolished, but subsequent refinement of the option design might have avoided this.

2.7.19 This option would be complicated to construct while maintaining the existing level of classic rail services and construction could not be completed by 2026, the target opening year. A construction period extending beyond 2026 would extend the duration of travel disruption for users of the existing station as well as the associated adverse environmental effects.

2.7.20 The January 2012 announced scheme was rejected principally because, on further evaluation, it was found not to meet cost and completion date targets, as well as causing prolonged disruption to the local communities.

Double deck station

2.7.21 Platforms would be constructed on two levels. There would be a concourse at street level with platforms above and below the concourse level. Ten high speed platforms and six or eight classic platforms would be constructed below street level (lower level platforms). Another six or eight classic platforms would be constructed at high level (upper level platforms) above a combined concourse. The Euston underground station concourse would be rebuilt at a lower level.

2.7.22 Due to the stacking of platforms, the footprint of the double deck station would be less than the other options considered apart from the 'double deck down' option. Less land would be required for the track fans on the railway approach north of the station. It was estimated that considerably fewer dwellings would be affected by this option, compared to the Proposed Scheme. No residential blocks would be demolished on the Regent's Park Estate. Commercial and residential property west of the existing station footprint would not be demolished and St James's Gardens would not be directly affected.

2.7.23 All of Euston Square Gardens would be required for this option, which would adversely affect the listed war memorial and lodges and the Bloomsbury Conservation Area.

2.7.24 The elevated level of the upper platforms would require a railway viaduct that would need to fly over Hampstead Road Bridge, which would create a visually intrusive structure and introduce the potential for train noise to affect more properties than

other options. This option would not allow the construction of an east- west bridge to the north of the station.

2.7.25 The principal reasons for rejecting the double deck station option were that it would be unable to maintain a sufficient level of classic train services during construction and require an extended construction programme. The complexity of the double deck station and the approach would extend the construction period by at least four years, and delay the commencement of HS2. A construction period extending beyond 2026 would also significantly extend the duration of travel disruption for users of the existing station as well as the associated adverse environmental effects.

Double deck down station

2.7.26 Following further stakeholder engagement, a variant of the double deck configuration, the 'double deck down' was also considered. This option would have a concourse at street level and two levels of platforms below the concourse.

2.7.27 The only feasible location at Euston for a low level double deck configuration would be to the east of the Northern line (Charing Cross branch) platform tunnels. The double deck down option would require the demolition of 140 dwellings, which is fewer than the Proposed Scheme, but greater than the 'double deck station'. In addition, the deep excavations required could impose unacceptable movements or stresses on the Northern line (Charing Cross branch) tunnels and the foundations of Gillfoot, a residential tower block.

2.7.28 There would be a requirement to construct the same number of platforms as the Proposed Scheme in and below the existing station footprint and approaches, while keeping the existing train services operational. The depth of the underground line tunnels, at this location, limits the depth of the new platforms and underground station itself would need to be largely rebuilt. Such a rebuild of the whole station complex above and below ground, while maintaining services, would inevitably involve a complicated staging process.

2.7.29 The double deck down option was rejected because it would still require substantial numbers of residential properties and construction would be long, complicated and costly. In particular, construction would take approximately 19 years, there would be major operational disruption to classic services and costs would be about twice those for the Proposed Scheme.

Split level platforms

2.7.30 The number of platforms would be the same as the January 2012 announced design. However, only the high speed and hybrid platforms would be constructed below ground level. The classic platforms would be repositioned as needed but still at their existing level. Separate concourses for high speed and classic services would be built at existing ground level. There would be a substantial separation between the high speed and classic parts of the station.

2.7.31 As with the Proposed Scheme, this option would result in demolition of residential and commercial property to the west of the existing station and of three residential blocks on the Regent's Park Estate and widening of the station approach tracks.

2.7.32 Most of the public open space at St James's Gardens would be within the land required permanently.

2.7.33 The whole of Euston Square Gardens would be required for the classic station concourse and access, which would affect the war memorial and lodges in Euston Square, the setting of listed buildings and the Bloomsbury Conservation Area.

2.7.34 The appraisal assumed that the Grade II* listed 1923 annex to 1-9 Melton Street would need to be demolished.

2.7.35 The 'split level platforms' option was rejected, in particular, because of poor internal operation of the station and its environmental effects on Euston Square and gardens.

Platforms at existing levels

2.7.36 Platforms would be arranged as in the January 2012 announced scheme, but would be constructed at existing ground level. This would require a higher level concourse that would be combined to serve both high speed and classic rail passengers. Constructing high speed platforms at the existing ground level would require Hampstead Road and Granby Terrace Bridges to be raised substantially to allow trains sufficient clearance to pass beneath.

2.7.37 Similar to the Proposed Scheme, this option would result in the demolition of residential and commercial property to the west of the existing station and three residential blocks on the Regent's Park Estate. Additionally, the assessment identified that an extra residential block, Cartmel, would need to be removed due to the raising and associated extension of the Hampstead Road Bridge.

2.7.38 Most of the public open space at St James's Gardens would be within the land required permanently. The bus station would extend across most of the north-east part of Euston Square Gardens, but would not affect the war memorial or lodges.

2.7.39 This option would avoid significant excavation because the tracks would be at existing ground level, which would yield a cost saving over the January 2012 announced scheme and simplify construction.

2.7.40 The appraisal assumed that the Grade II* listed 1923 annex to 1-9 Melton Street would need to be demolished.

2.7.41 This option was rejected because it would require the demolition of more dwellings than any other option as well as requiring bridges to the north of the station to be raised creating permanent visual effects.

Slide platforms southwards

2.7.42 The same platform arrangement as the January 2012 announced scheme would be built but the whole station would be moved south, extending into Euston Square Gardens. Platforms would be below existing ground level allowing a combined high speed and classic station concourse to be built at existing ground level.

2.7.43 As with the Proposed Scheme, this option would result in demolition of residential and commercial property to the west of the existing station and three residential blocks on the Regent's Park Estate and widening of the station approach tracks.

2.7.44 Most of the public open space at St James's Gardens would be within the land required permanently. Sliding the station southwards would simplify railway design in the station approach, but the station footprint would take all of Euston Square Gardens.

2.7.45 The volume of excavated material created by this option was estimated to be greater than the January 2012 announced scheme.

2.7.46 This option would require demolition of the Grade II* listed 1-9 Melton Street, including the 1923 annex.

2.7.47 This option was rejected because there would be no transport or operational benefits over the Proposed Scheme and it would create substantially greater adverse environmental effects.

Station approach

2.7.48 Design and environmental assessments have been undertaken on key elements in the station approach, in particular the construction requirements at Parkway and Park Village East and the layout and design of the replacement Hampstead Road and Granby Terrace Bridges. These have resulted, in particular, in reductions in the adverse environmental effects during construction and in the permanent land requirements, visual and cultural heritage effects at these locations.

3 Agriculture, forestry and soils

3.1.1 This environmental topic has been scoped out of the assessment for CFA1 as there are no agricultural or forestry activities affected by the Proposed Scheme in this urban area.

4 Air quality

4.1 Introduction

4.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme, covering nitrogen dioxide (NO_2), fine particulate matter[27] (PM10 and PM2.5) 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 road traffic and the operation of combustion plant. The road traffic emissions will arise mainly from temporary and permanent road closures and diversions during the construction phase, as well as during operation when the surrounding road network will be permanently altered. In addition, dust emissions will arise from construction activities, which include demolition, site preparation works, construction of the station and tunnel portal and the movement of machinery and vehicles 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:

- Volume 5: Appendix AQ-001-001;
- Map AQ-01-001 (Volume 5, Air Quality Map Book); and
- Map AQ-02-001-01 (Volume 5, Air Quality Map Book).

4.1.4 Maps showing the location of the key environmental features can be found in Maps CT-10-001 to CT-10-003a (Volume 2 CFA 1 Map Book).

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the air quality assessment are set out in Volume 1, the SMR (Appendix CT-001-000/1), the SMR Addendum (Appendix CT-0001-000/2) and appendices presented in Volume 5: Appendix AQ-001-001. 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 may occur from construction activities, from changes in the nature of traffic during construction and operations 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)[28]. 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

[27] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 micrometres in diameter.
[28] IAQM (2012), Guidance on the assessment of the impacts of construction on air quality and the determination of their significance.

properties is small, e.g. fewer than 10 within 20m of dust generating activities. Thus, a single property very close to a construction site cannot experience a 'significant effect' as defined by this methodology. The assessment presented here reaches a conclusion that incorporates this concept of significance being dependent on the number of receptors 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 is based on an estimate of the average daily flows in the peak month during 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.

4.2.5 Heating and hot water at Euston station will be provided by boilers fired by natural gas and the peak boiler load is estimated at 3,800kW. Multiple boilers (up to four, including a standby boiler) will be used to meet this load in order to provide resilience. The main boiler room will be located on the service deck. The height of boiler flues has been estimated at 3m above the adjacent station roof with the flues positioned a sufficient distance from higher roof structures for the purposes of this assessment.

4.3 Environmental baseline

Existing baseline

4.3.1 The environmental baseline reported in this section represents the environmental conditions identified within the study area. The main source of existing air pollution in the area is emissions from road traffic, as is the case for nearly all parts of London. Concentrations of road traffic-related pollutants are highest in central London. At places very close to roads where traffic flows are high, the airborne concentrations of the main pollutants are elevated substantially when compared to the 'urban background', as exemplified by locations near Euston Road.

4.3.2 Estimates for NO2, PM10 and PM2.5 concentrations have been obtained from London-wide modelled pollution maps[29] for 2008 and 2011, published by the GLA in 2010. The 2011 map has been used to characterise the baseline air quality in London, in addition to monitoring data and the background concentration maps[30] produced nationally by Defra, that have been used in the assessment on other parts of the route outside London. The GLA maps reflect concentrations at all locations, including at the roadside, whereas the Defra national maps are background concentrations and do not include the effects of individual roads. It is therefore considered that the GLA maps

[29] Greater London Authority (2008), London Atmospheric Emissions Inventory 2008, http://data.london.gov.uk/laei-2008 Accessed July 2013.
[30] Defra (2010), *Based Background Maps for NOx, NO2, PM10 and PM2.5*, http://laqm.defra.gov.uk/maps/maps2010.html Accessed July 2013.

provide a more accurate spatial indication of baseline conditions at a local level in this area, although they do not project beyond 2015.

4.3.3 The Euston area lies in the south-east of the LBC. The City of Westminster is close to the study area boundary. The area already experiences high levels of road traffic that make a significant contribution to air pollution. There are several air quality monitors close to the study area.

4.3.4 Monitoring in the vicinity indicates that many parts of the Euston area currently experience long-term and short-term average concentrations[31] of NO_2 that are above air quality standards, especially in close proximity to major roads. Monitoring and mapping data indicate that air quality standards for daily mean PM10 have been exceeded in recent years. Annual average PM10 and PM2.5 concentrations currently meet the standard. Background map and monitoring data are shown in Volume 5: Appendix AQ-001-001.

4.3.5 Whole borough Air Quality Management Areas (AQMAs) have been designated by LBC and the WCC, as a result of NO_2 and PM10 concentrations being in excess of the air quality standards for the annual and daily average respectively.

4.3.6 There are many receptors in the study area given its urban nature and the proximity of many residential properties and commercial premises to construction sites and roads where traffic flows will change (see Map AQ-01-001 and AQ-01-002, Volume 5, Air Quality Map Book). There are no receptors with statutory ecological designations within this study area.

Future baseline

4.3.7 Volume 5, Appendix CT-004-000 identifies developments with planning permission or sites allocated in adopted development plans, on or close to the Proposed Scheme. 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)

4.3.8 Future background pollutant concentrations have been sourced from Defra background maps[30] for 2017. Defra background maps predict NO_2 and PM10 concentrations in 2017 to be lower than in the 2012 baseline.

Operation (2026)

4.3.9 Future background pollutant concentrations have been sourced from Defra background maps[30] for 2026, which predict NO_2 and PM10 concentrations in 2026 to be lower than in the 2012 baseline.

[31] Long-term concentrations are usually described by the annual average concentration. Short-term concentrations refer to those which are measured as daily or hourly averages and for which air quality standards refer to peak concentrations.

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 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 will also make provision for the preparation of a local environmental management plan that 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 will be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of modern and efficient water spray systems on demolition sites to dampen down fugitive dust, given that demolitions will occur over a wide area and will be in close proximity to receptors;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors; and
- using enclosures to contain dust emitted from construction activities.

Assessment of impacts and effects

Temporary effects

4.4.3 Impacts from the construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for human receptors sensitive to dust and exposure to NO_2 and PM_{10}.

4.4.4 An assessment of construction traffic emissions has also been undertaken for two sets of 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 Euston area, demolition and construction sites at and around the station and approach will give rise to dust emissions. Excavation and earthworks will be sources of dust, as will vehicle movements within the sites. Movement of vehicles off site has the potential to transfer dust and/or mud onto local road surfaces.

4.4.6 Given the mitigation contained within the draft CoCP, the assessment of impacts arising from the dust emissions has concluded that these will be slight adverse or negligible in magnitude and that the effect on receptors will not be significant. The basis for this conclusion can be found in Volume 5: Appendix AQ-001-001 where the scale of dust emissions and their proximity to receptors is fully described.

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 through changes to traffic patterns arising from temporary road diversions.

4.4.8 Examination of the peak changes in traffic flows for scenarios in 2017 to 2021 along the affected roads has identified some roads that meet the criteria for a more detailed assessment, as set out in the SMR.

4.4.9 The assessment identified a number of receptors where there may be moderate or substantial air quality impacts from traffic during the construction phase. In some cases these are beneficial and lead to a decrease in air pollution at those receptors, but in others these are adverse impacts.

4.4.10 The main traffic impacts in the area arise from construction traffic, road closures and diversions. Vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, and removal of excavated materials. For NO_2, the moderate or substantial beneficial impacts result from the permanent closure of Gordon Street and Melton Street to vehicles, and are at properties located at:

- Guilford Street, close to Russell Square;
- Melton Street, between Drummond Street and Euston Street;
- the corner of Southampton Row and Vernon Place;
- the junction of Woburn Place and Bernard Street;
- the junction of Gordon Square and Byng Place; and
- the junction of Southampton Row and Bloomsbury Place.

4.4.11 For NO_2, there will be some receptors along the affected roads where impacts are predicted to be moderate or substantial adverse, given the magnitude of change and the fact that the air quality standard is exceeded at these locations without the Proposed Scheme. These impacts are predicted based on several conservative assumptions including; 2017 emissions; the peak flows in the construction programme and that these flows are constant over the assessment period. The main movement of excavated material is expected to last for just over one year, between 2018 and 2019. Works affecting the A400 Hampstead Road result in diversion of traffic to Eversholt Street between 2017 and 2022.

4.4.12 Temporary NO_2 impacts during the construction phase are predicted to be moderate or substantial adverse at receptors on three routes or areas: on or near Eversholt Street on the east side of Euston station (resulting mainly from traffic diversions); on Euston Road/Grays Inn Road (an access route for construction traffic from the east), and on the route taken by vehicles removing the material excavated from Euston (A400 Hampstead Road/Euston Road/A5 Edgware Road/A5205 St Johns Wood

Road/A41 Wellington Road). The receptors experiencing substantial adverse impacts are on:

- A4200 Eversholt Street;
- Ampthill Square;
- A501 Euston Road, close to the junction with Eversholt Street;
- A400 Hampstead Road, south of William Road; and
- A501 Euston Road, close to the junction with Chalton Street.

4.4.13 The receptors where temporary construction impacts are predicted to be moderate adverse are on:

- Upper Woburn Place;
- Euston Square adjoining Eversholt Street;
- Ampthill Square (backing onto Eversholt Street);
- Aldenham Street (adjoining Eversholt Street); and
- Polygon Road (adjoining Eversholt Street).

4.4.14 And north of Euston on:

- Arlington Road (resulting from Chalk Farm Road Bridge closure);
- Mornington Street;
- Drummond Crescent; and
- Ossulston Street;

and along the A501 Euston Road:

- between Gordon Street and Gray's Inn road;
- on Gray's Inn Road, north of Swinton Street;
- on North Gower Street, south of Drummond Street;

and associated with the movement of excavated material on:

- A5 Edgware Road, between Marylebone Flyover and St John's Wood Road;
- St John's Wood Road; and
- A41 Wellington Road.

4.4.15 PM10 impacts (in relation to the 24-hour standard) during the construction period are predicted to be substantial adverse on the A501 Euston Road, between Upper Woburn Place and Chalton Street, and moderate adverse along Gordon Street and Chalton Street, and on the A501/A5200 Gray's Inn Road, between King's Cross Bridge and Birkenhead Street.

4.4.16 The NO2 and PM10 impacts, as described above, will give rise to significant effects, both beneficial and adverse. These effects will be limited to the duration of peak traffic flows and are limited in their spatial extent to locations close to the roadside.

Permanent effects

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

Cumulative effects

4.4.18 The data used for the air quality assessment take account of predicted changes in traffic, which are derived from a combination of regional traffic growth factors and consideration of major locally consented schemes, as described in Section 12. In this way, the assessment accounts for cumulative effects.

Other mitigation measures

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

Summary of likely significant residual effects

4.4.20 The methods outlined within the draft CoCP, including the use of water spray systems for demolition, to control and manage potential air quality effects are considered effective in this location and no significant residual effects are considered likely from dust emissions. The additional traffic and changes in traffic flows caused by diversions will have significant effects, both beneficial and adverse.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No specific mitigation measures are proposed during operation in relation to the air quality effects in the Euston area. However, improvements in the accessibility of the station, better pedestrian links, the provision of additional cycle parking and other design measures aimed at creating greener transport infrastructure are likely to generate air quality benefits. In addition, receptors along some roads will experience improvements in air quality as a result of permanent closure.

Assessment of impacts and effects

4.5.2 Impacts from the operation of the Proposed Scheme will relate to changes in the volume, composition, distribution of road traffic and from boiler emissions in the station. There are no direct atmospheric emissions from the operation of trains that will cause an impact on air quality and these have therefore not been assessed.

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 Euston area have been screened to identify roads that required a detailed assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2026.

4.5.5 Some roads are predicted to have sufficiently large changes in traffic flows to meet these criteria for more detailed assessment. Further details of this assessment are provided in Volume 5: Appendix AQ-001-001. The assessment identified one receptor on Euston Road, close to Upper Woburn Place, one receptor on Upper Woburn Place, close to Euston Road, and one receptor at the junction of Euston Square and Grafton Place, where there may be moderate adverse NO_2 impacts from traffic during the operational phase. There are two locations on Euston Road, close to Gordon Street, where there may be moderate or substantial beneficial NO_2 impacts. These effects result from the redistribution of traffic arising from the permanent closure of Gordon Street to through traffic.

4.5.6 The NO_2 impacts described above will give rise to significant effects. These are both beneficial and adverse and are limited in spatial extent, i.e. confined to roadside locations.

4.5.7 PM10 impacts are predicted to be negligible at receptors in the study area during the operational phase.

4.5.8 The assessment of stationary sources has shown that the future station boilers are likely to cause only a small increase in concentrations of NO_2 and negligible impacts, which will not be significant. Assessment has shown that proposed flue heights of boilers will be of sufficient height to ensure effective dispersion.

Cumulative effects

4.5.9 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

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

Summary of likely significant residual effects

4.5.11 Significant residual effects, both beneficial and adverse, are anticipated for air quality in the area from the operation of the Proposed Scheme, in respect of NO_2 concentrations at Euston Road and Upper Woburn Place near Euston station. Whilst these effects are residual, they should be seen in the context of future improvements in background air quality brought about by continued reductions in vehicle emissions, which are expected to reduce NO_2 concentrations beyond 2026.

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 relating to the community for this study area comprise:

- impacts on the amenity of residential properties during construction: in Regent's Park Estate, Cobourg Street, Starcross Street; near the Ampthill Square Estate and at St Richard's House, Eversholt Street; in Park Village East and Mornington Terrace and Mornington Crescent;
- demolition of residential properties on the Regent's Park Estate, Cobourg Street, Euston Street and Melton Street;
- demolition of the Old Tenants Hall and Wolfson House;
- permanent loss of open space and play areas during construction;
- temporary loss of use of Euston Square Gardens; and
- temporary closure of vehicular access to residential properties on Park Village East.

5.1.3 Further details of the community assessments and write-ups of open space surveys and surveys of footpaths used by the public, undertaken within the CFA, are contained in Volume 5: Appendix CM-001-001.

5.1.4 Significantly affected community resources are shown in Maps CM-01-001 to CM-01-004a (Volume 5, Community Map Books).

5.1.5 The current assessment draws upon information gathered from local and regional sources including: LBC, UCL and Maria Fidelis Convent School.

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 Due to the large number and relatively high density of cafes, restaurants and public houses in the study area, impacts on these resources are only considered where the nearest alternative resources are over 1km away.

5.3 Environmental baseline

Existing baseline

5.3.1 Baseline data on community resources was collected up to 500m from the centre line of the Proposed Scheme and, additionally, for 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 routeing of construction traffic and takes account of catchment areas for community facilities, which could be affected where crossed by the Proposed Scheme.

5.3.3 The area is urban and is characterised by a mixture of housing estates, offices and buildings associated with UCL centred on Euston station. It is a major transport interchange and a terminus for intercity and local trains. The station is served by the West Coast Main Line (WCML) as well as two London Underground lines. These are the Victoria line and the Northern line (Charing Cross and Bank branches). Euston Square underground station is about 300m from Euston station, west along Euston Road. There is a bus station served by 12 bus routes south of the main entrance to Euston station. The station contains restaurants, cafes and shops. The A501 Euston Road is the main road in the area. The King's Cross Growth Area is located to the east of Euston station where major redevelopment is underway for new homes, offices and retail outlets.

5.3.4 This study area includes: the area to the south and west of the existing Euston station; the area to the east of the existing Euston station; and the area north of Granby Terrace.

Area south and west of the existing Euston station

5.3.5 The area west of Euston station between the station and Regent's Park is characterised by a mixed business and residential community. The western portion of the area is the mainly residential Regent's Park Estate, while buildings associated with UCL characterise the area to the south-west and south of the station. Many of the buildings in the area are medium to high rise blocks. There are also shops and restaurants on Drummond Street and the Surma Centre on Robert Street, which provides a focus for the local Bangladeshi community. The Shahjalah Jame Masjid Mosque is located on North Gower Street.

5.3.6 The area surrounding the station is well known for its mix of restaurants and shops and is frequented by local people and station users. There are community facilities in the area including shops, public houses, places of worship, health facilities and other services.

5.3.7 Regent's Park Estate is a housing estate with a mixture of social and private housing. The estate has community facilities such as the Old Tenants Hall on Harrington Street and the Samuel Lithgow Youth Centre on Stanhope Street. There are also areas of open space within the Regent's Park Estate including Hampstead Road Open Space and Eskdale play area.

5.3.8 The Maria Fidelis Convent School serves a large catchment and is split across two campuses: the lower school and the upper school. The lower school is located on North Gower Street to the west of Euston station. The upper school is on Phoenix Road to the east of the station. The lower school is located about 1km from the upper school and it is a 10-15 minute walk between the two campuses.

5.3.9 Other education facilities in the area include: Netley Primary School; Christchurch Church of England Primary School on Redhill Street and the Regent's Park Children's Centre. Dr Williams's Library (Congregational Library) is also located on Gordon Square, south of the Euston Road. Furthermore, UCL owns several buildings to the south-west and south of Euston station, including Wolfson House on Stephenson Way. UCL also has short-term leases on other buildings, such as 132-140 Hampstead Road.

5.3.10 Euston Square Gardens are located in front of Euston station, split into two areas separated by the access to the bus station. In addition, St James's Gardens on Cardington Street, west of Euston station, is a public open space located between the National Temperance Hospital and Maria Fidelis Convent (Lower) School.

Area east of Euston station

5.3.11 The area east of Euston station, within Somers Town, is characterised by blocks of social housing, including the high rise Ampthill Square Estate, interspersed with community facilities including places of worship, schools, shops, public houses, the British Library, youth and community centres, health care facilities and open space such as Harrington Square and a playground off Lancing Street. Schools in the area include: Maria Fidelis Convent (Upper) School; St Aloysius' Infant and Junior Schools on Phoenix Road; Regent High School on Charrington Street and St Mary and St Pancras Church of England Primary School on Werrington Street.

Area north of Granby Terrace

5.3.12 The area north of Granby Terrace is a residential area characterised by Georgian terraced housing known as Park Village. It is bordered to the west by Albany Street and to the east by the existing railway. There are few community facilities in the area apart from the Cumberland Market Tenants Hall located off Park Village East.

Future baseline

Construction (2017)

5.3.13 Volume 5: Appendix CT-004-000 provides details of the developments that are assumed to have been implemented by the start of the main construction and any that are likely to be built at the same time as the Proposed Scheme. These developments may introduce new residents and community facilities to the study area and may therefore be impacted by the construction and operation of the Proposed Scheme.

5.3.14 Netley Primary School on William Road (Committed development CFA1/12) is likely to be implemented before 2017 and is the only committed development relevant to the community assessment. It involves the remodelling of the school with new specialist education facilities, 80 residential units and public realm improvements.

Operation (2026)

5.3.15 The review of future baseline conditions has not identified any additional committed developments, within the study area, which are likely have been completed by the year of operation.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Areas of public open space and replacement play areas in the proposed open space north of Langdale have been incorporated into the Proposed Scheme design as part of the design development process to avoid or minimise the adverse environmental impacts created during the construction phase. This area includes the area currently occupied by Eskdale play space and part of the area currently occupied by Hampstead Road open space.

5.4.2 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):

- 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 public rights of way for pedestrians and cyclists 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);
- measures to be implemented to reduce construction traffic impacts or impacts associated with parking on residential streets (draft CoCP, Section 14); and
- where practicable, the avoidance of large goods vehicles operating adjacent to schools during drop off and pick up periods (draft CoCP, Section 14).

Assessment of impacts and effects

5.4.3 Details of all assessments of community resources are included in Volume 5: Appendix CM-001-001. These explain the rationale for determining the rating for sensitivity of the affected community resource, magnitude of impact and the assessment of significance.

5.4.4 A number of temporary and permanent utility diversions are proposed in locations described in Section 2 and these have been assessed within the constraints of the available information. Reasonable assumptions have been made, for instance the assessment has assumed that where multiple diversions will occur in the same area the works will be combined to minimise disturbance.

5.4.5 Access rights over land are also required but will not result in loss of land from any properties in this area.

Area south and west of the existing Euston station

Temporary effects

Residential property

5.4.6 The programme to construct the Proposed Scheme at Euston, re-construct Hampstead Road Bridge and the use of the Granby Terrace Bridge satellite compound will take place over an 11 year period. As a result, residential properties in Regent's Park Estate (east of Augustus Street) are predicted to experience in-combination effects during the construction period. These will affect the residential blocks of Langdale, Cartmel, Coniston, The Tarns and Augustus House. The combined effects will be significant construction noise and visual effects. This is considered to affect approximately 250 residential properties in this area. The combination of these effects, which are expected to coincide for up to four years, will result in a major adverse effect on the amenity of residents, which is considered significant.

5.4.7 The programme to extend and refurbish Euston station (including undertaking utility works in the surrounding area) will be coordinated from the National Temperance Hospital main compound and will take place over an 11 year period. As a result, nearby residential properties (10-20) at the northern end of Cobourg Street and at the eastern end of Starcross Street, are predicted to experience a combination of significant noise and visual effects. The combination of these effects, which are expected to coincide for between two and a half and three years, will result in a major adverse effect on the amenity of residents, which is considered significant.

5.4.8 The increase in construction traffic associated with construction activity around Euston station will create in-combination effects on A400 Hampstead Road (between William Road and Euston Road). A significant increase in HGV movements and a significant air quality effect will result in a significant in-combination effect. Section 12 provides information on the likely durations of construction traffic impacts. The combination of these effects will result in a major adverse, and therefore significant, effect on the amenity of residents along this section of road.

5.4.9 The increase in construction traffic will also create in-combination effects on sections of Stanhope Street, Robert Street and Albany Street. A significant increase in HGV movements and the associated indirect significant noise effects will result in a significant in-combination effect. The combination of these effects will result in a major adverse effect on the amenity of residents along these sections of road, which is significant.

Community facilities

5.4.10 Utility works in part of the grounds of Maria Fidelis Convent (Lower) School are expected to take a maximum of three months to complete. However, the nature and location of these utility works, considered alone, means that the impacts will not result in a significant effect.

5.4.11 The school is based on two sites and lesson timetabling seeks to reduce the need to move between sites. Only a small number of older pupils (based at the upper school) are required to use the facilities at the lower school. Teachers do move between the sites and the current preferred access route is across the front of the existing station. The construction works will disrupt and may extend the current route through Euston

station. Therefore, there may be a very small increase in journey times between the two sites, but this impact is not considered to result in a significant effect.

5.4.12 The construction works will border two sides of the Maria Fidelis Convent (Lower) School. The adjacent National Temperance Hospital construction compound will be used as the main construction site office for the Euston works and will be in use throughout the construction period.

5.4.13 Section 11 identifies significant noise effects that will affect the outside areas that the school uses for teaching, associated with utility works and demolitions and to a lesser extent retaining wall and bridge construction, occurring during the first three and a half years of construction. Section 11 also identifies the mitigation measures that will be put into place to reduce adverse noise impacts.

5.4.14 The assessment of amenity effects considers the combination of effects arising in other disciplines. There are predicted to be increased HGV movements on Robert Street (to the west of the lower school) although this is not expected to create a physical or psychological barrier that would influence activities at the school, as school's entrance is not on Robert Street. The visual and air quality assessments do not identify significant residual effects at this location. Therefore, no significant in-combination effects on the staff and pupils at the school have been identified in this assessment.

5.4.15 There are not considered to be any significant effects on Netley Primary School or Regent's Park Children's Centre.

5.4.16 There are not considered to be any significant effects on the Surma Centre at Robert Street.

Open space

5.4.17 All of the western part of Euston Square Gardens will be required for 11 years during construction works. The eastern part will be required over a period of 11 years, although there will be approximately three years, from 2017 to 2020, when this part of the gardens will not be required and will be returned to its existing use. Euston Square Gardens is an area of open space used by commuters, the local workforce and residents. Its location means that it is one of the most heavily used open spaces in LBC. Some of the existing mature trees will be retained and the gardens will be reinstated after construction. The complete loss of the western gardens for the construction period and the loss of the eastern gardens for the majority of the construction period will have a major adverse effect on the community and will be significant.

Cumulative effects

5.4.18 No significant temporary cumulative effects have been identified.

Permanent effects

Residential property

5.4.19 The construction works for the expansion and remodelling of Euston station and widening of the station approach will require the demolition of 214 dwellings, most of which are social rented housing on the Regent's Park Estate. These are in three

medium rise blocks: Silverdale (69 dwellings), Eskdale (60 dwellings) and Ainsdale (39 dwellings). In addition, Stalbridge House (20 private dwellings) will be demolished. The loss of these dwellings from the housing stock, particularly social rented housing, and the impacts on the people that they house will be a major adverse effect on the local community and will be significant.

5.4.20 The community immediately west of the existing station will also be affected by demolitions of residential property. The properties to be demolished are listed in Section 2 and include properties at Cobourg Street (18 dwellings), Euston Street (five dwellings) and Melton Street (three dwellings). Collectively, the loss of these residential properties will result in a major adverse effect and will be significant.

Community facilities

5.4.21 Widening of the railway cutting to accommodate the Proposed Scheme will require the demolition of the Old Tenants Hall off Harrington Street, located between the Silverdale and Ainsdale on the Regent's Park Estate. The hall is used for tenants' association meetings and a community motorcycle project, but its primary use is as home to the Silverdale Motorcycle Project. The project is focused on motorbike riding, maintenance and road safety and is aimed at 13-19 year olds. Run by Camden Council, the project is used by 'at risk' young people who are going through the youth justice system (reparation) or by direct referrals from social services or education institutions. The project also provides outreach services in the Regent's Park Estate and has links with the local community centres. No similar projects operate nearby and there is demand from across Camden and other London boroughs. In addition, no suitable premises for relocation have been identified at this time. The loss of this hall will have a major adverse effect on the community and will be significant.

5.4.22 UCL operate two educational facilities that will be demolished to construct the Proposed Scheme: 132-140 Hampstead Road and Wolfson House (4 Stephenson Way). UCL has recently taken a short-term lease of 132-140 Hampstead Road for use as temporary teaching facilities, while another building is redeveloped. UCL is aware that this latter building will be demolished to make way for the Proposed Scheme and that alternative arrangements will be neccessary. As the proposed educational use for this building is for a temporary period only, the demolition of it is not considered to be a significant effect. In addition to on-site educational uses, Wolfson House provides technical support services for other UCL premises and plays an important role is supporting UCL's educational infrastructure. Therefore, the demolition of Wolfson House is considered to have a major adverse effect and is significant.

Open space

5.4.23 The loss of open space and play facilities to the south and west of Euston station will be for a period of 11 years. Although reprovision of facilities will occur, following completion of construction, the effects have been considered to be permanent, because of the long duration of the deficit of provision.

5.4.24 The area currently occupied by St James's Gardens will form a new northern entrance and forecourt to Euston station. As part of this, there will be open space and trees to the north of Maria Fidelis Convent (Lower) School. The majority of the local features of St James's Gardens will be reprovided after construction on a site in the north-east of the Regent's Park Estate: the proposed open space north of Langdale (see Map

CT-06-001, Volume 2 CFA1 Map Book). This could include a multi-use games area, children's play area, landscaped areas and benches. The new areas of open space are further north than the original St James's Gardens but will remain accessible to residents in Regent's Park Estate. Although the reprovided open space north of Langdale is smaller than the total area lost from St James's Gardens, the main community facilities such as the multi-use games area and playground will be incorporated. The impact of the loss of these facilities is considered to be a major adverse effect and is significant.

5.4.25 Hampstead Road Open Space is located on the west side of Hampstead Road, to the south of Silverdale. The area contains a children's playground, benches and a lawn area and is on land required to construct and operate the Proposed Scheme. Although the users of this resource are mostly those living in adjacent residential blocks that will be demolished, there is still likely to be a demand for this open space and play area as there are limited nearby alternatives. The children's playground will be reprovided in the proposed open space north of Langdale. The loss of the Eskdale play area is a major adverse effect on the community and is significant.

5.4.26 The nearby Eskdale play area also lies on land required to construct and operate the Proposed Scheme. This is a children's playground and green space between the residential blocks of Eskdale and Langdale in the Regent's Park Estate (between Stanhope Street and Harrington Street). The playground has children's climbing frames and swings, is surrounded by mature trees and has several benches. The playground and open space serves the people living in the surrounding residential blocks. There are no other similar areas in the northern part of the estate. The loss of this resource will result in a major adverse effect on the community and is significant.

Cumulative effects

5.4.27 From a community-wide perspective, the combination of residential demolitions, changes to residential amenity, loss of community facilities and open space is considered to have an effect on the residential community of Regent's Park Estate. The community will experience disruption during the construction period, and the permanent relocation of residents from the area is expected to change how the community functions, for example, changing the demand for the remaining community resources and local businesses.

Area east of Euston station

Temporary effects

Residential properties

5.4.28 The construction activity to replace Hampstead Road bridge and the use of the A400 Hampstead Road overbridge satellite compounds (north and south) and utility works will take place over a six year period. As a result, residential properties on the Ampthill Square Estate are predicted to experience in-combination effects during the construction period. The in-combination effects are significant construction noise, air quality and visual effects. This is considered to affect approximately 130 residential properties in this area. The combination of these effects, which will coincide for approximately three years, will result in a major adverse effect on the amenity of residents and is considered significant.

5.4.29 The construction activity at the eastern edge of Euston station, the Royal Mail NW1 delivery office satellite compound and utility works will result in in-combination effects for residents at dwellings (approximately 60) properties at St Richard's House on Eversholt Street. The in-combination effects are significant construction noise and visual effects. There is also predicted to be an increase in HGV movements in this location and deterioration in air quality. The combination of these effects, which will coincide for approximately six months, will result in a major adverse effect on the amenity of residents and is considered significant.

5.4.30 At other locations along Eversholt Street, between Euston Road and Barnby Street, there is predicted to be significant increases in HGV movements and associated significant noise air quality effects. This will create in-combination effects for the residents of properties along this stretch of road. Section 12 provides information on the likely durations of construction traffic impacts. This will result in a major adverse effect on the amenity of residents, which is significant. Section 11, Sound, Noise and Vibration, provides information on the residential and non-residential receptors.

Community infrastructure

5.4.31 The Lancing Street satellite compound is needed for a compensation grouting shaft. The construction site will use the width of the road, excluding the footways and land to the east. This area of land is a children's playground, to the north of Wellesley House, and could be required for up to six years. The playground serves the surrounding residential blocks and there are few alternatives nearby. The loss of the playground will result in a major adverse effect and is significant.

5.4.32 There are utility works planned for Phoenix Road. These are not predicted to result in a significant effect on Maria Fidelis Convent (Upper) School or St Aloysius' Infant and Junior schools which are located on this road. In addition, there are no impacts predicted on St Mary and St Pancras Church of England Primary School on Werrington Street that will result in a significant effect on the community.

Permanent effects

5.4.33 No significant permanent effects have been identified.

Cumulative effects

5.4.34 No significant temporary or permanent cumulative effects have been identified.

Area north of Granby Terrace

Temporary effects

Residential properties

5.4.35 Construction will require the demolition and replacement of a deep retaining wall on the west side of the railway approach at Park Village East. The existing retaining wall between Park Village East and the railway has suffered over time from movement and damage. The construction of a new retaining wall will also help to address some historical subsidence issues. Construction at Park Village East will require the temporary phased closure of vehicular access to properties between numbers 16 and 36 Park Village East. Emergency access will be maintained. The provisions in the draft CoCP associated with parking on residential streets will reduce the impacts associated

with a temporary loss of parking. During the closure periods, residents and the Crown Estate, which is the freeholder, will only be able to access the affected properties on foot. The disruption to Park Village East will extend over a four year period but vehicular access to individual properties will only be restricted for a period of up to 12 months during the principal works to the retaining wall structures. The demolition and replacement of Mornington Street Bridge will also mean that residents will not be able to gain vehicular access to and from the east, while those works are in progress. There will be continuing discussion with residents in Park Village East in order to identify ways to reduce the impacts of these works. The access restrictions for residents and the duration of the construction works are considered to result in a major adverse isolation effect on the local community and are significant.

5.4.36 The residents of Park Village East are predicted to experience in-combination effects during the construction period. The in-combination effects are significant construction noise and visual effects. This is considered to affect over 50 residential properties in this area. The combination of these effects, which will coincide for approximately two years, will result in a major adverse effect on the amenity of residents, which is considered significant.

5.4.37 Residents at Mornington Crescent (approximately 25 properties) are predicted to experience in-combination effects from the demolition and reconstruction of Hampstead Road Bridge and Granby Terrace Bridge and the demolition of the carriage shed. The in-combination effects are significant construction noise and visual effects. The combination of these effects, which will coincide for approximately one year, will result in a major adverse effect on the amenity of residents, which is considered significant.

5.4.38 Residents at Mornington Terrace (approximately 90 properties) are predicted to experience in-combination effects from works on the retaining walls on either side of station approach. The in-combination effects are significant construction noise and visual effects. The combination of these effects, which will coincide for approximately four months, will result in a major adverse effect on the amenity of residents, which is considered significant.

5.4.39 The increase in construction traffic associated with construction activity around Euston station will create in-combination effects at A41 Wellington Road (between Circus Road and Wellington Place), and A5205 St John's Wood Road (between Edgware Road and Hamilton Terrace). The in-combination effects are significant increase in HGV movements and significant air quality effects. Section 12 provides information on the likely durations of construction traffic impacts. The combination of these effects will result in a major adverse effect on the amenity of residents along these sections of road, which is considered significant.

Cumulative effects

5.4.40 From a community-wide perspective, residents at Park Village East are expected to experience multiple significant effects, with construction activity restricting access for some properties and combined effects resulting in a change in amenity for a wider group of residents.

Permanent effects

5.4.41 No permanent significant impacts have been identified.

Cumulative effects

5.4.42 No significant permanent cumulative effects have been identified.

Other mitigation measures

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

5.4.44 HS2 Ltd is seeking to reach agreements with LBC and liaise with residents and other stakeholders to develop the measures proposed to mitigate or offset a number of the significant effects arising during construction. Some of these measures are described in the following paragraphs.

5.4.45 In addition to the re-provision of open space that forms part of the design of the Proposed Scheme, HS2 Ltd and LBC intend to improve existing public open spaces within Regent's Park Estate in order to mitigate the permanent loss of open space at St James's Gardens, Hampstead Road Open Space and the Eskdale Play Area. Areas identified include Cumberland Market, Munster Square, Clarence Gardens, Hope Gardens and Tolmers Square. At these sites, the playground equipment lost as a result of construction of the Proposed Scheme will be replaced, the multi-use games area will be reprovided at Cumberland Market along with an 'eco-gym' and improvement schemes will be implemented. There are few opportunities to create new open space in Regent's Park Estate. However, there may be opportunities to bring existing open spaces into the public realm, such as the space at the junction of Stanhope Street and Robert Street. In addition, appropriate measures for wayfinding from Regent's Park Estate to Regent's Park will be provided.

5.4.46 HS2 Ltd proposes to relocate the playground equipment at Wellesley House, Lancing Street, to an adjacent area of vacant land (just to the north of the existing playground), outside the land required for construction of the Proposed Scheme.

5.4.47 HS2 Ltd will continue to work with LBC, the owners of the Old Tenants Hall at Silverdale, to help identify suitable alternative land or premises and to facilitate its re-provision.

5.4.48 The Secretary of State for Transport is working in partnership with LBC on the replacement of the social rented housing that will be lost. Where reasonably practicable, this will be in the Euston area and with individual tenants moving only once. Options for the provision of replacement social rented housing continue to be developed with LBC. This could include both the provision of new purpose-built housing and the provision of alternative existing housing, which would be owned and managed by the council. LBC has consulted the local community on potential sites for replacement homes on the Regent's Park Estate. Funding for replacement social rented housing will be made available by the Government. Other homeowners will be compensated for the compulsory acquisition of their property interests in accordance with the National Compensation Code.

5.4.49 HS2 Ltd will continue to work with Maria Fidelis Convent School and LBC to assist the school's plans to integrate their facilities onto a single site to the east of Euston station, as soon as is reasonably practicable.

Summary of likely significant residual effects

5.4.50 There will be a major adverse effect due to the demolition of 188 residential properties on Regent's Park Estate. Neighbouring residents not affected by demolitions will experience a change in their amenity. Also in Regent's Park Estate, the construction of the Proposed Scheme will permanently require land occupied by the Old Tenant's Hall, Hampstead Road open space and Eskdale Play area. St James's Gardens will also be required permanently although the facilities will be reprovided following construction.

5.4.51 Immediately to the west of Euston station, the construction of the Proposed Scheme will result in the demolition of 26 residential properties on Cobourg Street (18 dwellings), Euston Street (five dwellings) and Melton Street (three dwellings). The amenity of residents at the remaining properties at the corner of Cobourg Street and Starcross Street is predicted to be affected by nearby construction activity. In addition, the construction traffic on some sections of A400 Hampstead Road, Stanhope Street, Robert Street and Albany Street is predicted to affect the amenity of residents and some community facilities. The UCL premises at Wolfson House will be required permanently.

5.4.52 Euston Square Gardens will be affected throughout the construction period. The playground adjacent to Lancing Street will also be affected temporarily and the amenity of residents of St Richard's House, Eversholt Street, will also be affected. Other residential properties along Eversholt Street will also experience amenity effects.

5.4.53 To the north of Euston station, residents at Park Village East are predicted to experience temporary isolation and amenity effects. The amenity of residents at Mornington Terrace and Mornington Crescent will also be temporarily affected.

5.4.54 On the edge of the study area, the amenity of residents will be temporarily affected on sections of A41 Wellington Road and A5205 St John's Wood Road.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 The east west overbridge, which will provide a new pedestrian and cycle access between Eversholt Street on the east side of the railway cutting and Hampstead Road on the west side, has been incorporated into the scheme design. It will open in 2026 and will provide improved cycling and pedestrian links between communities on either side of the railway.

Assessment of effects

5.5.2 Residents in approximately 50 to 60 properties in the residential blocks of Coniston, Langdale and Augustus House on Regent's Park Estate are predicted to experience in-combination effects during the operation of the Proposed Scheme. The in-combination effects are operational noise and visual effects. The combination of

these effects will result in a major adverse effect on the amenity of residents, which is considered significant.

5.5.3 The scheme will support the delivery of the objectives set out in the draft Euston Area Plan (EAP) which identifies substantial capacity in the area to accommodate new housing, commercial and other development linked to existing public transport and future improvements, which will support 7,700 jobs. Further detail can be found in Section 10.

Cumulative effects

5.5.4 No significant cumulative effects have been identified.

Other mitigation measures

5.5.5 No other mitigation measures are proposed.

Summary of likely significant residual effects

The amenity of approximately 50 to 60 residential properties at Coniston, Langdale and Augustus House on the Regent's Park Estate will, despite the provision of vehicle safety barriers that will act as noise barriers and other measures, be affected permanently by views of and noise arising from the operation of the Proposed Scheme.

6 Cultural heritage

6.1 Introduction

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

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

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

- Appendix CH-001-001 – Baseline Report;
- Appendix CH-002-001 – Gazetteer of Heritage Assets; and
- Appendix CH-003-001 – Impact Assessment Table.

6.1.4 Throughout this section, assets within the study areas are identified with a unique reference code, EUSXXX; further detail on these assets can be found in the gazetteer in Volume 5: Appendix CH-002-001.

6.1.5 Engagement has been undertaken with the Greater London Archaeological Advisory Service and the English Heritage historic buildings advisor for London with regard to the nature of the cultural heritage assets within the local area. In addition, engagement has also been undertaken with: the LBC conservation officer; the conservation area advisory committees; the Camden Railway Heritage Trust and the Euston Arch Trust.

6.2 Scope, assumptions and limitations

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

6.2.2 The setting of all designated heritage assets within the zone of theoretical visibility (ZTV)[32] of the Proposed Scheme has been considered. The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out, is defined as the land required, temporarily or permanently, to construct the Proposed Scheme plus 250m. For the purposes of this assessment, any assets within the 10mm settlement contour[33] are included within the assessment.

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

6.2.4 In undertaking the assessment, a limitation was identified in that not all areas identified in the archaeological risk model[34] 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 subsurface archaeological assets. Information from other sources of data, including the Historic Environment Record and local archives was utilised to provide information relating to the potential archaeological assets that may be present.

6.3 Environmental baseline

Existing baseline

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

Designated assets

6.3.2 The following designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction of the Proposed Scheme (see CH-01-001 to CH-01-004a Volume 5, Cultural Heritage Map Book):

- one (group asset) Grade II* listed building: 2 – 16, 22 – 34, 36A and 36B Park Village East (EUS003);
- 19 Grade II listed buildings:
  - Euston Square railings, lodges and war memorial are within Euston Square Gardens (London square) (EUS004);
  - Southampton Monument, Christie Monument and drinking fountain in St James's Gardens (EUS014);
  - numbers 14-15 Melton Street (EUS027);

[32] The ZTV used for this purpose in Greater London was that used for the draft ES and shown on the map series CH – 02 in Volume 5. This covers, in places, a smaller area than the ZTV shown on the map series LV – 07 and LV – 08. It has been concluded that there are no designated assets in the areas outside the draft ES ZTV, the setting of which could be affected by the Proposed Scheme.
[33] The area in which ground settlement arising from tunnelling or other below ground work could be at least 10mm in depth.
[34] 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.

- Mornington Street Bridge stone piers, i.e. pillars and associated lamp posts, west and east ends of bridge (EUS017);
- the Robert Stephenson statue in Euston station forecourt (EUS035);
- Gloucester Gate bridge and statue/drinking fountain, and animal drinking trough opposite Regent's Park Barracks, the York and Albany public house, numbers 119-123 Parkway and number 125 Parkway are within the Regent's Estate area of Regent's Park (Camden) Conservation Area (EUS012);
- number 58 Mornington Crescent and animal drinking trough on Hampstead Road are within the Camden Town Conservation Area (EUS016);
- the Parkway Tunnel (also known as the Park Street Tunnel) and cutting (EUS037).

- one Grade I registered park and garden: Regent's Park (EUS002);
- three conservation areas: Camden Town (EUS016), Bloomsbury (EUS0022); and Regent's Park, Camden, which incorporates part of the Grade I Registered Park (EUS002) and Nash's planned urban area to the east of the park (EUS012); and
- three London squares: Euston Square (EUS004); Ampthill Square Gardens (EUS018); and Harrington Square (EUS016).

6.3.3 The following designated assets are located within the ZTV (see CT-10-001, Volume 2, CFA1 Map Book and CH-02-001 to CH-01-001-L1 Volume 5, Cultural Heritage Map Book):

- 13 Grade I listed buildings:
  - Chimps breeding colony/gorilla house, London Zoo (EUS001); numbers 2-11 Gloucester Gate, numbers 1-10 Cambridge Terrace, numbers 1-42 Chester Terrace, numbers 1-12 Chester Place, numbers 1-4 Cumberland Place, numbers 1-59 Cumberland Terrace and numbers 12-14 Gloucester Gate, are in the Regent's Estate area of Regent's Park (Camden) Conservation Area (EUS012);
  - St Pancras (New) Church (EUS015);
  - University Church of Christ King and British Museum, and King Edward VII galleries are within the Bloomsbury Conservation Area (EUS022);
  - St Pancras station and Midland Hotel (EUS033), and King's Cross station (EUS013) within the King's Cross St Pancras Conservation Area (EUS013);
- 25 Grade II* listed buildings:
  - Cumberland footbridge and Elephant and Rhinoceros Pavilion, London Zoo (EUS001);
  - St John's Lodge, within the registered park and garden of Regent's Park and the Regent's Park (Westminster) Conservation Area (within grouping EUS002);

  - number 1-19 Park Village West, St George's Greek Orthodox Cathedral, monument in St Katharine's Precinct, the Danish Church, numbers 4 and 5 St Katharine's Precinct, numbers 1-3 and 6-9 St Katharine's Precinct and number 15 Gloucester Gate within the Regent's Estate area of Regent's Park (Camden) Conservation Area (EUS012);
  - number 58 Grafton Way within the Fitzroy Square Conservation Area (EUS020); numbers 29-45 (and Connaught Hall) Tavistock Square; the war memorial at British Medical Association House, 1-9a Woburn Walk, 2-16 Dukes Road, the Senate House, Institute Education/Institute of Legal Studies Bedford Way, Philips Building School of Oriental and African Studies, Great Ormond Street Hospital Chapel, Church of St George the Martyr and Russell Hotel, Russell Square, are within the Bloomsbury Conservation Area (EUS022);
  - numbers 1-9 Melton Street (EUS030);
  - Euston Fire Station (EUS031);
  - Baker Street underground station in the Dorset Square Conservation Area (EUS032);
  - Lord's Cricket Ground Pavilion in the St John's Wood Conservation Area (EUS039);
- 172 Grade II listed buildings including:
  - 119-125 Parkway and the York and Albany public house in the Regent's Park Conservation Area (EUS012);
  - the Edinburgh Castle public house (now called Edinboro' Castle), nos. 26-56 Mornington Terrace in the Camden Town Conservation Area (EUS016)
- four conservation areas: Regent's Park, Westminster (western half of the registered park and garden Regent's Park (EUS002)); Fitzroy Square (EUS020); Dorset Square (EUS032); and St John's Wood (EUS041); and
- four London squares: Cartwright Gardens (EUS022), Tavistock Square (EUS022) and Gordon Square (EUS022); and Oakley Square (EUS016).

Non-designated assets

6.3.4 St James's Gardens, the site of an 18th to 19th century burial ground and the site of the adjacent St James's Chapel (EUS040), which is a non-designated asset of high value lies wholly within the land required, temporarily and permanently, for the construction of the Proposed Scheme.

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

- 1 and 3 Cobourg Street, a late 19th century stables and post depot associated with Euston station (EUS029);
- the former entrance to Euston underground station, corner of Melton Street and Drummond Street (EUS027);

- Mornington Street Bridge, late 19th century railway bridge (associated with Grade II listed bridge piers (EUS017));
- 1 Park Village East, a late 19th/early 20th century riding school (EUS003); and
- the St James's Gardens memorials and the National Temperance Hospital, and former print works (EUS014).

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

- the find spot for a ring set with a Solidus possibly of Theodosius II of late Roman/early medieval date (EUS010);
- Euston station, the site of a 19th century rail station and 1960s station concourse, platforms, parcels deck and power signal box, and the 1970s station forecourt buildings (EUS005);
- Granby Terrace, late 19th/early 20th century Euston station carriage shed (EUS038);
- Mornington Terrace, late 19th/early 20th century former carriage shed wall (part of group asset EUS036);
- the 1900-6 railway cutting retaining wall between Euston station to Parkway (part of group asset EUS036); and
- the London Underground lines and associated platforms and structures (for example Euston Square underground station and the Circle line (EUS0024).

6.3.7 All non-designated heritage assets within 250m of the land required, temporarily and permanently, for the construction of the Proposed Scheme are listed in the gazetteer in Volume 5: Appendix CH-002-001 and identified on Maps CH-01-001 to CH-01-004a in Volume 5, Cultural Heritage Map Book. These include a number of assets with upstanding remains, the setting of which have been considered, for example:

- Euston House, 1930s purpose-built office (EUS018);
- St Aloysius' Roman Catholic church and convent, Eversholt Street, 1960s church (EUS018);
- Eversholt Street, 19th century terrace (EUS018); and
- Wellcome Trust, Research Institute, 183 Euston Road, 1930s Greco style office block. Part of a grouped asset of Greco style buildings located within and around Euston Square Gardens (EUS004).

Cultural heritage overview

6.3.8 The British Geological Society data show that Euston station and approach are located on a solid geology of London Clay. At the southern end of Euston station there are surface deposits of Lynch Hill Gravel which were deposited during the Wolstonian interglacial period. Further details of the geology of the area are contained in Section 8.

6.3.9 The topography around Euston station is generally flat, with a steady sloping incline from the station north towards Primrose Hill. The area is bisected south-west to north-east by Hampstead Road, and Euston Road is located east-west to the front of Euston station.

6.3.10 Little of archaeological significance has been identified directly in the area of the Proposed Scheme prior to the late post-medieval period. This may in part be due to the London clay deposits being unsuitable for occupational activity, with much of the prehistoric and Roman activity being focused on the areas of gravel deposits further to the south (in Bloomsbury and the City of London). The extensive late post-medieval and modern urban development of the area may have also removed remains from these periods that may have been present.

6.3.11 A late Roman/early medieval ring set with a Solidus (coin) was recovered within the area of Euston station forecourt (EUS010). This however represents an isolated find and associated remains would have been extensively disturbed during the 19th/20th century development of the area.

6.3.12 Medieval settlement has been identified within the Euston study area at 'Totten Hall Court' (EUS011) to the west of Euston station by Hampstead Road and 'Rugmore' within the northern area of Regent's Park (EUS002).'Totten Hall Court' represents the site of a medieval manor, which was located in a rural area several miles to the north of the medieval settlement cores of Westminster and London. 'Rugmore' was the potential site of a medieval hamlet which may have been removed by the creation of the Royal 'Marylebone Park' (EUS002) in the early post-medieval period.

6.3.13 Historically, the study area was used as agricultural land until the later 18th century. Following the construction of 'New Road' (Euston Road) in 1756, the area saw significant urban development spreading from Bloomsbury (EUS022) to the south. Built partially by the Duke of Bedford's estate. These developments were speculative building aimed at the middle classes with grand terraces and garden squares, for example, Tavistock Garden Square and Gordon Garden Square (EUS022).

6.3.14 The study area is located in an area of London that saw extensive development during the 18th and 19th centuries. Development was particularly associated with the early development of the railway, including the creation of the major railway terminus of Euston station (EUS005).

6.3.15 St James's burial ground (now known as St James's Gardens) was leased from Lord Southampton in 1789 and used as a burial ground until 1853 (EUS14, EUS040). The Chapel of St James's was constructed adjacent to the burial ground in 1791. In 1886, the north-eastern portion of the burial ground was sold for the expansion of Euston station. Complete burials were removed in advance of the station construction works but partial remains may have survived until the redevelopment of the station in the 1960s.The land around the chapel was sold to The Temperance Movement for the site of a hospital in 1875. Parts of the late 19th century hospital survive to the north of the former chapel site. An additional wing (Insull Wing) was built in 1914 to the south of the chapel with a linking bridge to the Victorian buildings. The 1914 building was further extended in the 1930s. In the early 1960s, St James's Chapel was demolished, although the burial vaults may survive beneath the hospital's modern car park (EUS040).

6.3.16 The early 19th century saw the creation of John Nash's Regent's Park and Regent's Park estate (EUS002, EUS003, EUS012). Formerly 'Marylebone Park', a royal park with medieval origins, Regent's Park (EUS002) was laid out according to plans set out by John Nash during the 1810s to 1830s. The development saw the creation of parkland with stucco villas and grand terraces arranged around the edges. The park and the grand terraces were designed as a coherent landscape, and were laid out to give the appearance of palatial mansions set in rural parkland. The villas on Park Village West and East (EUS003, EUS012), were designed by John Nash as idyllic rural villages, on the edge of the parkland. Despite subsequent small developments (including the construction of the London to Birmingham railway line) and World War II bomb damage, John Nash's rural landscape largely survives intact and has high heritage value.

6.3.17 Urban development intensified through the 19th century with the development of the Lord Southampton Estate, which included the construction of Mornington Crescent (EUS016) and the creation of Somers Town (EUS019).

6.3.18 Somers Town was planned as an upmarket development but by the late 19th century the estate had declined into slum housing and became a focus for late 19th century housing for railway workers. The area saw significant redevelopment in the 1920s and 1930s with slum clearance and the construction of large council apartment blocks.

6.3.19 Euston Square Gardens (grouped asset EUS004) was created as part of the 19th century urbanisation and contains the Euston Lodges (Grade II) which were constructed in the same 'Greco' style as the Euston (Doric) Arch (formerly located within Euston station to the north (EUS005)). The square is surrounded by significant buildings which include the Grade II* (Greco style) 1- 9 Melton Street (EUS043). Built in 1906-1908 as the headquarters of the London Edinburgh and Glasgow Assurance Company; it was the first purpose-built office building. The building was originally meant to be part of a larger scheme, designed by Arthur Beresford Pite, with a frontage on Euston Road. Pite, however, was not retained for the shortened 1930s extension. Grade I early 19th century St Pancras 'New' Church' (EUS015) lies on the opposite side of Euston Road with its distinctive caryatids.

6.3.20 The 'Greco' style of Pite's 1-9 Melton Street and the St Pancras 'New' Church were continued around Euston Square with the construction of the Grade II Drayton House and the Wellcome Trust building, built during the inter-war period (part of grouped asset EUS004). However, the style is not followed all around the square with the Art Deco Grade II* Euston Fire Station (EUS031) and Richard Seifert 1970s 'International' style Euston forecourt towers and bus station (EUS005). Euston Square also contains the Grade II Euston war memorial (EUS004), which was erected in 1921.

6.3.21 Constructed in 1837 for the London and Birmingham Railway Company, Euston station (EUS005) is the second oldest major rail terminal in London. The station included the Euston Arch which was constructed as the station's Euston Street entrance (approximately where the ramp for platforms 8 and 9 is now). The station and associated rail cutting (EUS036) was expanded during the late 19th century, including the construction of the Granby Terrace (EUS038) and Mornington Terrace carriage sheds (EUS036). Elements of the original 1830s cutting and tunnel survive in the form of the Grade II listed Parkway Tunnel (at the northern end of the station approach) and a section of adjoining cutting wall (EUS037).

6.3.22 No further major development was undertaken on the railway infrastructure prior to World War II.

6.3.23 Euston station and streets between the old station and Euston Square including Euston Grove and Euston Circus were demolished to construct the current Euston station, parcel deck and power signal box in the 1960s, including the demolition of the Euston Arch. Offices and a bus station were added to the forecourt in the 1970s. Only the lodges in Euston Square (EUS004) and the statue of Robert Stephenson (formerly located in Euston Great Hall (EUS035)), survive from the earlier station.

6.3.24 World War II had a significant impact on the character of the area. Bomb damage led to clearance of large parts of the Euston area, in particular around Somers Town (EUS019) and the area between Albany Street and Hampstead Road, where the cleared area was used to create the modern council-built Regent's Park Estate.

Future baseline

Construction (2017)

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

Operation (2026)

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

6.4 Effects arising during construction

Avoidance and mitigation measures

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

- management measures that will be implemented for assets that are to be retained within the land required for the construction of the Proposed Scheme (draft CoCP, Section 8);
- the preparation of project wide principles, standards and techniques for works affecting heritage assets (draft CoCP, Section 8);
- the use of appropriate equipment and methods to limit ground disturbance and settlement followed by monitoring, protection and remediation (draft CoCP, Section 10);
- a programme of archaeological investigation and recording to be undertaken prior to/or during construction works affecting the assets (draft CoCP, Section 8); and
- a programme of historic building investigation and recording to be undertaken prior to modification or demolition of the assets (draft CoCP, Section 8).

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

- the design avoids the need for partial demolition of the Grade II* 1-9 Melton Street (EUS043), now occupied by the Royal College of General Practitioners;
- construction sites for the works to the retaining walls and tunnel portal have been located and designed to avoid physical impacts to listed buildings on Parkway (EUS012) Park Village East (EUS003) and listed elements of Parkway Tunnel and cutting (EUS037);
- the replacement retaining walls, parapets and landscaping, which are to be designed to reflect the current setting of Park Village East (EUS012); and
- permanent relocation of the listed Southampton monument and Christie monument in St James's Gardens (EUS014), the Robert Stephenson statue (EUS035) in Euston station forecourt, the war memorial and railings in Euston Square Gardens (EUS004), and the listed Mornington Street Bridge piers and lamp stands (EUS017) as part of the Proposed Scheme.

Assessment of impacts and effects

Temporary effects

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

6.4.4 The Grade II* villas on Park Village East, which are located within the Regent's Park (Camden) Conservation Area (EUS003), are an asset of high value which lie within the land required to construct the Proposed Scheme. The character and context of the asset and its setting in the wider conservation area will be impacted by construction activities associated with the demolition of the Park Village East railway retaining wall and by the associated underpinning works and retaining wall replacement works. The majority of the construction works will be undertaken over a seven year period between 2016 and 2022.

6.4.5 To maintain the stability of Park Village East, temporary concrete walling beams will be constructed to the east of the existing retaining wall and temporary ground anchors will be inserted through the retaining wall, passing below Park Village East to stabilise the ground during the retaining wall replacement works. The parapet and landscape features will be restored on completion of the construction works. The temporary impact on setting will constitute a moderate impact and a major adverse effect.

Cumulative effects

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

Permanent effects

6.4.7 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.

Physical Impacts

6.4.8 The Grade II listed numbers 14-15 Melton Street (EUS027), assets of moderate value, will be demolished for the expansion and remodelling of Euston station. This will constitute a high impact and high adverse effect.

6.4.9 The partial demolition of Euston station and its parcels deck, and the demolition of the power signal box, One Euston Square and Grant Thornton House (assets of low value (EUS005)) for the expansion and remodelling of Euston station. This will constitute a high impact and moderate adverse effect.

6.4.10 The 1 and 3 Cobourg Street former stables (EUS029), the former Euston underground station on Melton Street (EUS027), Granby Terrace carriage shed (EUS038) and Mornington Street Bridge (EUS017), are assets of low value. They will be demolished for the expansion and remodelling of Euston station and Euston approach and this will constitute a high impact and moderate adverse effect.

6.4.11 The Parkway Tunnel and cutting (EUS037) will be partially demolished. It is uncertain which existing elements of the tunnel are listed The western wall of the original cutting (now the central retaining wall), which will be demolished, can be considered to be curtilage to the listing, The tunnel and cutting is an asset of moderate value. The demolition will constitute a high impact and high adverse effect.

6.4.12 The Euston railway cutting retaining wall and parapet at Park Village East (EUS036) will be rebuilt in a different form and slightly set back from its current position. The asset is of low value. This will constitute a high impact and moderate adverse effect.

6.4.13 The Mornington Terrace retaining wall parapet (EUS036), an asset of low value, will be partially demolished as part of the Mornington Street Bridge works. The parapet will be rebuilt in its current location. This will constitute a high impact and moderate adverse effect.

6.4.14 The late 19th/early 20th century National Temperance Hospital, and former print works (EUS014), assets of moderate value, will be demolished for the expansion and remodelling of Euston station. The impact will be high and have a major adverse effect.

6.4.15 St James's Gardens burial ground and the site of St James's Chapel located in the adjacent hospital car park (EUS040), assets of high value, will be removed for the expansion remodelling of Euston station, temporary construction compounds and for the construction of new access roads. This will constitute a high impact and a major adverse effect.

Impacts on the setting of heritage assets

6.4.16 The Grade II* 1-9 Melton Street (EUS030), an asset of high value will have its setting permanently impacted by the demolition of the adjoining 10 Melton Street, which will

expose the building's northern wall and remove the architect's intended street line. The effect of the construction works will be to permanently alter the appearance and appreciation of the setting of the listed building. The building will be isolated from its intended streetscape and the exposure of the northern wall will permanently alter the appearance of the building. This will constitute a medium impact and a major adverse effect.

6.4.17 The Grade II listed buildings: Southampton Monument and Christie Monument in St James's Gardens (EUS014) will be relocated to an appropriate location; the war memorial in Euston Square Gardens (EUS004) will be relocated further south as part of the alterations to the bus station, but on its original intended alignment within the gardens; the railings around Euston Square Gardens (EUS004) will be removed, retained and installed around the edges of the restored gardens; and the Mornington Street Bridge piers and lamp stands, west and east ends (EUS017), will be reinstalled as part of the new bridge as part of the Mornington Street Bridge replacement works. These assets are of moderate value and although they will be retained, their intended setting will be altered, which will affect the setting and appreciation of the assets. This will constitute a medium adverse impact and moderate adverse effect.

Permanent cumulative effects

6.4.18 The cultural heritage methodology includes the consideration of the inter-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.

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

Other mitigation measures

6.4.20 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed design to reduce further the significant effects described above. These refinements will include the identification of locations where the physical impact on below ground assets can be reduced through design.

Summary of likely residual significant effects

6.4.21 St James's Gardens will be permanently lost due to the construction of the Proposed Scheme. The gardens contain the post-medieval St James's burial ground and chapel. A programme of archaeological works will be prepared to investigate, analyse, report and archive these assets.

6.4.22 The Proposed Scheme will result in the demolition of a number of built heritage assets including 14-15 Melton Street (Grade II listed buildings, EUS027), the western side of the Parkway Tunnel (EUS037), Euston station (EUS005), the 1 and 3 Cobourg Street former stables (EUS029), the former Euston underground station on Melton Street (EUS027), Granby Terrace carriage shed (EUS038), Mornington Street Bridge (EUS017), the Euston railway cutting retaining wall and parapet at Park Village East (EUS036), the late 19th/early 20th century National Temperance Hospital, and former print works (EUS014). A programme of built heritage works will be prepared to investigate, analyse, report and archive these assets.

6.4.23 The Proposed Scheme will alter the setting of several built heritage assets around Euston, including, temporarily, the Grade II* listed buildings in Park Village East (EUS003) during construction, and permanently, the Grade II* 1-9 Melton Street. A number of listed buildings including the Southampton monument and Christie monument in St James's Gardens (EUS014), the war memorial in Euston Square Gardens (EUS004) and the Mornington Street Bridge piers and lamp stands, west and east ends (EUS017) will be relocated, significantly altering their setting.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 No measures have been required to reduce the impacts and effects on 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 No significant environmental effects will occur as a result of permanent changes to the setting of the heritage assets arising from the impacts of railway operation.

Cumulative effects

6.5.4 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.

6.5.5 Assessment of inter-project effects on cultural heritage assets arising from the interaction of the Proposed Scheme with cumulative development projects has been undertaken. No significant cumulative effects have been identified in relation to cultural heritage.

Other mitigation measures

6.5.6 No additional mitigation measures are required.

Summary of likely residual significant effects

6.5.7 There will be no significant residual effects during operation.

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 habitat in St James's Garden Site of Local Importance (SLI) and the loss of trees and buildings with the potential[35] to support bat roosts.

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

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

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: Greenspace Information for Greater London (GiGL), London Wildlife Trust and London Bat 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). 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-001-001, EC-002-001, EC-003-001, and EC-004-001.

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 It should be noted that the baseline information provided in Section 7.3 does not include descriptions of designated sites, habitats and species above bored tunnel where no impacts on ecological receptors are anticipated.

7.2.4 The scheme design and urban location of this area of the Proposed Scheme and the absence or limited extent of suitable habitats means that some species and species groups have been scoped out of the assessment as the habitats that support them are not present (e.g.no natural rivers), or are considered inherently unsuitable for species of interest due to their man-made nature. (e.g. concrete-walled canals). Within this

[35] A feature which is of identified as of being potentially suitable that it may support roosting bats. Potential roosts are graded as being of low, moderate or high potential to support bats depending on the likely suitability of the feature concerned.

area, these groups and species include amphibians, badger, dormouse, otter, water vole, aquatic invertebrates, fish, white-clawed crayfish). Further information is presented in Appendices EC-001-001, EC-002-001, EC-003-001, and EC-004-001 in Volume 5.

7.2.5 Access was not obtained to all of the land area where general habitat survey (Phase 1 habitat survey) was proposed. Partial Phase 1 habitat survey was carried out from footpaths used by the public for areas where access was not permitted. Potential key ecological receptors where access was not gained for survey include St James's Garden SLI. In addition, access could not be gained for survey of a number of buildings and trees. Further details are provided in Volume 5: Appendices EC-001-001, EC-002-001, EC-003-001, and EC-004-001 in Volume 5.

7.2.6 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.

7.2.7 The precautionary approach to the assessment has been adopted is sufficient to identify the likely significant 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-001-001, EC-002-001, EC-003-001, and EC-004-001 and Map Series EC-01 to EC-12, Volume 5 Ecology Map Book CFA1). Statutory and non-statutory designated sites are shown on Map EC-01-001, Volume 5, Ecology Map Book CFA1.

7.3.2 Land required for the construction of the Proposed Scheme and that adjacent to it consists of a predominantly built environment. The single largest area of green space[36] is Regent's Park and there are further small areas in private gardens. Grassland and mature trees are present in St James's Garden SLI and mature trees are present in Euston Square Gardens. The Camley Street Nature Park Local Nature Reserve (LNR) is located to the north-east of the Proposed Scheme. This area of the Proposed Scheme falls within an area designated in the London Plan as an Area of Urban Ecological Deficiency.

Designated sites

7.3.3 There is one statutory designated site located within 500m of the land required for the construction of the Proposed Scheme, namely Camley Street Nature Park LNR. This site provides natural habitat for bats, birds, butterflies, amphibians and plant life. It is approximately 470m north-east of the land required for the construction of the Proposed Scheme.

[36] Green spaces are areas of natural or semi-natural land, for example, parks, gardens and woodlands.

7.3.4 There are two Local Wildlife Sites (LWS) relevant to the assessment in this area. These are:

- Regent's Park Site of Metropolitan Importance SMI – comprises mature parkland trees, a small enclosed woodland, an ornamental lake and a grassland area managed specifically for wildlife. Over 100 species of birds annually have been recorded within the site, and a large number of invertebrates. The north-east corner of the SMI at Gloucester Gate Bridge is within the land required for the construction of the Proposed Scheme and is of county/metropolitan value; and
- St James's Garden Site of Local Importance (SLI) – contains a number of mature trees, ornamental shrubberies and two small grassland areas managed specifically for wildlife. The SLI is within the land required for the construction of the Proposed Scheme and is of local/parish value.

Habitats

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

Grassland

7.3.6 Amenity grassland is present, which has in small areas been left to grow tall as an urban wildlife enhancement. Grassland is a Camden Biodiversity Action Plan (BAP)[37] habitat. This grassland is of local/parish value.

Buildings and structures

7.3.7 Buildings and structures may support very limited higher-plant vegetation, ferns, and mosses and lichens. Field survey shows railway brickwork in Camden does support around five common fern species, although few structures support more than a very small number of individual ferns, which limits their interest. Built environment is listed as a Camden BAP habitat. The buildings and structures are of local/parish value.

Trees and ornamental planting

7.3.8 Urban trees, ornamental shrubbery, and flower beds are present in this area. They are commonly found in city squares, urban parks, and amenity plantings around buildings. This habitat complex is of local/parish value.

7.3.9 All other habitats are of local/parish value or below. Full descriptions are provided in Volume 5 (Appendices EC-001-001, EC-002-001, EC-003-001, and EC-004-001.

Protected and/or notable species

7.3.10 A summary of the species relevant to the assessment is provided in Table 7.

[37] London Borough of Camden, *Camden Biodiversity Action Plan,* http://camden.gov.uk/ccm/content/leisure/outdoor-camden/nature-in-camden/wildlife/introduction-to-the-camden-biodiversity-action-plan.en;jsessionid=6FC5EAFE94A929152DD96377CC9E5D6B Accessed: September 2013.

Table 7: Protected and/or notable species

Species/species group	Value	Receptor	Baseline and rationale for valuation
Birds	Up to national	Black redstart	Black redstart was not recorded during field surveys. However, areas of habitat, which are potentially suitable for black redstart including the rail land and light industrial areas, were not surveyed due to access restrictions. Black redstart could be present in these areas. The numbers of breeding birds in the UK are low (43 pairs) and these areas are outside the known areas of higher concentrations of this species in London. However, a conservative assumption that the species could be present has been made, and if present, they would represent more than 1% of the national population and therefore be of national importance.
	Up to district/borough	Breeding bird assemblages in Regent's Park	Whilst no field survey was carried out at Regent's Park, the desk study indicates that over 100 species of bird are recorded annually including one of London's largest breeding colonies of grey heron. Other species recorded (though not necessarily breeding)include a number of red listed species in the Birds of Conservation Concern[38] such as house sparrow, spotted flycatcher, and amber listed species in the BoCC such as reed bunting and kingfisher. In addition peregrine falcon and hobby were recorded. House sparrow is species of principal importance[39] and a London BAP[40] species.
	Up to district/borough	Wintering bird assemblages in Regent's Park	The desk study indicated that Regent's Park is used by a number of wintering bird species including red listed species in the BoCC such as lapwing, and amber listed species in the BoCC such as firecrest, lesser redpoll and kingfisher.
	Local/parish	Breeding bird assemblage in St James's Gardens	A total of 20 species were recorded at this small urban park; not all were breeding. Of local interest was grey wagtail, which probably breeds in or adjacent to the survey area. The remainder of the breeding bird assemblage comprised common and widespread species adapted to living in a built-up environment.
Bats	Up to county/ metropolitan	Bat assemblage associated with roosts within St James's Garden SLI, trees and buildings in the surrounding area	The field survey did not record any roosts. However, a small number of buildings, which may support roosts, could not be viewed. In addition, low levels of foraging and commuting activity were recorded at Gloucester Gate Bridge, including common and soprano pipistrelles, and single passes of noctule and brown long-eared bat. Trees with high potential to support roosts were identified in St James's Garden, the north-east corner of Regent's Park,and moderate potential for bat boxes fixed to trees on the Regent's Park Estate near Stanhope Street. Owing to the lack of access to carry out detailed survey it is not possible to rule out that some trees and buildings may potentially support maternity roosts of common bats such as pipistrelles or roosts of rarer bats, even in this urban

[38] Eaton, M.A. et.al. (2009). Investigation Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102, pp.296-341.
[39] Natural Environment and Rural Communities Act 2006. Section 41: Species of Principal Importance in England.
[40] London Biodiversity Partnership, London Biodiversity Action Plan, http://www.lbp.org.uk/londonpriority.html Accessed: October 2013.

Species/species group	Value	Receptor	Baseline and rationale for valuation
			environment. Therefore a precautionary value has been applied. Soprano pipistrelle and brown long-eared bats are species of principal importance. All bats are London and Camden BAP species.
Terrestrial invertebrates	Negligible	Terrestrial invertebrate assemblage at St James's Gardens and railway land	Desk study and scoping surveys for invertebrates from PRoW identified only habitats of low quality for invertebrates; the invertebrate assemblage at these sites and in the Euston area overall is considered to be of negligible conservation interest.

Future baseline

Construction (2017)

7.3.11 A summary of the known developments which are likely to be built and occupied prior to construction of the Proposed Scheme is provided in Volume 5: Appendix CT-004-000. None of these developments will affect the character and value of the baseline ecological resources.

Operation (2026)

7.3.12 There are no known committed developments or changes to management in this area that will affect the operational baseline.

7.4 Effects arising during construction

Avoidance and mitigation measures

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

Assessment of impacts and effects

Designated sites

7.4.2 The construction of the extension of Euston station will result in the permanent loss of the whole of St James's Garden SLI, 1 ha. This will result in the total loss of the site leading to a permanent adverse effect on site integrity that will be significant at the local/parish level.

7.4.3 No impacts are expected for the following designated sites which form part of the baseline: Camley Street Natural Park LNR and Regent's Park SMI.

Habitats

7.4.4 The construction of the extension of Euston station will result in the permanent loss of 1ha of grassland and scattered trees in St James's Garden SLI. This will have a permanent adverse effect on the conservation status of these habitats significant at the local/parish level.

7.4.5 The utilities works in the north-eastern corner of Regent's Park will result in the loss of <0.5 ha amenity grassland. This will have a permanent adverse effect on the conservation status of this habitat significant at the local/parish level.

7.4.6 It is considered unlikely that any other effects on habitat receptors significant at more than the local/parish level will occur. Effects significant at the local/parish level are listed in Volume 5: Appendix EC-006-005.

Species

7.4.7 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 cause adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to cause a significant adverse effect on the conservation status of the population concerned will differ dependent on the status of the species concerned.

7.4.8 A small number of buildings and trees with the potential to support bat roosts, and potentially maternity roosts will be demolished for the extension of Euston station. Whilst there are alternative roost sites in the area, the loss of buildings and trees has the potential to have a permanent adverse effect on the local bat assemblage that would be significant at up to the county/metropolitan level.

7.4.9 Losses of other habitat within the land required for the construction of the Proposed Scheme may require some bats to travel further, and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects are considered unlikely to affect the conservation status of any bat species.

7.4.10 The extension of Euston station may remove small areas of habitat which are suitable for black redstart in the railway land. However, there is extensive alternative nesting habitat in the area and the habitat loss is therefore not considered to affect the conservation status of this species. In addition, the draft CoCP specifies that works should occur outside the breeding season, should breeding birds be encountered during construction. The loss of habitat would not be significant for black redstart.

7.4.11 It is considered unlikely that any other effects on species receptors significant at more than the local/parish level will occur. Local/parish level effects are listed in Volume 5: Appendix EC-005-001.

Other mitigation measures

7.4.12 This section describes additional measures designed to reduce or compensate for significant ecological effects. These include habitat creation at the proposed open space north of Langdale (on the Regent's Park Estate), Euston Square Gardens and the consideration of green roofs in the station development.

7.4.13 Compensation for the loss of St James's Gardens will include the creation of new and enhancement of existing green space. This will include areas of wildflower and native shrub planting at the proposed open space north of Langdale and planting of wildflower grassland beneath trees at Euston Square Gardens. Bird boxes will be included on some trees in the landscaped areas. Trees planted as part of these compensation measures will include native species. These measures will mitigate the

loss of the features for which the site is designated such that there will be no significant residual effects.

7.4.14 The loss of any bat roosts in buildings and trees will be compensated for by the provision of alternative compensatory roosts in accordance with the principles of mitigation set out in the SMR Addendum (Volume 5: Appendix CT-001-000/2. Bat boxes will be installed in trees at Euston Square Gardens, or on other land within the scheme in the vicinity of Euston station. Following the implementation of the measures proposed, it is likely that any adverse effects on bats during the construction of the Proposed Scheme will be reduced to a level where there will be no significant effects on the conservation status of the species concerned.

Summary of likely residual significant effects

7.4.15 The mitigation, compensation and enhancement measures described above reduce the effects during construction to a level that is not significant.

7.5 Effects arising from operation

Avoidance and mitigation measures

7.5.1 No measures have been included as part of the design of the Proposed Scheme to avoid or reduce impacts on features of ecological value.

Assessment of impacts and effects

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

7.5.3 Collision risk for bats has been scoped out of the assessment for this area given trains already operate at a similar speed along the existing railway and it is unlikely that even with increased frequency, species would be at greater risk of collision.

7.5.4 It is considered unlikely that any other effects on ecological receptors will occur during operation.

Other mitigation measures

7.5.5 No additional mitigation measures for the operational stage are required.

Summary of likely residual significant effects

7.5.6 There will be no residual significant effects during operation.

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:

- large areas of residential land use; and
- groundwater quality within Secondary A aquifers at the southernmost extent of the study area.

8.1.4 The main land quality issues in this area include:

- the presence of potentially contaminative activities associated primarily with the long-standing railway land which includes sidings and maintenance facilities; and
- the presence of small pockets of former industry or other potentially contaminative activities (e.g. fuel stations) in the area required to construct the Proposed Scheme.

8.1.5 Details of baseline information and the land quality assessment methodology are presented 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-001-001: Land quality appendix.

8.1.6 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 13. Issues

regarding the disposal of waste materials including contaminated soils are addressed in Volume 3, Section 16.

8.1.7 Engagement has been undertaken with LBC Environmental Health Department and London Fire Brigade petroleum officer in relation to land contamination. Information received to date has been included in the assessment.

8.2 Scope, assumptions and limitations

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

8.2.2 Baseline data were reviewed for the area of land required to construct the Proposed Scheme, excluding areas of utility works on the highway, 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 was to verify desktop information and the lack of complete site walkovers is considered unlikely to have substantially affected the land quality assessment.

8.3 Environmental baseline

Existing baseline

8.3.1 Unless otherwise stated, all features described in this section are presented in Map LQ-01-001 (Volume 5, Land Quality Map Book).

Geology

8.3.2 This section describes the underlying ground conditions in 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-02-001 (Volume 5, Water Resources Map Book).

8.3.3 Made ground has not been indicated as present on the geological map[41]. A cover of made ground is likely to be present throughout the majority of the study area due to previous cycles of development.

8.3.4 Superficial deposits are present to the south and west of Euston station comprising the Langley Silt Member and Lynch Hill Gravel. While the Lynch Hill Gravel just falls within the footprint of the proposed Euston station development, the Langley Silt Member is inferred to outcrop further north. The Lynch Hill Gravel is described by the British Geological Survey (BGS) as gravels with pockets of sands and clays.

[41] Geological Survey of Great Britain (2006), *North London, Sheet 256, Solid and Drift Edition,* 1:50,000 series, Ordnance Survey, Southampton.

8.3.5 Langley Silt is described as silts and clays, varying from yellow to brown.

8.3.6 Superficial deposits are indicated as being absent from the remainder of the study area.

8.3.7 The bedrock geology underlying the entirety of study area is the London Clay Formation of the Thames Group. Typically this is a stiff grey and weathering to brown clay with thin beds of sand and pebbles at the base.

8.3.8 The geological succession beneath the London Clay generally comprises the following:

- the Harwich Formation, a thin sandy deposit (potentially only very localised);
- the Lambeth Group (also termed the Woolwich and Reading Formations) which comprises a mixture of clay, sand and occasional pebble beds;
- the Thanet Sand Formation, a dense green sand; and
- the Chalk Group, which is a soft white limestone.

8.3.9 In the very north of the Euston area, the route will enter tunnel, which will be confined within the London Clay Formation.

Groundwater

8.3.10 The Lynch Hill Gravel is classified by the Environment Agency as a Secondary A aquifer, but is considered to be of low value due to its limited extent and potentially poor water quality. The Langley Silt Member is classified as unproductive strata.

8.3.11 The London Clay is classified as an 'unproductive strata' (i.e. it is not considered to represent a usable groundwater resource). The Lambeth Group and Thanet Sand Formation are classified as Secondary A aquifers whilst the Chalk Group is classified as a Principal aquifer.

8.3.12 The Environment Agency reports that there are five private licensed groundwater abstractions from the underlying Chalk within the study area. No unlicensed groundwater abstractions have been identified from the data available.

8.3.13 The Environment Agency reports that there is a public water supply (PWS) with a source protection zone (SPZ) in this study area, approximately 840m west of the route (refer to Map WR-02-001, Volume 5, Water Resources Map Book for the location of the SPZ).

8.3.14 Further detail on the groundwater beneath the Proposed Scheme can be found in Section 13.

Surface waters

8.3.15 The route does not cross any watercourses within the area, which is located within the Thames River Basin District (RBD) and is covered by the river basin management plan (RBMP)[42] [43].

8.3.16 Although more than 500m from the route, the Proposed Scheme includes utility works in the vicinity of the Regent's Canal (lower section), which is the section of the canal below Kentish Town Lock at Camden.

8.3.17 There are no licensed surface water abstractions in the study area.

8.3.18 Further information on surface water is provided in Section 13.

Current and historical land use

8.3.19 The study area is dominated by the existing Euston station, associated maintenance and works areas, a railway shed and multiple railway lines, much of which is in retained cutting. From observation, the railway areas to the north of the station contain electrical switchgear equipment and parts are used for the storage of potentially contaminative liquids.

8.3.20 To the west of the existing Euston station, within the footprint of the proposed station, the area comprises housing, educational buildings, hotels and commercial premises including a photographic equipment supplier and a disused fuel filling station.

8.3.21 Historical potentially contaminative land uses, other than the existing railway land, include:

- a builder's yard, printing works, electrical substation and garages were present within the proposed western extension of Euston station;
- warehouses; engineering works; foundries; chemical works; printing works; and industrial laundry facilities to the west of the proposed western extension;
- a leather works and garage to the east of Euston station; and
- a tobacco works, timber yard, sawmill, fibrous plaster works and glass works towards the north of the study area.

8.3.22 Sites (both historical and current) identified by the review as posing a potential contaminative risk when the Proposed Scheme is constructed are (listed from east to west):

- railway land in the location of the proposed station development, route alignment and tunnel portal (Map LQ-01-001, B6, Volume 5, Land Quality Map Book);

[42] Environment Agency (2009) *River Basin Management Plan*, Thames River Basin District.
[43] The Environment Agency's Digital Rivers Network (DRN) indicates a culverted watercourse at a minimum distance of 500m east of the route at Euston. The reach has been included in the DRN to ensure connectivity between Highgate Ponds and the Thames within the DRN. It is considered that the watercourse is a part of the sewer network and is not a surface water feature. It has therefore not been included in this assessment.

- former leather works and current depot located to the east of Euston station (Map LQ-01-001, D5, Volume 5, Land Quality Map Book);
- former wagon works, sawmill, printing works, warehouses, chemical works, foundry and electricity substation located to the south-west of Euston station (Map LQ-01-001, D7, Volume 5, Land Quality Map Book);
- multiple former printing works abutting the north of St James's Gardens (Map LQ-01-001,C7, Volume 5, Land Quality Map Book);
- former chemical works, foundry and printing works located to the west of Hampstead Road (Map LQ-01-001, C7, Volume 5, Land Quality Map Book);
- disused fuel filling station at 142 Hampstead Road (Map LQ-01-001, C6, Volume 5, Land Quality Map Book); and
- timber yard located west of railway cutting adjacent to Regent's Park Barracks (Map LQ-01-001, B6, Volume 5, Land Quality Map Book).

8.3.23 Contaminants commonly associated with these uses could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

8.3.24 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). The only notable entry relates to the disused fuel station at 142 Hampstead Road (Map LQ-01-001, C6, Volume 5, Land Quality Map Book).

8.3.25 Other entries in the study area are further afield and relate to fuel stations and radioactive substance consents associated with hospitals in the study area.

Mining and mineral areas

8.3.26 There are no active mining or mineral sites or minerals safeguarding areas (MSA) within the study area.

8.3.27 No future areas of mining or mineral extraction are known.

Geo-conservation sites

8.3.28 Inspection of supplementary planning guidance issued by the London Geodiversity Partnership indicates that there are no current or potential geological designations (e.g. RIGS/LIGS or Geological SSSI) within the study area[44].

Receptors

8.3.29 The sensitive receptors that have been identified within this study area are summarised in Table 8.

[44] Green Infrastructure and Open Environments (2012), *London's Foundations: Protecting the geodiversity of the Capital.* Supplementary planning guidance, BGS/Natural England.

Table 8: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents	High
		Workers	Moderate
		Station users	High
	Controlled waters	Secondary A aquifer in Lynch Hill Gravel deposits	Moderate
		Secondary A aquifer in Lambeth Group/Thanet Sand Formation located beneath the London Clay	Moderate
		Principal aquifer in the Chalk	High
	Built environment	Buildings and property	Low to high
		Underground structures and services	Low

Future baseline

8.3.30 As part of the assessment of potential future baselines, a search was undertaken of all relevant planning permissions within the study, which are provided in Volume 5, Appendix CT-004-000. Although some planning permissions were identified, which are likely to be developed, it is unlikely that any will deliver an improvement in local land quality.

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. 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 gases and vapours (draft CoCP, Sections 5, 7, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (draft CoCP, Section 5);
- the management of human health 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 risks from extreme weather events which may affect land quality during construction (draft CoCP, Section 16).

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

- Environment Agency CLR11 'Model Procedures for the Management of Land Contamination' (2004)[45]; and
- British Standard BS10175 'Investigation of Potentially Contaminated Sites' (2011)[46].

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 'A Framework for Assessing the Sustainability of Soil and Groundwater Remediation' (2010)[47]. The preferred option will then be developed into a remediation strategy, and the regulatory authorities will be consulted prior to implementation.

8.4.4 Contaminated soils excavated from the site, wherever feasible, will be treated as necessary to remove or render any contamination inactive, and re-used within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation methods, soil washing and bio-remediation to remove oil contaminants. Contaminated soil disposed of off-site will be taken to a soil treatment facility, another construction site (for treatment, as necessary, and re-use) or to an appropriately permitted landfill site. Given the constraints relating to the confined construction area around Euston, it is likely that remediation and treatment would be undertaken outside this particular study area.

[45] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[46] British Standards Institution (2011), BS 10175:2011, Code of practice for investigation of potentially contaminated sites.
[47] Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

Assessment of impacts and effects

8.4.5 The Proposed Scheme will comprise a large extension to the existing Euston station together with remodelling of the current station. Both elements require large-scale below ground works, in particular the extension will involve excavation of a new retained cutting into the underlying made ground soils.

8.4.6 To the north of the station, the existing railway cutting will be widened as far north as Granby Terrace Bridge to accommodate the high speed railway. The retained cutting will also be excavated to a greater depth than the existing cutting to allow the high speed railway to enter tunnel south of Parkway.

8.4.7 It is expected that below ground works will not penetrate through the upper part of the Lambeth Group. However the risk assessment conservatively considers that some piling works could encounter the 'lower aquifer', defined as the lower London Tertiaries (lower Lambeth Group, Upnor Formation), Thanet Sand Formation and Chalk).

Land contamination

8.4.8 In line with the assessment methodology, as set out in the SMR and the SMR addendum, an initial screening process was undertaken (identified in the methodology as Stages A and B) to identify areas of current or historical potentially contaminative use within the study area and considers which of these areas might pose contaminative risks for the Proposed Scheme. In total, 44 areas were considered during this screening process, and of these, 21 areas were taken forward to more detailed risk assessments (Stages C and D), in which the potential risks were assessed more fully. All areas assessed are shown on Map LQ-01-001 (Volume 5, Land Quality Map Book) and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

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

- whether the site is directly affected by the Proposed Scheme;
- the vertical route alignment, i.e. whether the railway is in cutting at the site's location;
- the presence of underlying Principal or Secondary A aquifers or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

8.4.10 A summary of the baseline CSM is provided in Table 9.The impacts and baseline risks quoted are before any mitigation is applied.

8.4.11 The assessed baseline risk is based on the information provided at the time of 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 9: Summary of baseline CSM[48] for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[49]	**Area name and classification**	**Main potential impacts**	**Main baseline risk**[50]
1-14, 1-33	Existing on-site railway land overlying the London Clay Formation. (Map LQ-01-001, C6 and D6).	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters.	Moderate /low
		Potential impact on on-site humans to contamination by inhalation of asphyxiative or explosive ground-gases.	Moderate/low
		Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer).	Very low
1-40, 1-08, 1-07, 1-35, 1-44, 1-04, 1-30, 1-11	Former on-site printing works, chemical works and other previous contaminative land uses overlying London Clay. (Map LQ-01-001, B6, C6 and D6).	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters.	Low to moderate/low
		Potential impact on human health off-site from contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dust.	Very low to low
		Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer).	Very low
1-27, 1-24	Former on-site printing works and warehouse overlying a Secondary A (superficial) aquifer. (Map LQ-01-001, D7).	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters.	Low
		Potential impact to groundwater within the Secondary A superficial aquifer.	Low
		Potential impact to groundwater within the 'lower aquifer' (Secondary A Bedrock aquifer).	Very low

[48] CSM have been prepared as part of the detailed land contamination methodology (refer to Volume 5: Appendix LQ-001-001) for baseline, construction and post-construction.
[49] Each area is assigned a unique identification number (see Volume 5: Appendix LQ-001-001).
[50] The moderate or high risks identified reflect the uncertainty in existing baseline information. Whilst there are unlikely to be properties or receptors that experience the reported high or moderate existing baseline risk in the absence of site investigation, a precautionary, worst case risk is reported in the table.

Area reference[49]	Area name and classification	Main potential impacts	Main baseline risk[50]
1-05, 1-29, 1-25, 1-26, 1-32, 1-38, 1-01, 1-39, 1-20	Former off-site printing works, chemical works and other previous contaminative land uses. (Map LQ-01-001, C7, D5 and D7).	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters.	Moderate/low
		Potential impact on human health off-site from contamination by inhalation of migrating ground-gas and volatile vapours from contaminated soil/water.	Very low to low
		Potential impact to groundwater within the Secondary A superficial aquifer (refers only to polygons 1-29, 1-25, 1-26, Map LQ-01-001, D7).	Low

Temporary effects

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

8.4.13 Table 10 presents the summary of the construction effects obtained from a comparison of the baseline and construction impacts. The construction risk assessment takes into account the implementation of the mitigation measures set out within the draft CoCP. The details of these comparisons are presented in Volume 5: Appendix LQ-001-001.

Table 10: Summary of temporary (construction) effects

Area ref	Area name	Main baseline risk	Main construction risk	Construction effect and significance
1-14, 1-33	Existing on-site railway land overlying the London Clay Formation (Map LQ-001-01, C6 and D6),	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Moderate/low.	N/A – receptor not present	Negligible (not significant)
		Potential impact on on-site humans to contamination by inhalation of asphyxiative or explosive ground-gases = Moderate/low.	N/A – receptor not present	
		Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.	Very low	

Area ref	Area name	Main baseline risk	Main construction risk	Construction effect and significance
1-40, 1-08, 1-07, 1-11, 1-35, 1-44, 1-04, 1-30	Former on-site printing works, chemical works and other previous contaminative land uses overlying London Clay. (Map LQ-001-01, B6, C6 and D6)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low to mod/low. Potential impact on human health on-site humans to contamination by inhalation of volatile vapours from contaminated soil/water = Very low to low. Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.	N/A – receptor not present Very low to low Very low	Negligible (not significant)
1-27, 1-24	Former on-site printing works and warehouse overlying a Secondary A (superficial) aquifer. (Map LQ-001-01, D7)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low. Impact from leaching of contaminants from soil to groundwater Secondary A superficial aquifers = Low. Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.	N/A – receptor not present Low Very low	Negligible (not significant)
1-05, 1-29, 1-25, 1-26, 1-32, 1-38, 1-01, 1-39, 1-20	Former off-site printing works, chemical works and other previous contaminative land uses. (Map LQ-001-01, C7, D5 and D7)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low to mod/low. Potential impact on human health of-site humans to contamination by inhalation of volatile vapours from contaminated soil/water = Very low to low. Impact from leaching of contaminants from soil to groundwater Secondary A Aquifers (Refers only to polygons 1-29, 1-25, 1-26, Map LQ-001-01, D7) = Low.	Low to mod/low Very low to low Low	Negligible (not significant)

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.

8.4.15 Table 10 indicates that during construction activities there will be an overall negligible effect on identified receptors.

8.4.16 The main potential risks identified are associated with on-site human health where current and historical potentially contaminative activities are affected by the Proposed Scheme. It is expected that the measures set out in the draft CoCP will ensure that risks to human health will not be increased over baseline conditions, and in some instances may improve during construction as remediation is progressed.

8.4.17 Risks to groundwater quality in the lower aquifer from piling works will be managed in accordance with the draft CoCP and good practice, including the Environment Agency guidance on piling and penetrative ground improvement. It is therefore also expected that there will be a negligible effect on the groundwater quality within the lower aquifer during construction[51].

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

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

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

Permanent effects

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

8.4.22 Table 11 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 or not. The details of these comparisons are presented in Volume 5: Appendix 001-001.

[51] Environment Agency (2001), *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination*: Guidance on Pollution Prevention. National Groundwater & Contaminated Land Centre, Project NC/99/73. Solihull.

Table 11: Summary of permanent (post-construction) effects

Area reference	Area name	Main baseline risk	Main post-construction risk	Post-construction effect and significance
1-14, 1-33	Existing on-site railway land overlying the London Clay Formation (Map LQ-01-001, C6 and D6),	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Mod/low. Potential impact on on-site humans to contamination by inhalation of asphyxiative or explosive ground-gases = Mod/low. Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.	Low Low/mod Very low	Negligible to minor beneficial (not significant)
1-40, 1-08, 1-07, 1-11, 1-35, 1-44, 1-04, 1-30	Former on-site printing works, chemical works and other previous contaminative land uses overlying London Clay. (Map LQ-01-001, B6, C6 and D6)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low to mod/low. Potential impact on human health off-site from contamination by direct contact, ingestion and inhalation of contaminants in windblown, soil-derived dust = Very low to low. Potential impact to groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.	Low to very low Very low Very low	Negligible to moderate beneficial (significant)
1-27, 1-24 Former on-site printing works and warehouse overlying a Secondary A aquifer. (Map LQ-001-01)	Former on-site printing works and warehouse overlying a Secondary A (superficial) aquifer. (Map LQ-01-001, D7)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low. Impact from leaching of contaminants from soil to groundwater Secondary A superficial aquifers = Low. Potential impact to	Very low Very low Very low	Negligible to minor beneficial (not significant)

Area reference	Area name	Main baseline risk	Main post-construction risk	Post-construction effect and significance
		groundwater within the 'lower aquifer' (Secondary A bedrock aquifer) through piling or retaining wall construction through the London Clay Formation = Very low.		
1-05, 1-29, 1-25, 1-26, 1-32, 1-38, 1-01, 1-39, 1-20 Former off-site printing works, chemical works and other previous contaminative land uses. (Map LQ-001-01)	Former off-site printing works, chemical works and other previous contaminative land uses. (Map LQ-01-001, C7, D5 and D7)	Potential impact on human health on-site from contamination by direct contact, ingestion and inhalation of contaminants in soil and soil-derived dust and contaminated waters = Low to Moderate/low. Potential impact on human health of-site humans to contamination by inhalation of volatile vapours from contaminated soil/water = Very low to low. Impact from leaching of contaminants from soil to groundwater Secondary A aquifers (refers only to polygons 1-29, 1-25, 1-26, Map LQ-01-001, D7) = Low	Moderate/low Very low to low Low	Negligible (not significant)

8.4.23 In Table 11, the magnitude of the permanent effects and their significance has been determined by calculating the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.

8.4.24 Table 11 indicates that, following remediation, there will be, in most instances, an overall negligible to moderate beneficial effect on the areas of land identified as posing a contaminative risk within the area required to build the Proposed Scheme.

8.4.25 Depending on the type of remediation undertaken, the beneficial effect recorded for certain sites is most likely to arise from the removal of contamination sources and direct contact, or dust pathways, by the construction of new hard surfaces (for example on the construction sites) and from the new station buildings or track bed materials (in the operational part of the Proposed Scheme).

8.4.26 There will be a negligible effect on all sites identified as posing a contaminative risk that are located outside of the area required to build the Proposed Scheme.

Mining/mineral sites

8.4.27 There are no mining or mineral sites present within this study area.

Geo-conservation sites

8.4.28 There are no geo-conservation sites located within this study area.

Other mitigation measures

8.4.29 No additional mitigation measures are considered necessary to mitigate risks from land contamination during construction of the Proposed Scheme beyond those set out in the draft CoCP.

Summary of likely significant residual effects

8.4.30 With the application of the mitigation measures detailed above, there are likely to be no significant adverse residual effects. There are likely to be significant beneficial residual effects associated with the construction and remediation of pockets of former industrial land within the footprint of the Proposed Scheme including the expanded and remodelled Euston station.

8.5 Effects arising from operation

8.5.1 Users of the Proposed Scheme (i.e. rail passengers), whilst within trains, are at all routine times within a controlled environment, and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

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

Assessment of impacts and effects

8.5.3 An auto-transformer station will be constructed adjacent to the tunnel portal[52]. An auto-transformer station can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, the proposed auto-transformer station, in common with other modern substations, will use secondary containment appropriate to the level of risk.

8.5.4 There will be the potential for minor leakage of hydraulic or lubricating oils from high speed trains. Any leakage or spillage is expected to be very small and will not lead to any significant contamination.

8.5.5 There are no proposed depots within the study area.

8.5.6 Future station users have been considered in the operational phase risk assessments for the areas identified as posing a contaminative risk and that will include the extended and remodelled Euston station (refer to Table 11 and the CSM presented in Volume 5: Appendix LQ-001-001, Section 3).

8.5.7 The risk assessment for the post-construction stage may specify measures set out in the draft CoCP and implemented during the construction phase to remove, treat or

[52] The replacement substation will be constructed to the south of its current location.

isolate contamination. Further measures could also include the construction of permanent embedded design features in buildings – such gas protection measures (e.g. ventilation of confined spaces or inclusion of gas resistant membranes in basement or floor slabs). Overall risks for future station users from pre-existing contamination sources will be low to very low.

8.5.8 It is therefore considered that there will be no significant impacts to future station users from pre-existing land contamination.

8.5.9 Overall, there will be no significant operational effects associated with land quality in the Euston area.

Other mitigation measures

8.5.10 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

8.5.11 No significant residual effects are likely, associated with the operation of the Proposed Scheme.

9 Landscape and visual assessment

9.1 Introduction

9.1.1 This section of the report presents 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 just to the running of the trains but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

9.1.3 Principal landscape and visual issues in the area include:

- temporary effects to LCA and visual receptors during construction arising from the presence of construction plant and construction compounds, demolition of buildings, bridge replacements, road widening, the removal of existing trees and the closure of public open space, and traffic and pedestrian diversions; and
- permanent landscape and visual effects during operation arising from the presence of new structures in the landscape including the expansion of Euston station, the east west overbridge, the raised Hampstead Road Bridge the loss of open space and mature trees in St James's Gardens, the loss of mature trees from and changes to Euston Square Gardens, the presence of hardstanding and structures associated with the Euston portal, the addition of new public open spaces around the station, changes to the road layout, the presence of the new taxi rank in Cobourg Street, additional cycle parking, underground station entrances and emergency accesses, and the addition of the high speed railway and trains.

9.1.4 A separate, but related, assessment of effects on the setting of heritage assets is included in Section 6. Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented in Volume 5: Appendix LV-001-001, which comprises the following:

- Part 1 Engagement with technical stakeholders;
- Part 2 Environmental baseline report;
- Part 3 Assessment matrices; and
- Part 4 Schedule of not 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 the GLA, LBC and Westminster City Council. Summer field surveys, including photographic studies of LCA and visual assessment of viewpoints, were undertaken from June to October 2012 and in June 2013. Winter surveys were undertaken in December 2012 and from January to March 2013.

9.2 Scope, assumptions and limitations

9.2.1 The assessment scope, key assumptions and limitations for the landscape and visual assessment are set out in Volume 1, the SMR (Volume 5: Appendix CT-0001-000/1) and the SMR Addendum (Volume 5: Appendix CT-0001-000/2). This report follows the standard assessment methodology.

9.2.2 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV), which are shown in Maps LV-07-001 to LV-07-002a and LV-08-001 to LV-08-002a (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 and professional judgement on site has been used to refine the study area to focus on likely significant effects. Tall construction plant (e.g. cranes and piling rigs) are excluded from the ZTV for the construction phase and overhead line equipment is excluded from the ZTV for the operational phase, but these are described and taken in to account in the assessment of effects on landscape character areas and visual receptors.

9.2.3 LCA and visual receptors within approximately 500m of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at locations such as Regent's Park. At the request of stakeholders, very long distance views that include Euston have also been considered, including a number of protected vistas as defined in the London View Management Framework (LVMF)[53].

Assumptions

9.2.4 Utility works have been assessed on the available information about the scale and duration of excavations. Utilities works will be temporary in nature and are a common place occurrence in urban areas. Trees will be retained where reasonably practicable, in line with the draft CoCP (Section 12), and disturbance minimised. Where vegetation is removed, there will be appropriate replanting. Where the underground services are predicted to be large scale and will require 3m wide by 3m deep trenches, the presence of existing street trees has been noted and potential effects assessed.

Limitations

9.2.5 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 assess views from these locations.

9.2.6 The design of public realm, which includes reinstatement of Euston Square Gardens, is at a preliminary stage. The extent of public realm that forms part of the Proposed Scheme is shown on Map CT-06-001, (Volume 2, CFA1 Map Book),

[53] Greater London Authority (2012), *London View Management Framework SPG March 2012*.

9.3 Environmental baseline

Existing baseline

Landscape baseline

9.3.1 The study area is focussed on Euston station and comprises a densely developed area of central London. A varied mix of building styles, ages and layout reflects distinct development periods. The underlying topography is largely masked by urban development. However, the rising ground to the north of the station is evident in the open spaces of Primrose Hill, Parliament Hill and Hampstead Heath. Primrose Hill and Regent's Park to the north-west counterbalance the developed areas and include large expanses of parkland and mature trees. Smaller, formal squares are integrated into the fairly regular grid street pattern, including Euston Square Gardens to the south of the station and St James's Gardens to the west. Late 20th century medium and high rise residential estates are set in communal open spaces. Street trees and occasional areas of amenity planting make up the remainder of the vegetation within the study area. The A501 Euston Road, the primary road within the study area, passes to the south of Euston station. Immediately adjacent to the station are the A4200 Eversholt Street to the east and Melton Street/Cardington Street to the west. The A400 Hampstead Road, crosses over the railway corridor to the north of the station. A network of smaller residential roads provides access locally.

9.3.2 The LCA have been determined with reference to the London Landscape Framework[54]. The Proposed Scheme lies in the Hampstead Ridge Natural Landscape Area 5: the character of the area is summarised as containing (largely) Victorian terraced housing around historic settlement cores, with prominent rail and road infrastructure and extensive industrial and modern residential development.

9.3.3 Descriptions of all LCA are provided in Volume 5 Appendix LV-001-001, Part 2. For the purposes of this assessment, the study area has been subdivided into nine discrete LCA, three of which are most likely to be significantly affected. A summary of these LCAs is provided below. The LCA are shown in the MapsLV-02-001 to LV-02-002a (Volume 5, Landscape and Visual Assessment Map Book).

Euston Road Commercial Area LCA

9.3.4 The LCA includes a mixture of residential, institutional and commercial uses. The character of the area is dominated by Euston Road and the substantial scale of buildings that line it. Immediately south of the station is Euston Square Gardens, an important open space containing many mature trees, some of high quality that, together with the adjacent bus station and station forecourt buildings, overshadow the space. Euston Square Gardens, although well-maintained, are worn and often contain litter, as is typical of a heavily used urban area. The paths through the garden are busy through-routes for pedestrians and hence they have a more functional than recreational character. St James's Gardens, to the west of the station, is similarly dominated by mature trees and the surrounding built form which create a shaded space in summer and winter. St James's Gardens have a neglected air which detracts

[54] Alan Baxter, Sheils Flynn (2011), *London's Natural Signatures: The London Landscape Framework*, Natural England.

from their quality and condition. Friends House Garden, located to the south of Euston Road, is a well maintained semi-private space, with tree and shrub planting, used by the neighbouring Friends House. The 20th and 21st century development along the Euston Road and the dense urban fabric to the north and south of the road give the LCA an overwhelmingly inner city character. Overall the landscape condition is fair and the high levels of pedestrian and vehicle through traffic means that tranquillity is low. The southern part of the LCA is located in the Bloomsbury Conservation Area and the area around Cobourg Street is largely residential in scale, but due to the presence of the Euston Road, and the mixed quality, scale and style of the architecture in the area, overall, the landscape is of local value. Therefore, this area has a medium sensitivity to change.

Euston West Post-War Residential LCA

9.3.5 This area is centred on the Regent's Park Estate which is west of Hampstead Road and the railway corridor. Post-war residential apartment blocks, ranging from four to ten storeys, are the dominant built form in the area. The style of architecture is relatively consistent and there are no listed buildings within the character area. There are extensive areas of communal open space and established vegetation around the base of the buildings and these, together with street trees, provide a landscape setting for the substantial height and mass of the apartment blocks. The dense urban development, large-scale buildings and existing vegetation contain long views. The landscape condition is fair reflecting the generally good levels of maintenance of the communal gardens and streets with the poor condition of some of the local buildings. The widespread on-street parking throughout detracts from the quality and condition of the character area. Residential areas are quieter than the busy main roads, which include Hampstead Road, but overall, tranquillity is low. The landscape is of local value. Therefore, this area has a medium sensitivity to change.

Regent's Park Georgian Residential LCA

9.3.6 Located within the Regent's Park Conservation Area, this area is largely residential with villas and terraces of high architectural quality, dating from the early 19th century: many are Grade I or II listed. The architect, John Nash, drew up a masterplan for the area and although the plan was only partially implemented, the development in the LCA reflects the overall style of Nash's scheme. The buildings include a wealth of architectural details including arches, columns, pilasters, pediments, balconies and railings. They are up to four storeys high, built in stucco and stone, and front onto communal gardens. Chester Terrace overlooks Regent's Park. The combination of the distinctive architecture, the mature trees and planting in the communal gardens and the proximity to Regent's Park results in a character that is unique to this part of London. As a consequence of the area's architectural interest and its relationship with Regent's Park, the area is popular with tourists and visitors. The layout further east towards Park Village West and Park Village East is less formal with individual villas set in established mature gardens. The Regent's Park Barracks on Albany Street provides a continuous, austere brick frontage to the street. The housing, gardens and streets are well maintained and the area is of good condition. There is through traffic on Albany Street but the lack of traffic in most streets means that overall tranquillity is medium. The landscape is of regional landscape value due to its uniformly high architectural quality and consistency. Therefore, this character area has a high sensitivity to change.

Visual baseline

9.3.7 Descriptions of the identified representative viewpoints are provided in Volume 5 Appendix LV-001-001, 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 MapLV-03-001 to LV-03-002a and LV-04-001 to LV-04-002a (Volume 2, CFA1 Map Book). In each case, the middle number (xxx.x.xxx) identifies the type of receptor that is present in this area – 1: Protected views, 2: Residential, 3: Recreational, 4: Transport and 6: Employment.

9.3.8 Protected views identified within the study area include protected vistas identified in the London View Management Framework Supplementary Planning Guidance (SPG)[55] and designated views on the Camden Local Development Framework (LDF)[56] and Westminster LDF proposals map[57] and include: 5A.2, The General Wolfe statue – Greenwich Park, 6A.1, The Point – Blackheath Point as well as 4A.1, The Summit – Primrose Hill (reported in CFA3 Primrose Hill to Kilburn) and 2A.1, 2A.2 and 2B.1, The Summit – Parliament Hill (reported in CFA2 Camden Town and HS1 Link). The locations are shown in Maps LV-05-001, LV-05-002 and LV-05-003 (Volume 5, Landscape and Visual Assessment Map Book).

9.3.9 Protected views have also been identified in the conservation area appraisals for Regent's Park[58]; Camden Town[59]; Bloomsbury[60]; Primrose Hill[61] and Regent's Canal[62]. Specific designated views within the study area for CFA1, with views towards the Proposed Scheme in the Camden Town Conservation Area statement include:

- views west along Parkway towards Regent's Park, with views from the junction of Delancey Street and Parkway across the existing railway cutting to Park Village East; and
- panoramic views from the west end of Delancey Street along Mornington Terrace across the existing railway cutting to the south, with the housing blocks of the Regent's Park Estate in the middle ground and the West End skyline, including the Euston and BT towers, in the background.

9.3.10 The following views are designated as important views in the Regent's Park Conservation Area statement:

- views of Chester Terrace from Chester Road and from Chester Place;
- views from Mornington Street to Park Village East; and
- views towards St Katherine's, the Danish Church, with its spires and precinct.

[55] Mayor of London (2012), *London View Management Framework, Supplementary Planning Guidance.*
[56] London Borough of Camden, *Local Development Framework Proposals map*: http://gis.camden.gov.uk/geoserver/LDF.html Accessed July 2013.
[57] Westminster City Council, *Local Development Framework Proposals map*: http://www3.westminster.gov.uk/maps/index_udp.cfm Accessed September 2013.
[58] London Borough of Camden (2011), *Regent's Park Conservation Area Appraisal and Management Strategy*.
[59] London Borough of Camden (2007), *Camden Town Conservation Area Appraisal and Management Strategy*.
[60] London Borough of Camden (2011), *Bloomsbury Conservation Area Appraisal and Management Strategy*.
[61] London Borough of Camden (2001), *Primrose Hill Conservation Area Statement, January 2001*.
[62] London Borough of Camden (2008), *Regent's Canal Conservation Area Appraisal, September 2008*.

9.3.11 Residential receptors have a high sensitivity to change and are located close to and on both sides of the existing railway line, with some framed views along streets looking towards Euston station. In addition, some more distant views are possible from apartment blocks to the west of the study area. Existing views are all urban in character and typically include housing, office blocks and railway or road infrastructure. The dense urban development locally limits the extent of the views.

9.3.12 Recreational receptors, also with a high sensitivity to change, include users of Friends House Garden, Euston Square Gardens and St James's Garden. Views are generally close, with trees and open space in the foreground, looking across roads towards the existing buildings beyond.

9.3.13 People walking or cycling through residential streets have a medium sensitivity to change, but drivers and travellers on busy main roads, including Euston Road and Hampstead Road have a low sensitivity to change.

9.3.14 Employment receptors have a low sensitivity to change. Commercial uses are present throughout the study area but with a higher concentration close to the station building at Euston and along Euston Road. Views are characterised by the central London setting with busy thoroughfares, high rise buildings and some street trees.

Future baseline

9.3.15 A summary of the committed developments which are likely 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 that would introduce new visual receptors and may be significantly affected are also described. These developments are shown in Volume 5, Appendix CT-004-000.

Construction (2017)

9.3.16 There is a number of mixed use and residential developments within the study area which it is assumed will be built and occupied by 2017. They include: redevelopments at 117 Euston Road; 1 Mabledon Place; the corner of 24-36 Bidborough Street and Judd Street; adjacent to the British Library between Ossulston Street and Midland Road; at Charrington Street and a number of mixed use development within the King's Cross Growth Area. These developments would largely replace buildings of similar type and use or be additions to areas with buildings of a comparable scale and design. They would be largely characteristic of their setting. Overall, there would be no change to the overall sensitivity of the LCA.

9.3.17 In each case the future developments would replace existing buildings or would be in an area where visual receptors have already been identified. Therefore they would not affect existing views and would not generate new visual receptors by 2017.

Operation (2026)

9.3.18 There are further mixed use and residential developments within the study area which it is assumed would be built and occupied by 2026. They are located in the King's Cross Growth Area LCA. These developments would be additions to areas with existing buildings of a comparable scale and design and hence are largely

characteristic of their setting. They would not change the overall sensitivity of the LCA.

9.3.19 Since in each case the future developments would replace existing similar buildings or would be in an area where visual receptors have been already identified, they would not affect existing views and would not generate new visual receptors by 2026.

9.4 Temporary effects arising during construction

9.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible in many locations and will have the potential to give rise to significant temporary effects which cannot be mitigated practicably. Such effects are temporary and vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works will take place, including the establishment of compounds, tunnelling, main earthworks, structure works and construction of Euston station.

9.4.2 The effects associated with the peak construction phase in the Euston area are generally considered to be long term, given the length of the construction programme (see Section 2.3). The majority of the main and satellite compounds will be in place for the whole of construction period between 2016 and 2026. Exceptions that are relevant to the landscape and visual topic are Mornington Street Bridge satellite compound (approximately four years), Lancing Street satellite compound (approximately six years) and Hampstead Road Bridge east (south) satellite compound (approximately six years). The majority of civil engineering works at Euston station and along the station approach may individually take between 18 months and six years (in the case of Hampstead Road Bridge) in the period 2016 to 2022. The Euston Square connection and refurbishment of the existing part of the Euston station occur later in the programme, for the most part between 2022 and 2025. Effects after 2023 are likely to be reduced due to less construction equipment being required at that time and a reduced intensity of construction activity.

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

- construction of the entrance to Euston Square underground station on Gordon Street;
- underground utility diversion works;
- demolition of the western side of the existing Euston station building, including part of the parcels deck;
- demolition of commercial buildings including Grant Thornton House, One Euston Square, Walkden House, Wolfson House and small hotels and residences to the south and south-west of Euston station;
- demolition of the former underground station entrance on the corner of Melton Street and Drummond Street, Hotel Ibis, 1 and 3 Cobourg Street, Thistle Euston Hotel, the National Temperance Hospital, the power signal box,

the former BHS Ltd offices and distribution centre at 132-140 Hampstead Road, and the disused fuel filling station at 142 Hampstead Road;

- to the north-west of the station, demolitions include properties in the Regent's Park Estate including Silverdale, Ainsdale and Eskdale, Stalbridge House, and the carriage shed on Granby Terrace;
- to the east of the station and railway, demolition of the Royal Mail NW1 delivery office and the portable offices in the Addison Lee vehicle storage compound;
- loss of trees and open space within Euston Square Gardens, construction of a linear bus station north of Euston Square Gardens, and relocation of the war memorial and the Robert Stephenson statue in the Euston station forecourt;
- loss of trees and open space within St James's Gardens;
- loss of street trees along Euston Road, Cobourg Street and Eversholt Street;
- widening and reconfiguration of Cobourg Street;
- extension of Euston station to the west for the high speed platforms and larger concourse, including excavation of material, construction of retaining walls and northern entrance forecourt;
- construction of the east west overbridge between Eversholt Street and Hampstead Road and the service deck access bridge from Eversholt Street;
- demolition and reconstruction of bridges crossing the railway line, including the Hampstead Road, Granby Terrace and Mornington Street bridges;
- construction of Park Village East barrette retaining wall, including piling works and parapet reinstatement;
- construction of the Euston portal, including excavation and piling works; and
- construction of a portal headhouse in the railway cutting adjacent to Park Village East.

Avoidance and mitigation measures

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

- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds (draft CoCP, Section 12);
- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction (draft CoCP, Section 12);
- use of well-maintained hoardings and fencing (draft CoCP, Section 5);

- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles and machinery (draft CoCP, Section 12);
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses (draft CoCP, Section 5); and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works (Section 12).

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

Assessment of temporary impacts and effects

9.4.6 The most apparent changes to landscape character and viewpoints during construction will relate to the presence of construction plant and the removal of existing landscape elements, including the demolition of buildings and the loss of existing trees. Changes will be marked adjacent to the existing railway corridor and Euston station, most notably between Melton Street and Cobourg Street, with the demolition of existing buildings, extension and remodelling of Euston station, and entire closure of St James's Gardens to accommodate the National Temperance Hospital main construction compound. To the south of Euston station, demolitions and the use of Euston Square Gardens for satellite construction compounds will limit access and directly affect the gardens. Additional notable changes will occur in the Regent's Park Estate, west of Hampstead Road, at Park Village East and Mornington Terrace, with further demolitions and the construction of the tunnel portal, the construction of the east west overbridge and replacement bridges in this section of the route. The height of the construction plant and the close proximity of construction activities to viewpoints, particularly where existing buildings have been removed, will allow direct views of construction activity.

9.4.7 The effect of works associated with underground utilities has been assessed. Works may affect existing street trees along Eversholt Street, Phoenix Road, Chalton Street, Melton Street, Cobourg Street, Robert Street, Varndell Street, Harrington Street, Albany Street, Regent's Park adjacent to the London Zoo coach and car park, Harrington Square Gardens, Ampthill Estate and Mornington Terrace. Utility works will be temporary in nature and are a common occurrence in urban areas. Trees will be retained where reasonably practicable, in line with the draft CoCP (Section 12), and disturbance minimised. Where vegetation is removed, there will be appropriate replanting.

Landscape assessment

9.4.8 The following section describes the likely significant effects on landscape character areas 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-001-001, Part 4.

Euston Road Commercial Area LCA

9.4.9 The Proposed Scheme will introduce large-scale construction activity into this LCA associated with the extended and remodelled Euston station and the new entrance to

Euston Square underground station on Gordon Street. Construction activities will include the demolition of commercial and residential properties and the removal of street trees along Melton Street and Cobourg Street. Mature trees will also be removed along Euston Road, within Euston Square Gardens and St James's Gardens to facilitate below ground works. Public access to Euston Square Gardens will be limited during construction and St James's Gardens will be closed. Large-scale piling works for the construction of new retaining walls will take place to the west of the existing station in order to construct the high speed platforms.

9.4.10 The prominent, large-scale and intense construction activities will not be in keeping with the context of the domestic character of sections of Cobourg Street and neighbouring streets. The scale of the construction activity along Euston Road will be less apparent given the substantial width of the Euston Road, the prominence of traffic movements using the road and the large scale of the existing buildings that line it.

9.4.11 Construction sites are a common feature in central London. However, the increase in vehicle movements and activity will markedly reduce tranquillity locally within the residential areas, but not within the context of Euston Road.

9.4.12 While construction activities will be prominent, impacts will be limited to parts of the LCA adjacent to the existing station. However, construction will result in the removal of characteristic elements within the LCA. Therefore the overall magnitude of change is considered to be high.

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

Euston West Post-war Residential LCA

9.4.14 Activities within this LCA will include the demolition of post-war residential blocks to the west of the railway corridor and north of Cardington Street, including the Eskdale, Ainsdale and Silverdale blocks, as well as Stalbridge House, the power signal box and former BHS offices and distribution centre. Some existing areas of vegetation, including trees and shrubs around the residential blocks and street trees, will be removed as a part of the construction works. It has been assumed that street trees will be removed on Robert Street, Varndell Street, Harrington Street and Albany Street as a result of utility diversion works. Other construction works will include the east west overbridge, the demolition and reconstruction of the Hampstead Road Bridge and the Granby Terrace Bridge. Other elements of the Proposed Scheme will be constructed at a lower level than the surrounding land, within the railway corridor. These will require the excavation of material, followed by the installation of piled retaining walls along the west side of the station and the station approach. The lower level of the route, together with the dense urban development around the construction works will contain impacts locally.

9.4.15 Only a small part of the LCA will be directly affected by construction. However, the diversions and temporary road closures will affect a wider area due to the impact upon vehicular and pedestrian access required by the diversion of these routes and the presence of construction traffic on the smaller roads within the Regent's Park Estate. The increase in activity and lighting caused by the construction works will markedly reduce tranquillity in the LCA.

9.4.16 The construction works will take place adjacent to a busy railway corridor. However, the large scale of the construction activities will require the removal of characteristic elements including a number of existing buildings, street trees and communal gardens associated with the high rise residential blocks. Construction compounds and bridge works will be prominent.

9.4.17 Construction impacts will be limited to a small part of the LCA adjacent to the existing station and railway corridor, the magnitude of change overall is still considered to be high.

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

Regent's Park Georgian Residential LCA

9.4.19 Construction within and immediately adjacent to this LCA will include the construction of the tunnel portal, the demolition and reconstruction of the Mornington Street Bridge and the reconstruction of the retaining wall (including piling) along Park Village East. The majority of the LCA is located to the west of Park Village East and will not be directly affected by the Proposed Scheme.

9.4.20 At the Euston portal, the existing railway is in cutting about 10m below street level. A portal headhouse will be built above the western high speed track (northbound), immediately south of the tunnel entrance. The roof of the headhouse will provide a proportion of the emergency parking required at the portal, with the road along Park Village East providing the remainder. As part of the construction of the retaining wall along Park Village East, phased closure of the road will be required. Pedestrian and emergency access will, however, be maintained. The raised planter and associated shrubs and semi-mature trees on the eastern edge of Park Village East will be removed.

9.4.21 The increase in traffic movements and activity associated with the construction works will noticeably reduce tranquillity locally within the LCA.

9.4.22 The impacts will be limited to the areas of the LCA immediately adjacent to the existing railway corridor. The construction activity will result in the removal of existing trees and shrubs in the raised planted strip along Park Village East and will introduce large-scale construction plant adjacent to domestic buildings. The removal of trees will result in the loss of a key characteristic of the Regent's Park conservation area. However, as the extent of construction impacts will be limited to Park Village East, the overall magnitude of change is considered to be medium.

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

Visual assessment

9.4.24 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken during winter, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, will be in leaf. Where residential 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-001-001 Part 4.

9.4.25 The number identifies the viewpoint locations which are shown on Maps LV-03-001 to LV-03-002a (Volume 2, CFA1 Map Book). In each case, the middle number (xxx.x.xxx) identifies the type of receptor that is present in this area – 1: Protected views, 2: Residential, 3: Recreational, 4: Transport, 6: Employment.

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

9.4.27 In most cases, additional lighting is not considered to give rise to significant effects due to the widespread presence of existing lighting in the urban areas. Where there will be no direct foreground visibility of additional lighting, no further assessment has been undertaken.

Viewpoint 001.4.001: View looking north along Gordon Street in front of University College London

9.4.28 The Proposed Scheme will be located approximately 75m north from this viewpoint. The hoarding and double-stacked portable cabins at the Euston Road subway satellite compound will be prominent in the foreground of the view together with large construction plant. The removal of trees in Euston Square Gardens, which currently form the background of the view, together with the demolition of Grant Thornton House and One Euston Square will result in the alteration to key characteristics of the view. Overall, the magnitude of change is considered to be medium.

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

Viewpoint 001.4.002: View looking north from the corner of Euston Road and Gordon Street

9.4.30 Construction activities and the presence of large plant associated with the Euston Road subway and Euston Square connection will dominate the foreground, although they will be viewed in the context of traffic along Euston Road. The removal of the mature trees in Euston Square Gardens and along Euston Road will substantially open up the view, increasing the prominence of large construction plant in Euston Square Gardens and Melton Street. Similarly, the demolition of Grant Thornton House and One Euston Square will open views northwards. Melton Street will be closed and hoardings along the eastern façade of 1 to 9 Melton Street and the western section of Euston Square Gardens will partially screen views of construction activity from street level. Open and elevated views of the construction activity will be possible from Drayton House and the Wellcome Research Institute (four to six storeys high). Overall, there will be a high magnitude of change.

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

Viewpoint 001.2.008: View looking north and east from Cobourg Street

9.4.32 The expanded station footprint will extend along the east side of Cobourg Street, adjacent to this viewpoint. The view from the four storey residential properties and the Exmouth Arms public house looking east will be dominated by the hoarding at lower levels and large-scale construction plant above. Pedestrians on Cobourg street will have framed views northwards with hoardings in the foreground. The demolition of existing buildings, including the Ibis Hotel, 1 and 3 Cobourg Street and the removal of trees in St James's Gardens will open up views of construction activity, substantially changing the existing view. This will result in a high magnitude of change.

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

9.4.34 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.2.009: View east from North Gower Street looking along Starcross Street

9.4.35 Views from the four storey residential properties on North Gower Street and Starcross Street will remain largely screened by existing buildings. There will be framed views of the edge of the construction site, bounded by hoardings in the middle ground of the view (approximately 55m from the viewpoint). Demolition of the buildings on Cobourg Street will be noticeable but will not substantially change the view from the properties, (approximately 100m from the viewpoint). Cranes and other tall plant will be visible in the background above intervening buildings. Overall, the magnitude of change is considered to be medium.

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

9.4.37 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.2.015: Views east along Robert Street

9.4.38 The demolition of the National Temperance Hospital will open up views eastwards with glimpsed views of cranes also possible in the background. The removal of trees within St James's Gardens in the background of the view will also be apparent. Hoardings will be erected in front of the National Temperance Hospital to demarcate the working area, screening views at ground level but views of the multi-storey portable cabins will be possible. Limited, oblique views of the construction activities may be possible from the Woodhall residential block. It has been assumed, that there is a possibility of the loss of street trees resulting from utility diversion works along Robert Street, which will open up views towards the Proposed Scheme from a limited number of flats in Woodhall and for users of Robert Street resulting in an overall medium magnitude of change.

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

9.4.40 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.2.016: View east from Hampstead Road, near the Tarns and Rydal Water apartment blocks

9.4.41 The National Temperance Hospital main compound will be located approximately 40m from this viewpoint. The views from The Tarns and Rydal Water residential blocks, the community centre and pedestrians on Hampstead Road will be towards the four storey temporary site offices and site hoardings which will partially screen views of the works beyond. The construction compound will be highly visible, emphasised by the loss of vegetation in the communal gardens, but will be of a similar scale to the existing buildings. Cranes will also be visible in the background above intervening buildings. Overall, the magnitude of change is considered to be medium.

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

9.4.43 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.2.017: Views north and north-east from Staveley and Waterhead residential blocks on Varndell Street

9.4.44 There will be direct views north, along Harrington Street, of construction works from the residential flats located on Varndell Street framed by existing buildings. The works associated with Hampstead Road Bridge will be visible from the Waterhead block, emphasised by the removal of trees in the communal gardens to the north-east. The foreground of the view is open along Harrington Street, with the edge of the construction works highly visible in the middle ground and background. From the upper floors of flats on Varndell Street, cranes will be visible in the middle and background of the view largely above intervening buildings. The demolition of buildings and the loss of trees will represent a substantial change but partly filtered by built form in the middle ground of the view. Overall, the magnitude of change is considered to be medium.

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

9.4.46 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.2.020: View looking north-east from Langdale residential block and Augustus House

9.4.47 The Proposed Scheme will be located approximately 20m from this viewpoint. There will be close and direct views from the eight to ten storey modern flats, including Langdale and Augustus House, on Stanhope Street. Construction works, including the demolition of existing high rise apartment blocks and the removal of vegetation will be highly visible in the foreground. Cranes will also be prominent in the middle ground and background above intervening buildings. Overall, due to the major alteration to the key characteristics of the view the magnitude of change is considered to be high.

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

9.4.49 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.3.021: View east from St James's Gardens and 106-108 Hampstead Road

9.4.50 This viewpoint is representative of views at ground level from St James's Gardens and from buildings immediately adjacent to the National Temperance Hospital main compound. The public will not be able to use the gardens during the construction works. However, the construction works will be visible from the rear of the three and four storey neighbouring properties. The trees in St James's Gardens in the middle and background of the view will be lost, which will open up views of construction activity. Views from the upper floors will be direct and close of the construction compound and works to the western edge of Euston station, but views from lower floors will be partially screened. The National Temperance Hospital buildings will be demolished, but will be replaced, in part, by four storey portable buildings during the construction works. The loss of key characteristics of the view will result in a high magnitude of change.

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

9.4.52 At night, continuous lighting is proposed at the construction compound. St James's Gardens and surrounding areas are already lit but the dense tree canopy associated with the gardens limits the light spread. The loss of trees will open views towards the construction activity and associated lighting. Therefore, the magnitude of change to this receptor at night is considered to be medium, resulting in a moderate adverse effect.

Viewpoint 001.2.022: View looking east from the front of Cartmel, Coniston and Newlands residential blocks

9.4.53 There will be close and direct views from the residential blocks, in particular Cartmel which has seven storeys. The removal of trees to the east of Cartmel and Coniston will open up views of the construction works. The close proximity of the construction activity and hoardings associated with the Hampstead Road Bridge replacement works will be prominent in the foreground from the upper floors of the apartment blocks. Newlands is set slightly west of the Granby Terrace Bridge satellite compound and will benefit from some screening provided by existing vegetation. Cranes will be visible in the middle ground and background above intervening buildings. Overall, the magnitude of change is considered to be high.

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

9.4.55 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 001.6.024: View east from 1 to 9 Melton Street

9.4.56 The views from the upper floors of 1 to 9 Melton Street are close and will be direct and open towards construction works. The removal of the mature trees in Euston Square Gardens and along Euston Road, to facilitate the construction of the bus station and Euston Road subway and Euston Square connection, will open up views of the construction activity and will remove a key characteristic of the view. Currently, views are filtered through the trees. Additionally, the demolition of Grant Thornton House and One Euston Square will open up views eastwards towards Euston station and the main construction site. Melton Street will be closed and hoardings in front of the eastern façade of 1 to 9 Melton Street and encompassing the Euston Square Gardens (west) satellite compound will partially screen some of the construction activity and large-scale construction plant from street level. Overall, the magnitude of change is considered to be high.

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

Viewpoint 002.3.001: View north from Friends House Garden and from offices in adjacent buildings

9.4.58 The nearest part of the Euston Square Gardens, west and east satellite construction compounds will be located less than 50m from this viewpoint. There will be direct and close views of construction works from Friends House Garden, Friends House and from commercial offices at 161 to 169 Euston Road. The removal of the mature trees in the western part of Euston Square Gardens will substantially change the existing view and increase the prominence of any construction plant in the construction compound. Trees will be retained where reasonably practicable. In particular, trees along Euston Road will be retained in the eastern part of the gardens, partially filtering views of the construction compound to the north. The demolition of the Grant Thornton Building and One Euston Square will open up views of large-scale construction plant and buildings beyond. The lodges and The Podium will remain. Views from the offices are close and elevated (from four to six storeys high): the construction site will be visible over the busy Euston Road. Overall, this will result in a high magnitude of change.

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

Viewpoint 002.6.002: View north-west from Euston Fire Station

9.4.60 There will be direct and close views of construction works from the Euston Fire Station across the busy Eversholt Street. Trees lining Eversholt Street, within Euston Square Gardens, will be retained partially filtering views of the Euston Square Gardens (east) satellite compound in the middle ground. Cranes and other large plant will be visible in the background above intervening trees, where retained, and buildings. Therefore, views of construction activities will be partially filtered by intervening vegetation; the magnitude of change is considered to be medium.

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

Viewpoint 002.2.007: View west from Eversholt Street, between Phoenix Road and Polygon Road

9.4.62 The Proposed Scheme will be located approximately 10m from this viewpoint across the busy Eversholt Street. There will be direct and close views of construction works at the edge of Euston station from the residential and other properties located on Eversholt Street. The possible loss of trees resulting from utility diversion works and the demolition of the existing Royal Mail NW1 delivery office will open views west towards the construction activity. The presence of a satellite compound will replace the utilitarian Royal Mail building in the foreground of the view. Large plant and cranes will be visible in the background of the view. Overall, the magnitude of change is considered to be medium.

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

9.4.64 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 002.3.011: View north from Euston Square Gardens

9.4.65 The Euston Square Gardens (east and west) satellite construction compounds will be located adjacent to this viewpoint. The lodges and The Podium will remain. There will be direct and close views of the construction works from the pedestrian routes across Euston Square Gardens. Views at ground level will be limited by 2.4m high hoarding in the foreground but, above the hoardings, Euston station will be visible in the middle ground. The removal of the mature trees in both parts of Euston Square Gardens will substantially change the existing view, increasing the prominence of large construction plant in the satellite compounds. The demolition of the Grant Thornton House and One Euston Square will open up views towards Euston station working area resulting in a high magnitude of change.

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

Viewpoint 002.2.014: View south and west from apartments on Barnby Street

9.4.67 There will be direct and close views of demolition of the Royal Mail NW1 delivery office and satellite compound, due to the removal of street trees on Barnby Street and adjacent to the railway corridor. There will be oblique views, largely from the upper floors, of piling works, the demolition and replacement of Hampstead Road Bridge and the demolition of buildings on Hampstead Road in the background. Construction activities associated with the east west overbridge and service deck access bridge will be visible in the foreground and middle ground of the views but viewed in the context of the working railway corridor and existing light industrial landuse. Overall, the magnitude of change is considered to be medium.

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

9.4.69 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 003.2.001: View east from Augustus Street

9.4.70 The Proposed Scheme will be located approximately 80m from this viewpoint. There will be framed views towards the construction activity. In the foreground, they will be partially screened by existing buildings and vegetation. The demolition of residential blocks in the middle ground of the view will open up views eastwards. From upper floors, views of large plant will be evident in the background of the view. Overall, the magnitude of change is considered to be medium.

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

9.4.72 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 003.2.002: View east from dwellings on Park Village East (between Granby Terrace and Mornington Street Bridge)

9.4.73 Works for the Proposed Scheme will be located less than 10m from the dwellings along Park Village East and there will be direct and close views of construction works. The demolition of the carriage shed, removal of tree and shrub planting and the replacement of Granby Terrace Bridge will open up views of large construction plant in the foreground and middle ground of the view. Views of the piling works associated with the construction of the retaining wall along Park Village East and the demolition and construction of Mornington Street Bridge will be close and direct. The presence of hoardings and movement of plant and equipment will be prominent in the foreground of the view. Overall, the construction activities will be highly visible, large scale and prominent in the foreground of the view. Therefore, the magnitude of change is considered to be high.

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

9.4.75 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 003.2.010: View looking east from dwellings on Park Village East (between Mornington Street Bridge and Parkway)

9.4.76 The Proposed Scheme will be located less than 10m from the dwellings on Park Village East. The existing raised planter and associated tree and shrub planting will be removed, opening up views of the construction activity. There will be direct and close views from the dwellings on Park Village East of the piling and other construction activities associated with the retaining wall in the foreground of the view and the construction of the tunnel portal, headhouse and hardstanding, track works and replacement of Mornington Street Bridge in the middle and background of the view. A 2.4m high hoarding will be prominent in the foreground and will screen the construction works from ground level during the phased closure of the road. Overall, the magnitude of change will be high.

9.4.77 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a marked deterioration in the existing view, and therefore a major adverse effect.

9.4.78 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 004.2.004: View west from Dalehead, Gillfoot and Oxenholme apartments

9.4.79 The Proposed Scheme will be located adjacent to this viewpoint. There will be close and direct views of construction work in the foreground from Dalehead, Gillfoot and Oxenholme tower blocks. Views from Ampthill Square will be partially screened by adjacent buildings and existing vegetation. There will be two satellite compounds east of the railway cutting, one north of Hampstead Road and the other south, for the reconstruction of Hampstead Road Bridge. The construction works will include the removal of the Addison Lee vehicle compound and associated temporary buildings, some existing trees and shrubs in the Ampthill Estate and along Hampstead Road Bridge, opening views of the construction activity from the ground level and lower floors. Construction activity associated with the bridge works will be highly visible in the foreground and middle ground of the view (see Figure LV-01-269, Volume 2, CFA1 Map Book). In the background, the demolition of blocks in the Regent's Park Estate will also be visible. Overall, 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 a major adverse effect.

9.4.81 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 004.2.005: View south-west from Mornington Crescent (numbers 1 to 12) and Hampstead Road (numbers 261 to 263)

9.4.82 The Proposed Scheme will be located adjacent to this viewpoint. There will be direct and close views of construction works from the rear of dwellings located on Mornington Crescent. These will include views of the demolition and reconstruction of Hampstead Road and Granby Terrace bridges in the middle ground and the demolition of the carriage shed in the background of the view. The loss of the Addison Lee compound will not represent a substantial change in the view. Overall, the magnitude of change is considered to be high.

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

9.4.84 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 004.2.007: View west from Mornington Terrace

9.4.85 The Proposed Scheme will be located less than 10m from the dwellings on Mornington Terrace with direct and close views of construction works from Mornington Terrace and Clarkson Row. There will be oblique views of the construction of the tunnel portal and demolition and the replacement of Mornington Street Bridge. There will also be direct views of the piling and other works associated with the retaining wall on Park Village East and the demolition of the carriage shed in the middle ground. The rail systems works will also be visible in the foreground and middle ground. The parapet wall and street trees on Mornington Terrace will be

largely unaffected, with the exception of the wall and trees adjacent to Mornington Street Bridge satellite compound, which will be removed. Overall, the magnitude of change is considered to be high.

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

9.4.87 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 004.1.008: View west from Mornington Street and Mornington Terrace

9.4.88 Views from Mornington Street will be close and direct towards construction works. The Mornington Street Bridge satellite compound will be located less than 10m from this viewpoint; hoardings will be prominent in the foreground and will screen some of the construction activity from street level. However, views of the satellite compound and large-scale construction plant will be possible, albeit against the backdrop of the existing busy railway corridor. Therefore, the magnitude of change is considered to be medium.

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

Viewpoint 004.1.010: View west from the corner of Delancey Street and Mornington Terrace

9.4.90 The Proposed Scheme will be located approximately 30m to the south-west of the viewpoint. Views from Mornington Terrace will be partially screened by the existing parapet wall with the majority of the construction activity at a lower level within the railway corridor. Views west from the Edinboro' Castle public house and adjacent dwelling, across the railway corridor, will be direct of the tunnel portal and oblique of the retaining wall works associated with Park Village East. Views from properties on Delancey Street and Mornington Terrace will be partially screened by intervening trees and buildings. The construction plant and Mornington Street Bridge satellite compound will be prominent but seen against the backdrop of the existing busy railway corridor. Therefore, the magnitude of change is considered to be medium.

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

9.4.92 Effects at night will be non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Cumulative effects

9.4.93 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 those completed by 2017 will form part of the baseline for the construction of the Proposed Scheme. The cumulative effects of these developments on LCA and viewpoints are described below. The developments are shown on Map CT-13-001- to CT-13-003a (Volume 5, Cross Topic Appendix 1 Map Book).

9.4.94 Three large-scale mixed use schemes in the King's Cross Growth Area are likely to be under construction between 2017 and 2026. Although these developments would take place fairly close to the route of the Proposed Scheme, site investigation has indicated that any visibility of construction activity indicated on the ZTV would, in fact, be screened by dense intervening development and vegetation.

9.4.95 The combined presence of construction activity and plant from the King's Cross Growth Area developments and the construction of the Proposed Scheme will not change the assessment for receptors identified as not significantly affected by the construction of the Proposed Scheme on its own.

Other mitigation measures

9.4.96 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 detailed design stage. This may include consideration of early planting in ecological mitigation sites which would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be practicably mitigated due to the visibility of construction activity and sensitivity of surrounding receptors. Therefore no other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

9.4.97 As no other mitigation measures are considered practicable, the temporary residual significant effects during construction remain as described above. However, these effects will be largely temporary and reversible in nature lasting only for the duration of the construction works. Any residual effects will generally arise from the widespread visibility of construction activity and construction plant and structures within the landscape and viewed from surrounding residential and commercial properties visible to users of footways in 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 includes, ordered from south to north:

- the loss of mature trees from Euston Square Gardens and St James's Gardens;
- the entrance to Euston Square underground station located on Gordon Street;
- the restored Euston Square Gardens and upgraded bus station, including a bus access route via Melton Street replacing the existing route through the centre of the gardens, and the relocation of the war memorial and statue of Robert Stephenson;
- the realignment and widening of Cobourg Street, to incorporate a taxi rank and drop-off/pick-up points and a north-south cycle route;
- St James's Gardens, which will be reduced in size by approximately 80% and incorporated into the northern entrance forecourt;

- the extended and remodelled Euston station on the western side of the existing station will extend approximately 75m to the west of the existing station, with a variable roofline that is approximately 35m high at its highest point. A forecourt at the northern entrance will include the restored part of St James's Gardens, covered cycle parking and new tree planting;
- the introduction of the east west overbridge for pedestrians and cyclists, which will provide a connection between Hampstead Road to Eversholt Street;
- the reconstructed and slightly realigned Hampstead Road Bridge;
- the proposed open space north of Langdale on the Regent's Park Estate;
- the reconstructed and realigned Granby Terrace Bridge;
- the reconstructed parapet wall and planting along Park Village East;
- the reconstructed Mornington Street Bridge; and
- the Euston portal and associated headhouse at Park Village East.

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 will be incorporated into the design of the Proposed Scheme include:

- creation of a unified station frontage onto Euston Road as a result of high quality architectural design and the demolition of Grant Thornton House and One Euston Square;
- the retention of the existing Euston station facing Eversholt Street, apart from the concourse, which will be integrated with the high speed part of the station constructed to the west;
- the retention of buildings, including 1 to 9 Melton Street, 1 Eversholt Street (The Tower and The Podium), Euston House, 1 Park Village East (the Old Riding School), the York and Albany public house and 119 to 125 Parkway;
- the introduction of a new public space including a multi-use games area and children's play area and associated planting north of Langdale, as part of the mitigation for the partial loss of St James's Gardens;
- the creation of a public space at the northern entrance to the station, incorporating pedestrian and cycle facilities, green space and planting, on part of the site of St James's Gardens;
- the restoration of Euston Square Gardens with a larger forecourt, bus station and open space in front of the station. The bus station access will be moved from the middle of the gardens to Melton Street and the design allows the creation of a continuous public space, including the relocated war memorial

and statue of Robert Stephenson, the two lodges (retained in their current position) and the listed railings that enclose the gardens;

- the introduction of new planting where the east west overbridge meets Eversholt Street;
- the replacement of parapets with appropriate brick finishes and reinstatement of planting along Park Village East; and
- the replacement of trees, where possible, along Euston Road and Eversholt Street and in Euston Square Gardens, St James's Gardens and in the proposed open space north of Langdale.

9.5.3 These measures have been taken account of in the assessment of the operational effects as follows.

Assessment of impacts and effects

9.5.4 The likely effects on landscape character and viewpoints during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the presence of the large-scale, extended Euston station, particularly where it will be in close proximity to smaller residential scale properties; the permanent loss of the majority of St James's Gardens, although it is replaced by other forms of public realm; the permanent loss of buildings and widening of the railway corridor in the Regent's Park Estate; and the changed relationship between the residential blocks and the raised Hampstead Road Bridge.

Landscape assessment

9.5.5 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-001-001, Part 4.

9.5.6 The assessment of effects in year 15 has assumed that proposed planting has matured. The assessment of effects in year 60 assumes all planting has reached its fully mature height.

Euston Road Commercial Area LCA

9.5.7 Within this LCA, the Proposed Scheme will comprise the realignment of Cobourg Street, the extended and remodelled Euston station, the main forecourt and restored Euston Square Gardens and the new northern entrance forecourt. Smaller features will include a vent building for Euston underground station at the south end of Cobourg Street and a new entrance to Euston Square underground station in Gordon Street. All of these will form key elements within the LCA.

9.5.8 Certain elements of the Proposed Scheme will have a positive impact on the character of parts of this LCA, including:

- the remodelling and extension of the main station forecourt, including hard and soft landscaping extending along the whole station frontage through to the realigned Cobourg Street;

- improved accessibility of the station forecourt achieved by removing steps and barriers to allow better pedestrian circulation and way finding;
- creation of pedestrian access routes linking across to Euston Square Gardens;
- provision of a new east west overbridge originating at the northern entrance forecourt, creating a new public space incorporating part of the St James gardens;
- the restoration of Euston Square Gardens, including replacement tree planting and associated public realm improvements. The relocation of the bus access to Melton Street will also unite the gardens into a single space; and
- the provision of active frontages along the western station façade which will be representative of regeneration in the area, creating more pedestrian activity, but also potentially adversely affecting the tranquillity of the local area.

9.5.9 However, these positive elements will also be set in the context of other substantial changes within the LCA which will have a more notable effect on the character of the area, including:

- the remodelled and extended Euston station, which will have a footprint approximately a third greater than at present. The maximum height of the station will be 60m AOD, about 35m higher than existing street level. The height limit will also apply to the western façade of the station along Cobourg Street, but it is anticipated that the average height here will be lower and not uniform. The overall scale of the station will be considerably larger than the surrounding built elements, resulting in the loss of the existing smaller scale street pattern;
- the realignment and widening of Cobourg Street will incorporate taxi facilities, vehicular drop-off/pick-up points, introducing a wider highway into the area with greater levels of vehicular movement;
- the inclusion of additional structures within Euston Square Gardens, including an emergency access to the underground station and cycle stands;
- the permanent loss of a large proportion of St James's Gardens; and
- loss of street trees along Melton Street, Cardington Street and Eversholt Street.

9.5.10 Overall some parts of the character of this area will be improved, the Proposed Scheme will result in the introduction of prominent new elements into the LCA. The station expansion will alter the pedestrian and vehicle movement patterns locally through the presence of the station entrances along the western façade. There will be a local reduction in tranquillity of the LCA as a result of the increase in pedestrian activity and taxis along Cobourg Street. The reinstated St James's Gardens will incorporate a smaller area of open green space adjacent to the northern entrance forecourt and new taxi provision.

9.5.11 The restored Euston Square Gardens will offer the opportunity to unite the two halves of the gardens and enhance the setting of the lodges and link to the enlarged public realm associated with the station forecourt. However replacement tree planting will not be of sufficient stature in year 1 to replace the existing trees.

9.5.12 Overall, on the basis of the level of detail the design proposals are currently at, the magnitude of change is considered to be medium.

9.5.13 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. The magnitude of change when built will be dependent on the final architectural and landscape design.

9.5.14 By year 15 and beyond to year 60 of operation, the maturity of planting established as part of the Proposed Scheme will result in greater landscape integration. However, the permanent loss of the majority of St James's Gardens and the provision of more fragmented open space would remain therefore the overall effect will be unchanged.

Euston West Post-war Residential LCA

9.5.15 The majority of the LCA is located outside of the extent of the Proposed Scheme and the relatively dense urban grain and high rise buildings will limit the effects on the wider LCA. Impacts on landscape character in year 1 of operation within this LCA will include:

- the permanent loss of residential and commercial buildings and widening of the railway corridor in the Regent's Park Estate and loss of communal gardens;
- the changed relationship between the Cartmel and the reconstructed Hampstead Road Bridge;
- the realigned Granby Terrace Bridge, also elevated to align with Hampstead Road Bridge;
- the introduction of the western access point to a new east west overbridge, which, although a new element, will be consistent with the existing landscape and improve pedestrian permeability; and
- the introduction of the proposed open space, north of Langdale, with children's play areas and associated planting.

9.5.16 The loss of existing large-scale commercial buildings along Hampstead Road (in the adjacent LCA), the three residential blocks in the Regent's Park Estate and associated established communal gardens will remove dominant and enclosing elements in the LCA. The raised Hampstead Road Bridge, new parapet wall along the widened railway corridor and new and replacement tree planting associated with the open space north of Langdale and communal gardens will provide limited enclosure in year 1. East west permeability will be improved by the construction of the proposed east west overbridge.

9.5.17 The Proposed Scheme will result in alterations to key characteristics of the LCA, but will be contained to areas adjacent to the railway corridor. Overall, the magnitude of change is considered to be medium.

9.5.18 In year 1 of operation the medium magnitude of change, combined with the medium sensitivity of the character area, will result in a moderate adverse effect.

9.5.19 By year 15 and beyond to year 60 of operation, the maturity of planting established as part of the Proposed Scheme in the open space north of Langdale and in the communal gardens, in particular, will result in greater landscape integration and reduce effects to be minor adverse. These are reported in Volume 5: Appendix LV-001-001, Part 4.

Visual assessment

9.5.20 This section describes the significant effects on visual receptors during year 1, year 15 and year 60 of operation. Non-significant effects on visual receptors are presented in Volume 5: Appendix LV-001-001, Part 4.

9.5.21 The view of the Proposed Scheme from viewpoint 004.1.008 illustrated in the photomontage shown in Figure LV-01-267 (Volume 2, CFA1 Map Book) will not be significantly affected due to the like-for-like replacement of Mornington Street Bridge.

9.5.22 The view of the Proposed Scheme from viewpoint 004.1.010 illustrated in the photomontage shown in Figure LV-01-004 (Volume 2, CFA1 Map Book) will not be significantly affected by the addition of the portal headhouse, as it will be viewed in the context of the existing railway corridor and is largely characteristic of the existing view from a receptor.

9.5.23 The location of the Proposed Scheme within LVMF views 5A.2 and 6A.1 is illustrated in the photomontages shown in Figures LV-01-001 and LV-01-002 (Volume 2, CFA1 Map Books). The Proposed Scheme will not give rise to significant effects on these protected vistas.

9.5.24 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.

9.5.25 A full assessment of effects arising from operational lighting has not been undertaken. With regard to the station and its forecourts, detailed design, which will include lighting design, has not been developed. However, it is assumed that the high speed platform lighting north of the station building will be designed to minimise light pollution effects. In the station approach, the lighting regime will remain similar to the existing design. In most cases, additional lighting is not considered to give rise to significant effects due to the widespread presence of existing lighting in the urban areas.

9.5.26 The number identifies the viewpoint locations which are shown in Maps LV-04-001 to LV-04-002a (Volume 2, CFA1 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.

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

9.5.28 The level of effect will be highly dependent on the final architectural and landscape design quality for the built elements and public realm and may be less than that described.

Viewpoint 001.4.002: View north from the corner of Euston Road and Gordon Street

9.5.29 The extended and remodelled Euston station will be visible across Euston Square Gardens through the newly planted trees. The station will be a new element that is highly visible but is compatible with the existing view. Therefore, the magnitude of change is considered to be medium.

9.5.30 The medium magnitude of change, assessed alongside the low sensitivity of the receptor, will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.31 In summer of year one of operation, while the existing intervening vegetation will provide some additional screening, the magnitude of change is considered to remain medium meaning the overall effect will be unchanged.

9.5.32 By year 15 and year 60 of operation, the tree planting within Euston Square Gardens will have matured, providing some screening and enclosure. However, the expanded station will still be a prominent feature in the view. Therefore, the effects will remain unchanged.

Viewpoint 001.2.008: View north and east from Cobourg Street

9.5.33 The view from the four storey residential properties and the Exmouth Arms public house looking east will be dominated by the large scale station building. The views for pedestrians and vehicles users looking north along Cobourg Street will remain framed along the western side by existing buildings. However, to the north and east there will be close and direct views of the new western façade and northern entrance area on Cobourg Street, which will form prominent elements in the view. Therefore, the magnitude of change is considered to be high.

9.5.34 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.

9.5.35 In summer of year 1 of operation, while proposed vegetation will partially screen the northern entrance on Cobourg Street, the new planting will be immature, the magnitude of change is considered to remain unchanged.

9.5.36 By year 15 and year 60 of operation, the tree planting to the south of the northern entrance to the station will have matured, providing some screening and enclosure. However, the expanded station will still be a prominent feature in the view. Therefore, the effects will remain unchanged.

Viewpoint 001.2.016: View east from Hampstead Road, near The Tarns and Rydal Water residential blocks

9.5.37 The views towards the Proposed Scheme from The Tarns and Rydal Water and of pedestrians on Hampstead Road will be close and direct. The opportunities for screening views from this location towards the Proposed Scheme will be limited due to the proximity of the built elements and the lack of available space. However, replacement tree planting in communal gardens and proposed trees associated with the northern station entrance forecourt and St James's Gardens will be present. The new junction where Cobourg Street meets Hampstead Road, the east west overbridge, the extension to Euston station and northern entrance will be prominent in the view. The built elements associated with the Proposed Scheme will be largely in scale with existing buildings in the view but will not front directly onto Hampstead Road allowing slightly more open views from the properties. Therefore, the magnitude of change is considered to be medium.

9.5.38 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.

9.5.39 In summer of year 1 of operation, effects will be unchanged due to the limited planting between the elements of the Proposed Scheme and the viewpoint.

9.5.40 By year 15 and beyond to year 60 of operation, the lack of mitigation planting between the receptor and the Proposed Scheme means that effects will be unchanged.

Viewpoint 001.2.020: View north-east from Langdale and Augustus House

9.5.41 The loss of buildings will open up views of the Proposed Scheme in the foreground alongside the existing railway corridor although this will be at a lower level. The reconstructed Hampstead Road Bridge and Granby Terrace Bridge will form notable elements, but will be seen in the context of the existing railway corridor and backdrop of the existing buildings to the east of the railway corridor. The tree and shrub planting within the new public open space between Granby Terrace and Hampstead Road bridges will be visible but relatively immature in year 1. Therefore, the magnitude of change is considered to be medium.

9.5.42 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.

9.5.43 In summer of year 1 of operation, while existing vegetation will provide some additional screening, the new planting will be relatively immature, the magnitude of change is considered to remain medium meaning the overall effect will remain unchanged.

9.5.44 Year 15 and year 60 effects are non-significant and are reported in Volume 5: Appendix LV-001-001 Part 4.

Viewpoint 001.3.021: View east from St James's Gardens and 106-108 Hampstead Road

9.5.45 There will be direct and open views across the realigned Cobourg Street and the retained area of St James's Gardens, to the extension to Euston station which will be

the dominating element in middle ground of the view. It will screen all views beyond this location. The loss of mature trees in the gardens and the presence of the station building and the taxi access and drop off zone at the end of Cobourg Street will represent a substantial change to the view. The magnitude of change is considered to be high.

9.5.46 The high magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a major adverse effect in the winter of year 1 of operation.

9.5.47 In summer of year 1 of operation, effects will be unchanged due to the low height of the proposed planting in the gardens.

9.5.48 By year 15 of operation, although proposed planting will have matured, providing some screening, the elements of the Proposed Scheme will remain clearly visible beyond. Therefore effects will be unchanged.

9.5.49 By year 60 of operation, the further growth and maturity of the proposed planting will provide greater screening of the Proposed Scheme, particularly from the properties on Hampstead Road. However, elements of the Proposed Scheme will remain prominent in the view from the gardens. The overall magnitude of change will therefore be medium, giving rise to a moderate adverse effect.

Viewpoint 001.2.022: View south-east from the front of Cartmel, Coniston and Newlands residential blocks

9.5.50 The raised Hampstead Road Bridge will be a dominant element in the view from the ground floor flats and made more visible by the loss of trees particularly to the east of the Cartmel residential block. Views from Newlands and Coniston will be partially filtered by existing vegetation. From higher floors, the route of the Proposed Scheme will be highly visible. The east west overbridge will form a prominent element in the middle ground, but will be seen in the context of the existing buildings and the western extension to the station in the background of the view. Therefore, the magnitude of change is considered to be medium.

9.5.51 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.

9.5.52 In summer of year 1 of operation, effects will be unchanged due to the limited opportunities for new planting between the elements of the Proposed Scheme and the viewpoint.

9.5.53 By year 15 and beyond to year 60 of operation, the lack of mitigation planting between the receptor and the Proposed Scheme means that effects will be unchanged.

Viewpoint 002.3.001: View north from Friends House Gardens and office workers in adjacent buildings

9.5.54 The reinstated Euston Square Gardens will be visible in the immediate foreground of the view. The loss of the mature trees in the western part of Euston Square Gardens and the removal of the Grant Thornton House and One Euston Square will open up views of the north and west towards the new entrance and forecourt of Euston station and 1 to 9 Melton Street in the background of the view. Views over the eastern part of

the gardens will be largely unchanged though some of the trees to the north will have been removed. Therefore, the magnitude of change is considered to be medium.

9.5.55 The medium magnitude of change, assessed alongside the high sensitivity of the receptor, will result in a moderate adverse effect in the winter of year 1 of operation.

9.5.56 In summer of the first year of operation, while the existing intervening vegetation will provide some additional screening, the magnitude of change is considered to remain medium, meaning that the overall effect will be unchanged.

9.5.57 Year 15 and year 60 effects are non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 002.3.011: View north from Euston Square Gardens

9.5.58 There will be direct views across Euston Square Gardens of the proposed cycle stands and the underground emergency access building in the foreground, the remodelled Euston station and the new bus station adjacent to the gardens in the middle and background of the view. To the west the new forecourt, the southern façade of Euston station and Grade II* listed 1-9 Melton Street will be visible due to the removal of the two office blocks and the loss of trees within the gardens. The views of these elements and The Podium will entirely fill the middle ground, screening any views beyond. The replacement tree and shrub planting within the gardens will be relatively immature in year 1. Therefore, the magnitude of change is considered to be medium.

9.5.59 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.

9.5.60 In summer of year 1 of operation, effects will be unchanged due to the lack of maturity of the intervening planting.

9.5.61 Year 15 and year 60 effects are non-significant and are reported in Volume 5: Appendix LV-001-001, Part 4.

Viewpoint 003.2.010: View looking east from dwellings on Park Village East (between Mornington Street Bridge and Parkway)

9.5.62 From numbers 2 to 16 Park Village East there will be close, direct and oblique views of the portal headhouse. The structures will be seen over a new parapet wall, against the backdrop of the existing railway corridor and the trees and buildings on Mornington Terrace in the background. The reinstated planter and associated tree and shrub planting will be relatively immature in year 1 and the headhouse will be a notable new element in the view. From upper floors glimpsed views of the tunnel portal will be possible; however, this will be consistent with the existing elements of the view. From numbers 18 to 28 Park Village East, there will be an oblique view of the tunnel portal headhouse. However, there will be close and direct views of the reconstructed Mornington Street Bridge, to the south which, since it replaces an existing bridge will not affect the view. Overall the magnitude of change is considered to be medium.

9.5.63 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.

9.5.64 The view of the Proposed Scheme from this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-003 (Volume 5, CFA1 Map Book).

9.5.65 In summer of year 1 of operation, effects will be unchanged due to the low height of the proposed planting.

9.5.66 Year 15 and year 60 effects are non-significant and are reported in Volume 5: Appendix LV-001-001 Part 4.

Viewpoint 004.2.004: View west from Dalehead, Gillfoot and Oxenholme

9.5.67 The reconstructed Hampstead Road Bridge and the Granby Terrace Bridge will be conspicuous in the foreground of the view. They will be seen in the context of the existing and extended railway corridor in the middle ground of the view. The remaining residential blocks of the Regent's Park Estate, the proposed open space north of Langdale and some of the properties at the southern end of Park Village East will be visible in the background. The loss of trees adjacent to Hampstead Road Bridge in the communal gardens will allow open views to the roads beyond and replacement planting will be relatively immature in year 1. Therefore, the magnitude of change is considered to be medium.

9.5.68 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.

9.5.69 The view of the Proposed Scheme from close to this location during year 1 of operation is illustrated on the photomontage shown in Figure LV-01-005 (Volume 2, CFA1 Map Book). The photomontage has been prepared from the closest location possible to the residences taking into account the raised elevation of the bridge and adjacent sections of Hampstead Road (which would place the representative viewpoint location partially underground if shown in a photomontage).

9.5.70 In summer of year 1 of operation, effects will be unchanged because there is no intervening planting in the foreground of the views.

9.5.71 By year 15 and beyond to year 60 of operation, the limited replacement planting means that effects will be unchanged.

Viewpoint 004.2.005: View south-west from Mornington Crescent (numbers 1 to 12) and Hampstead Road (numbers 261 to 263)

9.5.72 There will be close and direct view of the reconstructed and realigned Granby Terrace Bridge in the foreground, beyond which to the south there will be oblique views of Hampstead Road Bridge. The existing and extended railway corridor will cross the length of the view; the loss of the carriage shed and new retaining wall and parapet will represent a change but will be largely characteristic of the existing view as will the loss of three residential blocks in the Regent's Park Estate. Langdale and the proposed open space, Augustus House and Cubitt Court (100 Park Village East) will form the background of the view screening the majority of views of the Regent's Park Estate beyond. Therefore, the overall magnitude of change is considered to be medium.

9.5.73 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.

9.5.74 In summer of year 1 of operation, effects will be unchanged because there is no intervening planting.

9.5.75 By year 15 and beyond to year 60 of operation, the absence of mitigation planting means that effects will be unchanged.

Cumulative effects

9.5.76 It is considered that there are no cumulative effects of the Proposed Scheme in combination with any other committed development as referred to in Section 2.1.

Other mitigation measures

9.5.77 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. However, no other mitigation measures are considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

9.5.78 High quality architectural and landscape design will deliver many enhancements to the new station frontage facing Euston Road, the main station forecourt and the northern station forecourt, and associated soft landscaping including the restoration of Euston Square Gardens.

Summary of likely residual significant effects

9.5.79 As no other mitigation measures are considered practicable, the permanent residual significant effects during operation remain as described above. Where new or replacement planting is proposed, significant effects will reduce over time as the proposed mitigation planting matures. However, the following significant residual effects will remain following year 15 of operation:

- the presence of a large-scale built structure, the extended Euston station, in close proximity to smaller residential scale properties within a small area of the Euston Commercial Area LCA and the permanent loss of most of St James's Gardens, even though it is replaced by other forms of public realm;
- the permanent loss of buildings and widening of the railway corridor in the Regent's Park Estate and the changed relationship between Cartmel and the raised Hampstead Road Bridge to the west in the Euston West Post-war Residential LCA;
- effects on residents in properties adjacent to the Proposed Scheme, including Cobourg Street and Hampstead Road, where the presence of the remodelled Euston station together with new road and bridge infrastructure represent large scale, prominent elements (viewpoints 001-2.008, 001.2.016, 001.3.021, 001.2.022 and 004.2.004); and
- effects on pedestrians looking north to the main Euston station entrance, where the loss of trees in Euston Square Gardens will open up the view, emphasising the prominence of the remodelled station (001.4.002).

10 Socio-economics

10.1 Introduction

10.1.1 This section reports on the assessment methodology and scope, environmental baseline, and provides an assessment of 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, in relation to:

- premises demolished, with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- effects on the amenity (e.g. air quality and construction dust, noise and vibration, construction traffic and visual impacts) and isolation of an area which could affect business operations. Any resulting effects on employment are reported at a route-wide level; and
- potential employment opportunities arising from construction in the local area (including in adjacent CFAs).

Operation

10.1.5 The proposed operation of the route will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

10.2 Scope, assumptions and limitations

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

10.2.2 Engagement with stakeholders and community organisations, including LBC, has been undertaken with regard to socio-economic resources that may be impacted by the Proposed Scheme.

10.3 Environmental baseline

Existing baseline

Study area description

10.3.1 Section 2 of this report provides a general overview of the Euston area, which includes data of specific relevance to socio-economics, notably demographic and employment data. The following provides a brief overview in terms of employment, economic structure, labour market, and business premises availability within the area[63].

10.3.2 The Euston area is located within inner north London, entirely within the LBC. Euston is a dense, mixed employment and residential area. The area around Euston station is identified in the London Plan as an opportunity area[64] with significant capacity to accommodate new housing, commercial and other development linked to existing or potential improvements to public transport accessibility. A draft Euston Area Plan (EAP) has been developed to take forward plans for the opportunity area and sets out a strategy for the provision of employment space, sufficient to support over 7,700 jobs[65].

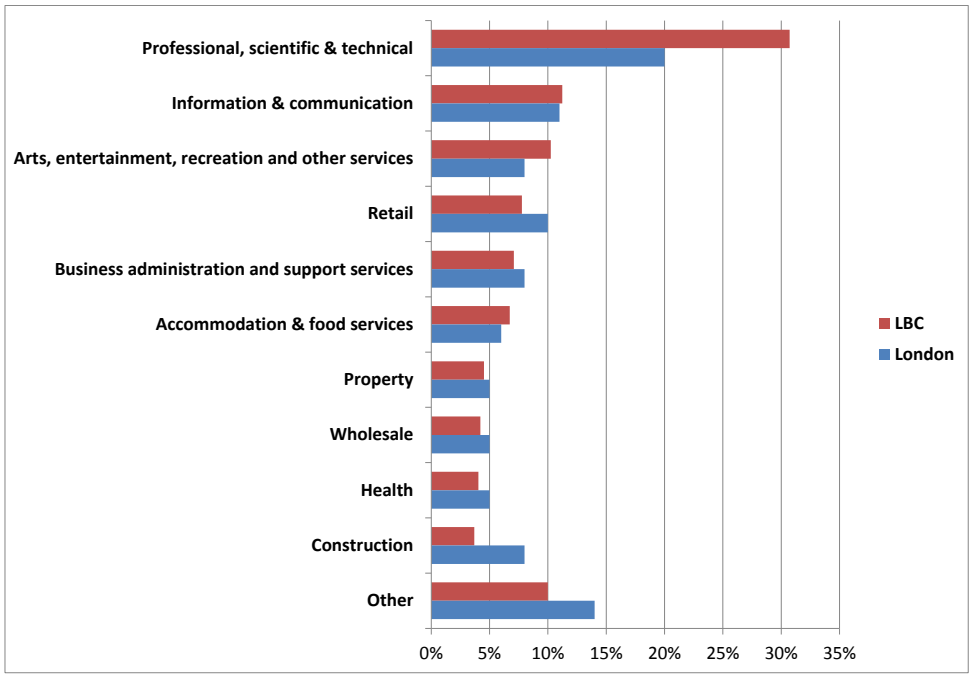
10.3.3 Where possible, baseline data has been gathered on demographic character areas (DCA)[66] to provide a profile of local communities. Map SE-02-001 (Volume 5, Socio-economics Map Book) shows the location of these DCA. The area contains four DCA – Regent's Park, Euston Square, Somers Town and Regent's Park Estate.

Business and labour market

10.3.4 The professional, scientific and technical services sector accounts for the largest proportion of businesses (31%) in the LBC, with the information and communication (11%), arts, entertainment, recreation and other services (10%), and retail (8%) sectors also accounting for relatively large numbers of businesses within the borough. This is shown in Figure 9[67]. For comparison, within the London region, the professional, scientific and technical services sector accounts for the largest number of businesses (20%), with the information and communication (11%),and retail (10%) sectors also accounting for relatively large numbers of businesses within the region[68].

[63] 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.
[64] Greater London Authority (2011), *The London Plan: Spatial Development Strategy for London.*
[65] Greater London Authority, Transport for London and Camden Council (2013), *Euston Area Plan; A new plan for the Euston area, Consultation draft*.
[66] 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 (LSOA).
[67] The figure presents the proportion of businesses within each business sector in the borough but not the proportion of employment by sector.
[68] Office for National Statistics (2012), *UK Business: Activity, Size and Location 2011*, ONS, London. Please note 2011 data has been used to provide an appropriate comparison with 2011 Census data.

Figure 9: Business sector composition in the LBC and London[68 69]

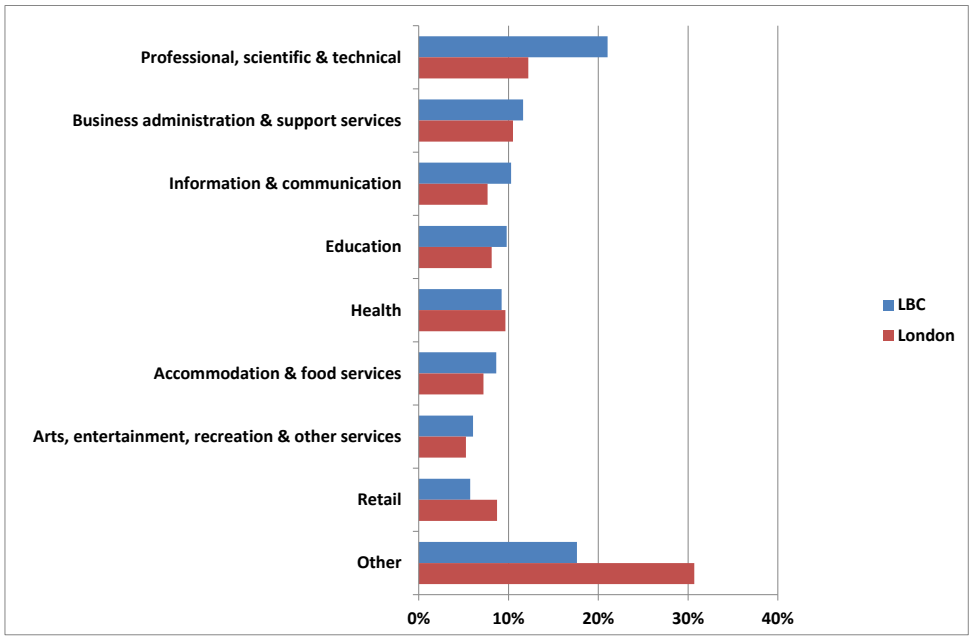


10.3.5 Approximately 291,000 people worked in the LBC while 7,000 people worked within the Regent's Park DCA, 23,000 within Euston Square, 15,000 within Somers Town, and 9,000 within the Regent's Park Estate DCA[70].

10.3.6 According to the ONS Business Register and Employment Survey 2011, the sector with the highest proportion of employment in the borough is professional, scientific and technical (22%), which accounts for a higher proportion of jobs than that recorded across London (13%) and England (8%). The business administration and support services sector is also important in the LBC accounting for 11% of employment compared to 10% recorded across London and 8% across England. The information and communication sector in the LBC accounts for 10% of employment, higher than that recorded for London (8%) and England (4%). This is shown in Figure 10.

[69] 'Other' includes agriculture, forestry and fishing, production, motor trades, transport and storage (including postal), finance and insurance, public administration and defence; and education sectors.
[70] ONS (2012), *Business Register and Employment Survey 2011*, ONS, London.

Figure 10: Proportion of employment by industrial sector in the LBC and London[70] [71]



10.3.7 Key employment sectors for Regent's Park DCA are professional, scientific and technical (26%), information and communication (17%), finance and insurance (17%) and public administration and defence (11%). For Somers Town DCA, key sectors are professional, scientific and technical (14%), accommodation and food services (13%), transport and storage (including postal) (11%) and arts, entertainment, recreation and other services (11%). In Euston Square DCA, key sectors are professional, scientific and technical (21%), education (17%) and accommodation and food services (12%). For Regent's Park Estate DCA, key sectors are professional, scientific and technical (24%), transport and storage (including postal) (13%), information and communication (13%) and finance and insurance (13%).

10.3.8 According to the 2011 Census[72], the employment rate[73] for LBC residents in 2011 was 63% (109,000 people) which is broadly in line with that recorded for both London and England (both 65%). The employment rate in the Regent's Park DCA was 68%, 52% within Somers Town DCA, 38% within Euston Square DCA, and 47% within the Regent's Park Estate DCA.

10.3.9 The unemployment rate in the LBC in 2011 stood at 8%, slightly higher than the England average (7%). The unemployment rate in the Regent's Park DCA was 4%, 12% within Somers Town DCA, 14% within Euston Square DCA, and 13% within the Regent's Park Estate DCA[74].

10.3.10 According to the 2011 Census, 51% of LBC residents aged 16 and over were qualified to National Vocational Qualification Level 4 (NVQ4), compared to 38% in London and 27% in England, and 13% had no qualifications which was lower than that recorded

[71] 'Other' includes agriculture, forestry and fishing, production, construction, motor trades, wholesale, transport and storage (including postal), financial and insurance, property and public administration and defence sectors.
[72] ONS (2012), *Census 2011, ONS, London.*
[73] The proportion of working age (16-74 years) of residents in employment. Employment comprises the proportion of the total resident population who are 'in employment' and includes full-time students who are employed.
[74] 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.

both for London (18%) and England (23%). In 2011, 55% of Regent's Park DCA residents aged 16 and over were qualified to NVQ4 level, compared to 33% within Somers Town DCA, 39% within Euston Square DCA, and 27% within the Regent's Park Estate DCA. The proportion of residents with no qualifications was 11% in Regent's Park DCA, compared to 22% within Somers Town DCA, 6% within Euston Square DCA, and 20% within the Regent's Park Estate DCA.

10.3.11 The DCA defined within the Euston area vary in terms of their character and socio-economic indicators. Somers Town DCA and Regent's Park Estate DCA are primarily residential areas, with commercial uses located on Chalton Street and Eversholt Street (Somers Town) and on and around Hampstead Road and Drummond Street (Regent's Park Estate). Each contains high proportions of social rented housing and have below average rates of employment and qualifications attainment compared to London and England. They also record higher unemployment levels and greater proportions of residents with no qualifications than regional and national averages. Euston Square DCA is more mixed in character containing commercial (Euston station and surrounding office and retail businesses), educational (UCL), health (UCL Hospital) and residential uses (including student housing), though it has similarly below average rates of employment and qualifications attainment. Regent's Park DCA comprises mostly owner occupied/privately rented housing or parkland and has above average rates of employment and unemployment and educational attainment, outperforming the LBC as a whole.

Property

10.3.12 Data for quarter 3 of 2012 for the Euston area as defined and published by Colliers International indicates an office premises floorspace stock of 690,000 square metres with a vacancy rate of 5% (approximately 34,800 square metres)[75]. In the neighbouring 'City Midtown' area, the same source recorded vacancy rates of around 5%.

10.3.13 Average vacancy for office property in the LBC in July 2013 has been assessed as 9% based on marketed space against known stock[76]. Overall, this suggests moderate to good availability, although availability will vary by quality.

10.3.14 The LBC Business Premises Study (2011) indicates that local availability of such premises is constrained in the borough, with vacancies estimated at 2% (of a total stock of approximately 335,000 square metres)[77].

10.3.15 Average vacancy for industrial and warehousing property in the LBC in July 2013 has been assessed as 1% based on marketed space against known stock[78]. Overall, this suggests very low availability of alternative accommodation.

10.3.16 January 2012 data from Colliers CRE[79] identifies vacancy rates in retail space of around 3% in central London, which includes much of the Euston area.

[75] Colliers International (2012), *Central London Quarterly Offices: Quarter 3 2012*, Colliers International, London.
[76] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).
[77] Roger Tym and Partners/London Borough Camden (2011), *Camden Business Premises Study*, Roger Tym and Partners, London.
[78] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).
[79] Colliers International (2012), *Central London Retail Health Check*, Colliers International, London.

10.3.17 Average vacancy for retail property in the LBC in July 2013 has been assessed as 2% based on marketed space against known stock[80]. Overall, this suggests low availability of alternative accommodation.

Future baseline

Construction (2017)

10.3.18 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2017. Implementation of all outstanding development consents and land allocations will result in approximately an additional 300 jobs[81] by 2017. The existing composition and numbers of employers, employees and economic sectors in the Euston area is likely to change over time in ways that cannot be accurately forecast.

Operation (2026)

10.3.19 Volume 5: Appendix CT-004-000 provides details of the developments which are assumed to have been implemented by 2026. There are no consents or allocations in this area which are expected to accommodate significant additional employment between 2017 and 2026.

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 In order to avoid or minimise the environmental impacts during construction, the Proposed Scheme design includes provisions to:

- maintain access to business premises during the construction phase; and
- maintain a pedestrian route between Euston station and both Drummond Street (during 2017, access will be maintained via Cobourg Street) and Euston Street, throughout the construction phase.

10.4.2 The draft CoCP includes a range of provisions that will help mitigate the socio-economic effects associated with construction within this local area, including:

- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding to reduce impacts on access to and visibility of their premises (draft CoCP, Section 5);
- reducing nuisance through sensitive layout of construction sites (draft CoCP, Section 5);
- applying best practicable means (BPM) during construction works to minimise noise (including vibration) at sensitive receptors (including local businesses) (draft CoCP, Section 13);

[80] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).
[81] Potential employment has been estimated through employment floor space and the Homes and Communities Agency (HCA) (2010), *Employment Densities Guide 2nd edition*. The estimate is calculated using standard employment density ratios and estimates of floor areas.

- requiring contractors will be required to monitor and manage flood risk and other extreme weather events which may affect socio-economic resources during construction (draft CoCP, Sections 5 and 16); and
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (draft CoCP, Section 14).

Assessment of impacts and effects

Temporary effects

Change in business amenity value

10.4.3 Businesses within the Euston area may experience air quality, noise and vibration, visual or construction traffic impacts as a result of construction of the Proposed Scheme. Taken in combination, the residual effects from these other topic assessments may amount to a significant change in amenity which leads to a possible loss of trade for the affected businesses.

10.4.4 The Exmouth Arms on Starcross Street may experience potentially significant noise and visual residual effects as a result of the proposed construction and demolition activities associated with the western expansion of Euston station. The sensitivity of this establishment is deemed to be high as users are considered to be susceptible to changes in amenity and the construction works may discourage customers. These in-combination effects will occur over a period of two years and six months and given the high levels of sensitivity, the Proposed Scheme is assessed to have a significant amenity effect on this business.

10.4.5 The Wesley Hotel (previously known as the Methodist International Centre) on Euston Street may experience potentially significant noise and visual residual effects as a result of the proposed construction and demolition activities associated with the western expansion of Euston station. The sensitivity of this establishment is deemed to be high as users are considered to be susceptible to changes in amenity and the construction works may discourage guests. These in-combination effects will occur over a period of two years and six months and given the high level of sensitivity, the Proposed Scheme is assessed to have a significant amenity effect on this business.

10.4.6 Drummond Street is located in close proximity to Euston station running parallel with Euston Road. Drummond Street is well known for its South Asian restaurants and supply shops and is frequented in particular by local residents and station users. Although it is acknowledged there may be some disruption to business activities on Drummond Street due to the western expansion of Euston station, the Proposed Scheme is not assessed to have a significant amenity effect on these businesses.

10.4.7 There is one business on Eversholt Street which may experience potentially significant noise (for five months), visual (for ten years) and HGV construction traffic (for seven months) residual effects as a result of construction works at Euston station, including the demolition of the existing Royal Mail NW1 delivery office. This business is the Roj Café and Sandwich Bar. The sensitivity of this establishment is deemed to be high as users are considered to be susceptible to changes in amenity and construction works may discourage customers, which may include passing trade. Given the high level of

sensitivity, the Proposed Scheme is assessed to have a significant amenity effect on this business.

10.4.8 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3).

Isolation

10.4.9 Businesses within the Euston area may experience significant isolation effects as a result of construction of the Proposed Scheme. As a consequence this could lead to a loss of trade for the affected businesses.

10.4.10 Construction works at Euston station would require a number of road closures. Some buildings along Cardington Street and Melton Street and buildings between Cardington Street and the east side of Cobourg Street will be demolished.

10.4.11 As a consequence of these construction works the following roads will be closed over a 10 year period: all of Melton Street; all of Cardington Street; a section of Stephenson Way from its junction with Euston Street to a point past Wolfson House; and for Euston Street, Drummond Street and Starcross Street, the section of each road between Cardington Street and Cobourg Street. During the construction works the following roads will become cul-de-sacs: Euston Street, Drummond Street, Starcross Street and Stephenson Way. Vehicular access to these roads will be via North Gower Street. A pedestrian access route from Euston station through to both Drummond Street (during 2017, access will be maintained via Cobourg Street) and Euston Street will also be maintained throughout the construction period. Given both pedestrian and vehicular access is maintained throughout the construction period to these roads, there is not assessed to be a significant isolation effect.

Construction employment

10.4.12 There will be a number of construction compounds for the Proposed Scheme within the CFA, including the National Temperance Hospital and The Podium main compounds. These locations are set out in Section 2 of this report.

10.4.13 The peak number of construction personnel at all construction sites at Euston is estimated to be approximately 2,100 in 2020 to 2023, of which 610 will be office-based staff. Numbers will decrease to approximately 1,125 personnel by around 2024. Depending on skill levels required and the skills of local people, these opportunities are potentially accessible to residents in the locality and to others living further afield, particularly given the location of the works at/close to an inner London transport hub.

10.4.14 The impact of the direct construction employment creation has been assessed as part of the route-wide assessment (see Volume 3).

10.4.15 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 (see Volume 3).

Cumulative effects

10.4.16 No committed developments have been identified that are considered to interact with the Proposed Scheme.

10.4.17 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

10.4.18 Combined effects arise where business establishments are affected by other environmental effects (from noise, vibration, air quality, visual and construction traffic) such that their ability to trade is disadvantaged thereby potentially prejudicing jobs in business establishments affected. These effects have been identified earlier in Section 10 and assessed in the route-wide assessment (see Volume 3).

Permanent effects

Businesses

10.4.19 Businesses directly affected, i.e. those that lie within land which would 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.

10.4.20 In all, 93 businesses within the Euston area would be directly impacted by the Proposed Scheme. These together form 17 defined resources. Eight of the resources which experience direct impacts are subject to potentially significant effects on business activities and employment. These resources are listed in Table 12.

Table 12: Resources with potentially significant direct effects

Resource	Description of business activity
Business premises within Euston station and on station frontage	Retail/services premises within/adjacent to Euston station including within Euston Square Gardens.
Royal Mail delivery office, 1 Barnby Street	Combined office and storage building.
Offices, 132-140 Hampstead Road	Combined office and storage building in educational use by University College London (UCL).
Ibis Hotel Euston, 3 Cardington Street	Hotel at Cardington Street/Drummond Street junction.
Thistle Euston Hotel, Cardington Street	Hotel north of St. James's Gardens on Cardington Street.
The Cottage Hotel, 67-75 Euston Street	Hotel on Euston Street.
Wolfson House, 4 Stephenson Way	Accommodates a laboratory used by UCL and technical support services for the UCL campus and other businesses.
93-103 Drummond Street	Retail business with ancillary storage and office space.

Impact magnitude

10.4.21 The magnitude of impact focuses on the number of jobs which are affected (either through displacement or possible loss) by the Proposed Scheme. It also considers the implications of this impact in relation to the scale of economic activity and opportunities in the area.

Sensitivity

10.4.22 The following was taken into account when considering the sensitivity of resources:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effect

10.4.23 Taking account of the sensitivity of the resource and the magnitude of impact, the significance of the resultant effects is set out in Table 13.

Table 13: Significant effect on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Business premises within Euston station and on station frontage	High	Medium	Major adverse
Royal Mail delivery office, 1 Barnby Street	Medium	Medium	Moderate adverse
Offices, 132-140 Hampstead Road	High	Low	Moderate adverse
Ibis Hotel Euston, 3 Cardington Street	High	Medium	Major adverse
Thistle Euston Hotel, Cardington Street	High	Medium	Major adverse
The Cottage Hotel, 67-75 Euston Street	Medium	Medium	Moderate adverse
Wolfson House, 4 Stephenson Way	High	Medium	Major adverse
93-103 Drummond Street	Medium	Medium	Moderate adverse

10.4.24 Construction at the station would require the demolition of retail premises within and at the frontage of Euston station as part of a phased demolition process. It is considered likely that most of these businesses affected are dependent upon their location in/next to the station. Consequently, there is likely to be some loss of retail activity and employment, although this could be kept to a minimum through appropriately timed phasing. Overall, the effect on this resource and its employees is assessed to be major adverse and will therefore be significant.

10.4.25 The combined office and storage building at the Royal Mail delivery office on Barnby Street is proposed to be demolished. With moderate to good availability of alternative premises, it is considered reasonably likely that the office component of the premises would be able to find and move to alternative local premises. Availability of alternative warehousing/storage premises in LBC is constrained and such business activity may therefore find it more difficult to find alternative local premises. The

effect on this resource and its employees is assessed to be moderate adverse and will therefore be significant.

10.4.26 The Proposed Scheme will require the demolition of 132-140 Hampstead Road previously used as a combined office and storage building. UCL has a five year lease on the building, ending in 2018, and will use it to rehouse the Bartlett School of Architecture while the school's current premises are refurbished. The effect on this resource and its employees is assessed to be moderate adverse and will therefore be significant.

10.4.27 The Ibis Hotel Euston, the Thistle Euston Hotel and Cottage Hotel will be demolished. Hotels can be bespoke buildings and there is a more limited supply than, for example, office space. It is considered that these operators may have difficulty in finding suitable alternative premises. The effect on the Ibis Hotel Euston and the Thistle Euston Hotel and their employees is assessed to be major adverse in each case and will therefore be significant. The effect on the Cottage Hotel and its employees is assessed to be moderate adverse and will therefore also be significant.

10.4.28 The Proposed Scheme will require the demolition of Wolfson House, which includes a laboratory, offices and technical support services belonging to UCL. It is considered that the occupier will find it difficult to find suitable alternative accommodation given the specific locational and design requirements associated with the facility. The effect on this resource and its employees is assessed to be major adverse and will therefore be significant.

10.4.29 The Proposed Scheme will require the demolition of 93-103 Drummond Street, a photographic equipment and supplies retailer. It is considered that the occupier will find it difficult to find suitable alternative accommodation given the limited supply of available floorspace within LBC. The effect on this resource and its employees is assessed to be moderate adverse and will therefore be significant.

10.4.30 There are also locations where the construction footprint requires the demolition of properties but where the associated employment losses do not present particular relocation problems given the office-type premises that these occupiers will require and the availability of alternative premises. These properties include:

- One Euston Square (also known as 40 Melton Street and formerly known as Railtrack House);
- Grant Thornton House, 22 Melton Street; and
- Walkden House, 10 Melton Street.

10.4.31 It is estimated that the Proposed Scheme would result in the displacement or possible loss of a total of 3,090 jobs[82] within the Euston area. The impact on the local economy from the loss/relocation of jobs is considered to be relatively moderate in the context

[82] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) *Employment Densities Guide 2nd Edition* (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

of the total number of people employed in the LBC (291,000) and the scale of economic activity and opportunity in the area.

Cumulative effects

10.4.32 No committed developments have been identified that are considered to interact with the Proposed Scheme.

10.4.33 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed and reported as part of the route-wide assessment (see Volume 3).

Other mitigation measures

10.4.34 The assessment has concluded that there are significant adverse effects arising during construction in relation to businesses directly affected by the Proposed Scheme.

10.4.35 Businesses displaced by the Proposed Scheme will be fully compensated within the provisions of the National Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to new premises and will therefore provide additional support over and above statutory requirements to facilitate this process. HS2 Ltd is also working with the LBC Business Mitigation and Opportunities Group to identify measures to offset the impact of the Proposed Scheme on local businesses.

10.4.36 HS2 Ltd has undertaken engagement with businesses at Drummond Street so that any impacts on their business activities arising from the construction of the Proposed Scheme are reduced or eliminated.

10.4.37 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 providing support to businesses and local residents to facilitate access to procurement and employment opportunities arising from the construction of the Proposed Scheme.

Summary of likely residual significant effects

10.4.38 Likely significant residual effects are shown on Maps SE-01-001 to SE-01-002 (Volume 5, Socio-economics Map Book). The Proposed Scheme will require the demolition of eight significantly affected socio-economic resources. During construction customers may also be discouraged from using the Roj Café and Sandwich Bar on Eversholt Street, the Exmouth Arms on Starcross Street and the Wesley Hotel on Euston Street as they are expected to be affected by construction works associated with the western expansion of Euston station.

10.5 Effects arising during operation

Avoidance and mitigation measures

10.5.1 No mitigation measures are proposed during operation within this area.

Assessment of impacts and effects

Resources with direct effects

10.5.2 There are no resources considered likely to experience significant direct effects during the operational phase of the Proposed Scheme within this area.

Change in business amenity

10.5.3 No 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. Within this area there will be a station at Euston and initial estimates suggest that gross direct employment for station and train operations may be approximately 500 jobs.

10.5.5 Retail floorspace will be built at the station as part of the Proposed Scheme. This will result in an overall net gain of approximately 850 square metres of retail floorspace (equivalent to approximately 45 additional jobs) compared to what is currently at the station, creating additional employment opportunities to what exist currently.

10.5.6 The project will contribute significantly to the creation of wider development opportunities (including OSD) in the Euston area. It is reasonable to anticipate that in this way, the project will help to generate significant employment opportunities as part of the realisation of the draft Euston Area Plan (EAP). It has been estimated that the Proposed Scheme will support the creation of approximately 2000 jobs in the area around the station. To give an indication of the full scale development potential, the draft EAP proposes 180,000m^2 of employment floorspace, which could accommodate 7,700 jobs, and new retail, leisure and social infrastructure, to serve the station and support local communities.

10.5.7 Direct operation employment created by the Proposed Scheme could also lead to indirect employment opportunities for local businesses supplying the project and businesses associated with the retail floorspace or OSD, or benefiting from expenditure of directly employed workers on goods and services.

10.5.8 Some of these employment opportunities would be accessible to residents in the locality and, given the transport accessibility of the area within the London travel to work area (TTWA), also to residents living further afield.

10.5.9 The impact of operational employment creation has been assessed in aggregate as part of the route-wide assessment (Volume 3).

Cumulative effects

10.5.10 No committed developments have been identified that are considered to interact with the Proposed Scheme.

Other mitigation measures

10.5.11 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

10.5.12 There are no significant effects identified in this assessment that will arise during operation.

11 Sound, noise and vibration

11.1 Introduction

11.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme for the Euston area on:

- people, primarily where they live ('residential receptors') in terms of a) individual dwellings and b) on a wider community basis, including any shared community open areas[83]; 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'[84].

11.1.2 The assessment of likely significant effects from noise and vibration on community, heritage and ecological receptors are presented in Sections 5, 6 and 7 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, 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 Euston is available in the relevant appendices in Volume 5:

[83] '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.

[84] Quiet areas are defined in the Scope and Methodology Report as Quiet Areas as identified under the Environmental Noise Regulations. or are resources which are prized for providing tranquillity (further information is provided in Section 9).

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000);
- sound, noise and vibration baseline (Appendix SV-002-001);
- sound, noise and vibration construction assessment (Appendix SV-003-001);
- sound, noise and vibration operation assessment (Appendix SV-004-001); 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 existing baseline sound environment for this area is typical of urban central London.

11.2.2 Sound levels are high in close proximity to busy multi-lane roads, such as Euston Road, where daytime sound levels are typically around 75 dB[85]. However, due to the screening provided by buildings and other structures, sound levels can be much lower (typically 55 to 60dB) on side roads away from the major thoroughfares.

11.2.3 To the north of Euston station, sounds from existing trains (including 'wheel squeal'), traffic on Hampstead Road and other local roads contribute to the prevailing sound environment. Here, daytime sound levels are typically 65 to 70dB.

11.2.4 To the east of the station, sound from traffic on the A4200 Eversholt Street, a relatively busy road, dominates the sound environment and daytime sound levels are typically around 70dB. Side roads away from the station have lower sound levels, due to the screening effect of buildings and other obstacles between these locations and the main road traffic sound sources, resulting in daytime sound levels of typically 55 to 60dB.

11.2.5 Located to the south of the station is the A501 Euston Road, which is a very busy cross London route. Local to this road, traffic movements, including many buses and HGV, generate sound levels during the day of around 75dB. Further to the south, smaller side roads can be screened from the busy main roads – typically experiencing sound levels around 65dB. Local traffic still dominates the sound environment.

11.2.6 To the west of the station, at St James's Gardens and adjacent areas, sound levels are relatively low for an urban environment. Daytime levels are typically around 55dB, due to the screening of the main road traffic sound by buildings and other obstacles. The playground of Maria Fidelis Convent (Lower) School borders St James's Gardens and also experiences sound levels which are relatively low for such an urban location.

[85] Quoted dB values at residential areas refer to the free-field 16 hour daytime (07:00 to 23:00) equivalent continuous sound pressure level, $L_{pAeq,16hr.}$

11.2.7 Night-time sound levels[86] across the study area are 2 to 4dB lower than the daytime level where it is dominated by road traffic on busy main roads and 5 to 8dB lower in locations further away from these roads.

11.2.8 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for this area in Volume 5: Appendix SV-002-001.

11.2.9 It is likely that the majority of receptors adjacent to the Proposed Scheme are not currently subject to appreciable vibration, save for those receptors closest to the existing railway. On a reasonable worst case basis, vibration from the Proposed Scheme has therefore been assessed at all receptors using specific thresholds, below which receptors will not be affected by vibration, as described in Volume 1, Section 8. No vibration baseline measurements have therefore been undertaken.

Future baseline

11.2.10 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads[87], tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

Construction (2017)

11.2.11 The assessment of noise from construction activities assumes a baseline year of 2017 which represents the period at the start of the main construction. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline (2012/13) and the future baseline year of 2017. The assessment of noise from construction traffic assumes a baseline year of 2021, representative of the middle of the construction period when the construction traffic flows are expected to be at their peak. Further information can be found in Section 12, Traffic and Transport.

Operation (2026)

11.2.12 The assessment is based upon the predicted change in sound levels that result from the Proposed Scheme and assumes a baseline year of 2026 to coincide with the proposed start of passenger services. As a reasonable worst case, it has been assumed that no change in baseline sound levels around Euston will occur between the existing baseline (2012/13) and the future baseline year of 2026.

[86] Night-time sound levels refer to the free-field 8 hour night-time (23:00 to 07:00) equivalent continuous sound pressure level, $L_{pAeq,8hr.}$
[87] Tyre noise typically becomes the dominant sound source for steady road traffic at speeds above approximately 30mph

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.

11.3.2 At Euston, the following activities will need to be undertaken during the evening and night-time for reasons of safety, engineering practicability or to reduce the impact on existing transport:

- evening work to construct retaining walls and abutment works in the south of the station approach;
- night work to demolish the carriage shed and buildings close to the railway;
- night work to demolish parts of Granby Terrace Bridge, Hampstead Road Bridge and Mornington Street Bridge, including installation of bridge demolition decks; and
- night work to construct parts of Granby Terrace Bridge, Hampstead Road Bridge, Mornington Street Bridge and the east west overbridge including construction of new bridge piers, installation of temporary supports, trusses and precast decks.

11.3.3 The assessment takes account of people's perception of noise throughout the day and more stringent criteria are applied in this assessment during evening and night-time periods when people are more sensitive to noise compared to the busier and more active daytime period. Details of these criteria are set out in Volume 5 Appendix SV-002-001.

Local limitations

11.3.4 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-002-001.

Avoidance and mitigation measures

11.3.5 The potential for substantial impacts from construction noise over extended periods of time in the Euston area was identified early in the development of the scheme design, and from autumn 2012 noise assessments have been used to inform the choice of construction methods. Early studies focused on reducing the potential for disturbance at night. Alternative working methods for some night-time activities such as bridge demolitions have been adopted, significantly reducing the effects on local communities.

11.3.6 Input from Park Village East residents resulted in a change in the way the barrette walls will be built, moving some of the noisier works to track level in the railway cutting, thus reducing noise sources at street level.

11.3.7 Construction traffic using local roads in the Regent's Park Estate, in particular, Stanhope Street, was identified as a source of noise impact early in the transport studies. The proposal to re-open Granby Terrace Bridge in mid-2018 to take construction traffic from the western bulk excavation area straight to Hampstead Road via Granby Terrace Bridge, rather than through the Regent's Park Estate, has been adopted as an effective noise mitigation measure, since fewer receptors would be affected.

11.3.8 The assessment assumes the implementation of the principles and management processes set out in the draft CoCP (Section 13) which are:

- Best Practicable Means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA) will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings; and then
  - screening: for example local screening of equipment or perimeter hoarding;
- where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered in accordance with the draft CoCP Section 13.2, which sets out the noise insulation and temporary re-housing policy;
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise, including control of working hours, and provide a further assessment of construction noise and vibration including confirmation of noise insulation/temporary re-housing provision;
- contractors will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to and be reviewed by the Nominated Undertaker and will be made available to the local authorities; and
- contractors will be required to comply with the terms of the draft CoCP and appropriate action will be taken by the nominated undertaker as required to ensure compliance.

11.3.9 In addition to this mitigation, taller screening as described in the draft CoCP[88] has been assumed, wherever practicable, along the edge of the majority of the construction site boundaries.

11.3.10 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP's noise insulation and temporary re-housing policy. Noise insulation or ultimately temporary re-housing will avoid residents being significantly affected[89] by levels of construction noise inside their dwellings.

11.3.11 Qualification for noise insulation and temporary re-housing will be identified as part of seeking prior consent from the local authorities under Section 61 of the CoPA. Qualifying buildings will be identified early enough so that noise insulation can be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria. Noise insulation, where required, will be installed as early as possible to reduce internal sound levels from construction activities, which will also be effective when the Proposed Scheme comes into operation.

11.4 Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

11.4.1 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, the following residential buildings are forecast to experience noise levels higher than the noise insulation trigger levels as defined in the draft CoCP.
For daytime construction the trigger level is an equivalent continuous noise level of 75 dB[90] measured outdoors:

- St Richard's House (approximately 60 dwellings), on Eversholt Street;
- buildings containing approximately ten dwellings at Parkway at the junction with Park Village East;
- Cubitt Court, Tintern House, Silsoe House and Richmond House (approximately 145 dwellings), Park Village East;
- buildings containing approximately ten dwellings on Park Village East, near Mornington Street Bridge;
- buildings containing approximately 15 dwellings on Park Village East (north end);
- buildings containing approximately 90 dwellings on Mornington Terrace and Clarkson Row;
- buildings containing approximately 25 dwellings on Mornington Place;
- buildings containing approximately 25 dwellings on Mornington Crescent;

[88] 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.
[89] Information is provided in the emerging National Planning Practice Guidance – Noise http://planningguidance.planningportal.gov.uk.
[90] $L_{pAeq,0800\text{-}1800}$ measured at the façade.

- Dalehead and Gillfoot residential blocks (approximately 160 dwellings), on the Ampthill Estate;
- four residential blocks (approximately 50 dwellings), Ampthill Square;
- buildings containing approximately 30 dwellings on Cobourg Street and east end of Drummond Street;
- buildings containing approximately 20 dwellings on Starcross Street;
- buildings containing approximately 60 dwellings at the north end of Stanhope Street;
- Langdale and Coniston (approximately 80 dwellings) on Harrington Street; and
- Cartmel and The Tarns (approximately 100 dwellings) on Hampstead Road.

11.4.2 The mitigation measures, including noise insulation where necessary, in these buildings, will reduce noise inside all dwellings to a level where it should not significantly affect residents.

Residential receptors: direct effects – communities

11.4.3 The avoidance and mitigation measures in this area will avoid airborne construction noise adverse effects[89] on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this section.

11.4.4 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

11.4.5 In locations with lower existing sound levels[91], construction noise effects[89] are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life. These effects are considered to be significant when assessed on a community basis taking account of the local context[92].

11.4.6 Vibratory piling of bridge piers and vibro-compaction is likely to result in appreciable ground-borne vibration at a small number of dwellings closest to these activities. These receptors will also be exposed to appreciable noise from the construction of the Proposed Scheme. The significance of the identified vibration effects has been assessed in combination with the airborne noise also identified at these receptors.

11.4.7 The direct construction noise effects on the acoustic character of the areas around the residential communities identified in Table 14 are considered to be significant. The durations of impact shown in Table 14 at each location are the total number of months in which the relevant significance criteria are forecast to be exceeded. Construction activities are likely to vary considerably in intensity during these periods.

[91] Further information is provided in Volume 5: Appendix SV-001-000.
[92] Further information is provided in Volume 5: Appendix SV-001-000 and SV-003-001.

Table 14: Adverse effects of construction noise and vibration that are considered to be significant on a community basis

Significant effect number (see Volume 5 Appendix SV-003-001)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact
CSV01-C01 Eversholt Street	Construction noise	Day	Approximately 60 dwellings in St Richard's House, 110 Eversholt Street	Demolition of buildings in the station approach with typical and highest monthly noise levels around 70dB and 80dB[93]	5 months
CSV01-C02 Park Village East	Construction noise	Day	Approximately 55 dwellings in Cubitt Court and Tintern House*, Park Village East	Demolition of buildings in the station approach, utility diversions, bridge construction, retaining wall construction, earthworks excavation, construction traffic with typical and highest monthly noise levels around 70dB and 80dB	24 months
	Construction noise and vibration	Night	Approximately 55 dwellings in Cubitt Court and Tintern House, Park Village East	Demolition of the carriage shed, construction of new bridge piers with typical and highest monthly noise levels around 60dB and 70dB[94]	Noise: 24 months Vibration: 1-2 months
	Construction noise	Day	Approximately 65 dwellings in Richmond House, and Goldsmith's House hostel, Park Village East.	Demolition of buildings in the station approach, utility diversions, bridge construction, retaining wall construction, earthworks excavation, construction traffic with typical and highest monthly noise levels around 65dB and 80dB	11 months
	Construction noise	Night	Approximately 65 dwellings in Richmond House, and Goldsmith's House hostel Park Village East.	Demolition of the carriage shed, construction of new bridge piers with typical and highest monthly noise levels around 55dB and 65dB	11 months
	Construction noise	Day	Approximately 25 dwellings in Silsoe House*, Park Village East	Demolition of buildings in the station approach, utility diversions, bridge construction, retaining wall construction, earthworks excavation, construction traffic with typical and highest monthly noise levels around 65dB and 80dB	11 months
	Construction noise	Night	Approximately 25 dwellings in Silsoe House, Park Village East	Demolition of the carriage shed, construction of new bridge piers with typical and highest monthly noise levels around 55dB and 65dB	11 months
	Construction	Day	Approximately	Demolition of buildings in the station	9 months

[93] Daytime: equivalent continuous sound level at the facade, $L_{pAeq,\ 0800\text{-}1800}$

[94] Night-time: equivalent continuous sound level at the facade, $L_{pAeq,\ 23:00 - 07:00}$

Significant effect number (see Volume 5 Appendix SV-003-001)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact
	noise		10 dwellings on Park Village East, near Mornington Street Bridge	approach, utility diversions, bridge construction, barrette retaining wall construction, cantilevered road and parapet construction, earthworks excavation, construction traffic with typical and highest monthly noise levels around 80dB and 90dB	
	Construction noise and vibration	Night	Approximately 10 dwellings on Park Village East, near Mornington Street Bridge	Mornington Street Bridge demolition, construction of new bridge piers with typical and highest monthly noise levels around 65dB and 75dB	2 months
	Construction noise	Day	Approximately 15 dwellings on Park Village East, north	Utility diversions, barrette retaining wall construction, cantilevered road and parapet construction, earthworks excavation, construction traffic with typical and highest monthly noise levels around 75dB and 85dB	6 months
	Construction noise	Night	Approximately 15 dwellings on Park Village East, north	Mornington Street Bridge demolition, construction of new bridge piers with typical and highest monthly noise levels around 55dB and 70dB	6 months
	Construction noise	Day	Approximately 20 dwellings on Park Village West	Utility diversions, barrette retaining wall construction, cantilevered road and parapet construction, construction traffic with typical and highest monthly noise levels around 60dB and 65dB	2 months
	Construction noise	Day	Approximately 10 dwellings on Parkway between Delancey Street and Park Village East	Utility diversions, demolition of existing retaining wall, construction of barrette wall, cantilevered road and parapet construction with typical and highest monthly noise levels around 55dB and 70dB	6 months
	Construction noise	Night	Approximately 10 dwellings on Parkway between Delancey Street and Park Village East	Mornington Street Bridge demolition, construction of new bridge piers with typical and highest monthly noise levels around 50dB and 60dB	2 months
CSV01-C03 Mornington Terrace	Construction noise	Day	Approximately 90 dwellings on Mornington Terrace	Contiguous piling retaining wall abutments, excavation, barrette wall construction (Park Village East) with typical and highest monthly noise levels around 70dB and 80dB	4 months
	Construction noise and vibration	Night	Approximately 90 dwellings on Mornington Terrace	Mornington Street Bridge demolition, construction of new bridge piers with typical and highest monthly noise levels around 50dB and 65dB	3 months
	Construction noise	Day	Approximately 25 dwellings on Mornington	Contiguous piling retaining wall abutments, excavation, barrette wall construction at Park Village East with	4 months

Significant effect number (see Volume 5 Appendix SV-003-001)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact
			Place	typical and highest monthly noise levels around 65dB and 80dB	
	Construction noise	Night	Approximately 25 dwellings on Mornington Place	Mornington Street Bridge demolition, construction of new bridge piers with typical and highest monthly noise levels around55dB and 65dB	3 months
	Construction noise	Day	Approximately 25 dwellings on Mornington Crescent	Demolition of the carriage shed and buildings in the station approach, earthworks, demolition and construction of Granby Terrace Bridge and Hampstead Road Bridge. with typical and highest monthly noise levels around 65dB and 75dB	14 months
	Construction noise	Night	Approximately 25 dwellings on Mornington Crescent	Bridge demolitions, construction of new bridge piers, installation of bridge trusses and precast planks with typical and highest monthly noise levels around 45dB and 60dB	11 months
CSV01-C04 Ampthill Estate	Construction noise	Day	Approximately 80 dwellings in Gillfoot*, Ampthill Estate	Utility diversions, demolition of buildings in the station approach, construction of Granby Terrace and Hampstead Road bridges with typical and highest monthly noise levels around 70dB and 80dB	28 months
	Construction noise	Night	Approximately 80 dwellings in Gillfoot, Ampthill Estate	Removal of Granby Terrace and Hampstead Road bridge decks and piers, construction of bridge structures with typical and highest monthly noise levels around 70dB and 80dB	16 months
	Construction noise	Day	Approximately 80 dwellings in Dalehead* on Ampthill Estate	Utility diversions, demolition of buildings in the station approach, construction of Granby Terrace and Hampstead Road Bridges with typical and highest monthly noise levels around 70dB and 80dB	6 months
	Construction noise	Night	Approximately 80 dwellings in Dalehead on Ampthill Estate	Removal of Granby Terrace and Hampstead Road Bridge decks and piers, construction of bridge structures with typical and highest monthly noise levels around 55dB and 65dB	1 months
	Construction noise	Day	Approximately 50 dwellings on Ampthill Square*	Utility trenching, demolition of buildings in the station approach, excavation, construction of new bridge with typical and highest monthly noise levels around 65dB and 75dB	38 months
	Construction noise	Night	Approximately 50 dwellings on Ampthill Square	Construction of new bridge piers, trusses and precast decks with typical and highest monthly noise levels around 60dB and 70dB	21 months
CSV01-C05 Cobourg	Construction noise and	Day	Approximately 30 dwellings	Utility trenching, demolition of buildings in Melton Street and	Noise: 33 months

Significant effect number (see Volume 5 Appendix SV-003-001)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact
Street	vibration		on Cobourg Street and side streets	Cardington Street, construct barrette retaining walls and abutments, major earthworks. with typical and highest monthly noise levels around 75dB and 85dB	Vibration: 1 month
	Construction noise	Evening	Approximately 30 dwellings on Cobourg Street and side streets	Retaining walls and abutments with typical and highest monthly noise levels around 50dB and 55dB[95]	3 months
	Construction noise	Night	Approximately 30 dwellings on Cobourg Street and side streets	Bridge construction with typical and highest monthly noise levels around 45dB and 55dB	3 months
	Construction noise	Day	Approximately 20 dwellings on Starcross Street	Utility trenching, demolition of buildings in Melton Street and Cardington Street, construct barrette retaining walls and abutments, major earthworks with typical and highest monthly noise levels around 70dB and 80dB	25 months
	Construction noise	Evening	Approximately 20 dwellings on Starcross Street	Retaining walls and abutments with typical and highest monthly noise levels around 65dB and 70dB	3 months
	Construction noise	Night	Approximately 20 dwellings on Starcross Street	Bridge construction with typical and highest monthly noise levels around 50dB and 55dB	3 months
CSV01-C06 Regent's Park Estate	Construction noise	Day	Approximately 60 dwellings in Augustus House on Stanhope Street	Utility trenching, demolition of Eskdale and buildings in the station approach, on site traffic, major excavation, bridge construction with typical and highest monthly noise levels around 70dB and 85dB	46 months
	Construction noise	Night	Approximately 60 dwellings in Augustus House on Stanhope Street	Installation of bridge demolition deck, construction of new bridge pier, installation of temporary supports, trusses & precast planks with typical and highest monthly noise levels around 60dB and 65dB	24 months
	Construction noise and vibration	Day	Approximately 80 dwellings in Langdale and Coniston on Harrington Street	Utility trenching, demolition of Ainsdale, Silverdale and buildings in the station approach, major earthworks, barrette retaining wall construction, construction of new bridge and carriageway with typical and highest monthly noise levels around 70dB and 85dB	40 months

[95] Evening: equivalent continuous sound level at the facade, $L_{pAeq,\ 19:00 - 23:00}$

Significant effect number (see Volume 5 Appendix SV-003-001)	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed duration of impact
	Construction noise	Evening	Approximately 80 dwellings in Langdale and Coniston on Harrington Street	Construction of barrette retaining walls and abutments with typical and highest monthly noise levels around 65dB and 70dB	2 months
	Construction noise	Night	Approximately 80 dwellings in Langdale and Coniston on Harrington Street	Installation of bridge demolition deck, construction of new bridge pier, installation of temporary supports, trusses and precast decks with typical and highest monthly noise levels around 65dB and 70dB	6 months
	Construction noise and vibration	Day	Approximately 70 dwellings in Cartmel on Hampstead Road	Utility trenching, demolition of Silverdale and buildings in the station approach, major earthworks, barrette retaining wall construction, construction of new bridge and carriageway with typical and highest monthly noise levels around 70dB and 80dB	5 months
	Construction noise	Night	Approximately 70 dwellings in Cartmel on Hampstead Road	Installation of bridge demolition deck, construction of new bridge piers, installation of temporary supports, trusses and precast decks with typical and highest monthly noise levels around 60dB and 70dB	5 months
	Construction noise	Day	Approximately 30 dwellings in The Tarns on Hampstead Road	Utility trenching, demolition of buildings in the station approach, major earthworks, barrette retaining wall construction, construction of new bridge and carriageway with typical and highest monthly noise levels around 70dB and 80dB	5 months

* Adverse noise effects are also forecast to occur in shared open areas.

Residential receptors: indirect effects

11.4.8 Construction road traffic associated with the Proposed Scheme will generate airborne noise. In the Euston area road traffic management measures on some roads will divert public traffic to other roads (for further information please refer to Section 12: Traffic and Transport). These two changes to road traffic patterns have been assessed to estimate noise changes on roads in the area.

11.4.9 Increases in local road traffic as a result of construction of the Proposed Scheme is likely to cause adverse noise effects on residential receptors along the following local roads:

- Stanhope Street, north of Robert Street (CSV01-C07), increase in road traffic noise (approximately 2 to 4dB) due to construction traffic until mid-2018;

- Robert Street, from Hampstead Road to Albany Street (CSV01-C08), increase in road traffic noise (approximately 1 to 2dB[96] on the East section and up to 3dB on the West section from Stanhope Street to Albany Street) due to construction traffic;
- Albany Street, from Parkway to Robert Street (CSV01-N23), increase in road traffic noise (approximately 1 to 2dB) from the addition of HGV using the ZSL London Zoo coach park as a Lorry Holding Area from 2018;
- Eversholt Street, from the Euston Road to the Barnby Street Royal Mail delivery office satellite compound (CSV01-C09), increase in road traffic noise (approximately 1 to 2dB[13]) due to construction traffic;
- Barnby Street (CSV01-C10), increase in road traffic noise (approximately 8 to 9 dB) due to construction traffic;
- Torrington Place (CSV01-C11), increase in road traffic noise (approximately 3dB) due to traffic diverting to avoid the closure at Gordon Street;
- Albert Street, north of Mornington Street (CSV01-C12), increase in road traffic noise (approximately 3 to 4dB) due to traffic diverting to avoid the closure of Mornington Street Bridge; and
- Mornington Street (CSV01-C13), increase in road traffic noise (approximately 3dB) after the re-opening of Mornington Street Bridge.

11.4.10 These adverse effects[89] would be a change in the acoustic character of the area such that there is a perceived change in the quality of life and are considered significant when assessed on a community basis taking account of the local context[91].

Non-residential receptors: direct effects

11.4.11 The area around the Euston works has various non-residential and commercial receptors, many of which are already exposed to high levels of road traffic noise. The assessment of potential noise effects incorporates consideration of baseline sound levels, and, in many cases, construction noise effects are not expected because construction noise will not increase these. There are also many non-residential and commercial receptors on roads where utilities works will be carried out, where noise impacts will be too short i.e. less than one month to result in a significant effect[97].

11.4.12 The assessment of effects on non-residential receptors has been undertaken on a reasonable worst case basis. Further information can be found in Volume 5: Appendix SV-003-001.

11.4.13 Significant construction noise or vibration effects have been identified on a reasonable worst case basis on the following non-residential receptors:

[96] Although these are small increases, they are considered significant due to the high existing baseline level at this location. Further information is contained in the SMR.
[97] Noise from works will be kept to a reasonably practicable minimum through implementation of the CoCP.

- Park Village Studio on Park Village East (CSV01-N01), due to a range of works including utility trenching, barrette pile cap breaking and cantilevered road construction over a period of 3 months;
- Travelodge hotel on Eversholt Street (CSV01-N02). A combined direct and indirect effect from noise due to a range of works including utility trenching and demolition for a period of 2 months and the increases in road traffic due to construction;
- Maverick TV Studio on Churchway (CSV01-N03). Daytime noise and vibration effects are identified only briefly during utility works, but given the sensitivity of the building this is considered significant;
- St Mary's Church, St Aloysius' RC Church and commercial properties on Eversholt Street (CSV01-N04, CSV01-N05 and CSV01-N06), daytime noise effects over a period of 5 months due to a range of works including utility trenching and demolition;
- offices in Cobourg Street and the Wesley Hotel in Euston Street (CSV01-N07 and CSV01-N08), daytime noise effects over a period of up to 30 months due to a range of works including demolitions a new utility corridor, barrette pile construction and major earthworks;
- Exmouth Arms public house in Starcross Street (CSV01-N09), daytime noise effects over a period of up to 11 months due to a range of works including demolitions a new utility corridor, barrette pile construction and earthworks;
- the Mosque in Starcross Street (CSV01-N10), daytime noise effects over a period of up to 33 months due to a range of works including demolitions, a new utility corridor, barrette pile construction and earthworks;
- the Margarete Centre at 108 Hampstead Road and Maria Fidelis Convent School in North Gower Street (CSV01-N11 and CSV01-N12), daytime noise effects over a period of up to 41 months due to a range of works including demolitions, a new utility corridor, barrette piling of retaining walls, major earthworks and bridge construction;
- Regents Park Children's Centre nursery in Augustus Street (CSV01-N13), daytime noise effects over a period of up to 12 months, due to a range of works including demolitions a new utility corridor, earthworks, and bridge construction;
- the West Euston Partnership offices on the junction of Robert Street and Hampstead Road (CSV01-N14), daytime noise effects over a period of 5 months due to a range of works including demolitions and construction of a new utility corridor; and
- offices at 1-9 Melton Street (CSV01-N15), daytime noise effects over a period of up to 7 months due to a range of activities including demolition of buildings in Euston Square, construction of a new utilities corridor and earthworks.

Non-residential receptors: indirect effects

11.4.14 Increases in local road traffic as a result of construction of the Proposed Scheme is likely to cause significant indirect noise effects at non-residential receptors along the following local roads:

- Stanhope Street, north of Robert Street (CSV01-N16), increase in road traffic noise (approximately 2 to 4dB) due to construction traffic until mid-2018;
- Robert Street, from Hampstead Road to Stanhope Street (CSV01-N17), increase in road traffic noise (approximately 1 to 2dB) due to construction traffic until mid-2018;
- Eversholt Street, from the Euston Road to the Barnby Street (CSV01-N18), increase in road traffic noise (approximately 1 to 2dB) due to construction traffic;
- Barnby Street (CSV01-N19), increases in road traffic noise (approximately 8 to 9 dB) due to construction traffic;
- Torrington Place (CSV01-N20), increases in road traffic noise (approximately 3dB) due to traffic diverting to avoid the closure at Gordon Street;
- Albert Street, north of Mornington Street (CSV01-N21), increases in road traffic noise (approximately 3 to 4dB) due to traffic diverting to avoid the closure of Mornington Street Bridge;
- Mornington Street (CSV01-N22), increases in road traffic noise (approximately 3dB) after the re-opening of Mornington Street Bridge; and
- Albany Street, from Parkway to Robert Street (CSV01-N23), increases in road traffic noise (approximately 1-2dB) from the addition of HGV using the Regents Park Holding Area and serving the site from 2018.

Cumulative effects from the Proposed Scheme and other committed development

11.4.15 This assessment has considered the potential cumulative construction noise effects of the proposed scheme and other committed developments[98]. In this area, the main committed developments are too far from the noise sensitive receptors that overlook, and may be affected by noise from, the Euston station and approach construction works to add significantly to noise impacts from the Proposed Scheme. Accordingly, construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

Summary of likely residual significant effects

11.4.16 The avoidance and mitigation measures reduce noise inside all dwellings from the construction activities such that it is does not reach a level where it would significantly affect[89] residents.

[98] Refer to Volume 5: Appenndix CT-004-000.

11.4.17 The measures also reduce the construction noise effects[89] on acoustic character in the majority of residential communities. Despite these measures, the effects on the acoustic character in the following local residential community areas are considered to be significant:

- Eversholt Street;
- Park Village East;
- Mornington Terrace and parts of Mornington Place and Crescent;
- Ampthill Estate;
- Cobourg Street; and
- Regent's Park Estate including Cartmel, Coniston and Langdale;

11.4.18 On a reasonable worst case basis, noise from specific construction activities has been identified as resulting in significant residual effects on the following non-residential properties:

- film/TV studios on Park Village East and Churchway;
- a hotel, two churches and commercial premises on Eversholt Street;
- the Exmouth Arms public house, offices in Starcross Street and the Wesley Hotel in Euston Street;
- the Mosque in Starcross Street;
- the Margarete centre at 108 Hampstead Road and Maria Fidelis Convent School in North Gower Street;
- Regents Park Children's Centre nursery in Augustus Street; and
- offices at 1-9 Melton Street and on the corner of Robert Street and Hampstead Road.

11.4.19 Increases in local road traffic on Albany Street; Robert Street from Hampstead Road to Albany Street; Stanhope Street, north of Robert Street; Eversholt Street; Barnby Street; Torrington Place; Albert Street north of Mornington Street; and Mornington Street as a result of construction of the Proposed Scheme are likely to cause significant noise effects on adjacent residential and non-residential receptors.

11.4.20 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so, HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures. The outcome of these activities will be appropriately reflected in the Environmental Minimum Requirements.

11.5 Effects arising during operation

Local assumptions and limitations

Local assumptions – service pattern

11.5.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based on the highest likely train flows, including the Phase Two services. Trains are expected to be 400m long during peak hours and a mix of 200m and 400m long trains at other times. It has been assumed in the assessment that there will be no changes to the timetables and other characteristics of the classic trains operating into and out of Euston station.

11.5.2 The expected passenger service frequency for both Phase One and Phase One with Phase Two services are described in Volume 1[99]. 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 15. 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 15.

Table 15: Train flows and speeds

Description of line	Time period for peak daytime flows	Number of trains per hour in each direction Phase Two services(Phase One only trains per hour in each direction is set out in brackets)	Speed
Main line between London and the north	07:00 – 21:00	18 (14)	110 kph, with speeds reducing toward Euston station

Local assumptions – tunnelled sections

11.5.3 Tunnel portals are likely to include mechanical ventilation equipment. It is likely that this equipment will only operate for limited testing periods during the daytime[100], or in the event of an emergency.

Avoidance and mitigation measures

Airborne noise

11.5.4 HS2 trains will be quieter than the relevant current European Union specifications. The track will be specified to reduce noise, as will the maintenance regime. Further information is provided in Volume 5: Appendix SV-001-000.

11.5.5 The solid containment and safety barriers included on the rebuilt Hampstead Road Bridge will reduce the effect of noise from road traffic noise on the Regent's Park Estate. Barrier locations are shown on Map Series SV-05 (Volume 2, CFA1 Map Book).

[99] The change in noise and vibration effects between the different passenger services is assessed in Volume 1.
[100] For example, HS1 vent shaft fans are tested monthly.

11.5.6 Permanent noise effects are avoided or reduced in other locations along the line, for example along Park Village East by the new retaining walls for the railway cutting and their parapets. The location of these barriers is shown on Map Series SV-05 (Volume 2, CFA1 Map Book).

11.5.7 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).

Ground-borne noise and vibration

11.5.8 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects –individual dwellings

11.5.9 The mitigation measures 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

11.5.10 The avoidance and mitigation measures in this area will avoid airborne noise adverse effects on the majority of receptors and at the following communities:

- Ampthill Estate;
- along Mornington Terrace; and
- along Park Village East.

11.5.11 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2, CFA1 Map book) shows the long term 40dB[101] 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 contour[102]. In general, below these levels adverse effects are not expected.

11.5.12 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, CFA1 Map Book).

11.5.13 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. These effects are considered to be significant when assessed on a community basis taking account of the local context.

[101] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$).
[102] 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 LpAeq,day) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

11.5.14 The direct adverse effects[89] on the areas of the residential communities identified in Table 16 are considered to be significant.

Table 16: Adverse effects of operational noise and vibration that are considered to be significant on a community basis

Significant effect number (see Map series SV-05)	Source of significant effect	Time of day	Location and details
OSV01-C01	Airborne noise increase from new train services and the realignment of Hampstead Road.	Daytime and night-time	Forecast increases in sound from the railway are likely to cause a moderate adverse effect on the acoustic character of the area around Langdale and the adjacent open spaces, and a minor adverse effect around Augustus House and Coniston and their adjacent shared community open areas. These buildings are located in the Regent's Park Estate.

Residential receptors: indirect effects

11.5.15 Changes in road traffic due to the operation of the Proposed Scheme, set out in Section 12: Traffic and Transport, is likely to create beneficial noise effects on residential receptors along the following local roads:

- Drummond Street (OSV01-C05), where road closures will result in a reduction of outdoor noise levels by approximately 5dB in the vicinity of dwellings located immediately adjacent to these roads; and
- Robert Street and Varndell Street (OSV01-C06), outdoor noise levels will reduce by approximately 5dB in the vicinity of dwellings located immediately adjacent to these roads due to reorientation of traffic routes in this area.

11.5.16 Changes in road traffic due to the Proposed Scheme, set out in Section 12, is likely to cause adverse noise effects on residential receptors along the following local roads:

- part of North Gower Street and Cobourg Street (OSV01-C02), increased road traffic noise levels of approximately 5dB;
- the section of Stanhope Street between Granby Terrace and Robert Street (OSV01-C03), an overall increase in outdoor noise levels of around 5 dB is forecast[103]; and
- Mornington Street and Arlington Street to the north of the station (OSV01-C04), an increase in outdoor noise levels of around 3 dB.

11.5.17 The changes in noise levels resulting from the changes in road traffic are likely to affect the acoustic character of the area, such that there is a perceived change in the quality of life.

11.5.18 These effects are considered significant when assessed on a community basis taking account of the local context.

[103] The increase in traffic noise on this road is around 12dB, but the sound level at the adjacent dwellings is not currently dominated by the traffic flow on this road.

Non-residential receptors: direct effects

11.5.19 The assessment of operational noise and vibration indicates that significant direct effects are unlikely to occur on non-residential receptors in this area.

Non-residential receptors: indirect effects

11.5.20 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Summary of likely significant residual effects

11.5.21 The mitigation measures reduce noise inside all dwellings such that it does not reach a level where it would significantly affect residents.

11.5.22 The avoidance and mitigation measures in this area will avoid noise and vibration adverse effects[89] on the majority of receptors and communities including shared open areas.

11.5.23 The residual permanent noise beneficial effects on the acoustic character of the communities that result from reduced noise levels, due to road closures, at Drummond Street, Robert Street and Varndell Street and their adjacent shared community open areas are considered significant. The residual permanent noise adverse effects, due to increases in traffic, in part of North Gower Street, Cobourg Street, Stanhope Street, Mornington Street and Arlington Street are considered significant.

11.5.24 Taking account of the avoidance and mitigation measures and the local context, the residual permanent noise adverse effects on the acoustic character of the Regent's Park Estate community in the vicinity of Langdale, Augustus House and Coniston, including their adjacent shared community open areas, are considered significant.

11.5.25 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid the adverse 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 appropriately reflected in the Environmental Minimum Requirements.

12 Traffic and transport

12.1 Introduction

12.1.1 This 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 within the Euston station and the station approach area.

12.1.2 With regard to traffic and transport, the main issues are changes in passenger movements through Euston station and on onward modes of transport including London Underground services, buses, walking, cycling, taxi and private vehicle pick up/set down movements and increased traffic as a result of implementation of the Proposed Scheme, road diversions, temporary and permanent road closures, and temporary and permanent diversions or closure of paths used by the public (treated in the same way as PRoW for the purposes of the ES).

12.1.3 The effects on traffic and transport have been assessed quantitatively, based on baseline traffic and passenger conditions and future projection scenarios.

12.1.4 A detailed report on traffic and transport and surveys undertaken within the area is contained in Volume 5 Appendix TR-001-000, Transport Assessment.

12.1.5 Maps showing the location of the key transport infrastructure can be found on Figure 2.

12.1.6 Engagement has been undertaken with the key transport authorities including Transport for London (TfL), Network Rail (NR) and LBC.

12.2 Scope, assumptions and limitations

12.2.1 The assessment scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, the SMR and the SMR Addendum. This report follows the standard assessment methodology defined in these documents.

12.2.2 The study area includes the area around Euston station, although the highway assessment covers the detailed area within TfL's Central London Highways Assignment Model (CLoHAM), corresponding to an area approximately 1km outside the pre-December 2010 extended Congestion Charging zone. The public transport assessment is similarly focussed on the area around Euston station but also covers the wider London public transport network as represented within TfL's Railplan model.

12.2.3 A number of transport modelling tools have been used to inform the assessment namely TfL's Railplan model and CLoHAM for public transport and highways respectively. The Railplan model uses long distance rail demand (including HS2 demand) from the DfT's PLANET Modelling Framework (PFMv4). The time periods available in these tools means that the public transport assessment covers the weekday morning peak period (07:00-10:00) and evening peak period (16:00-19:00), while the highway assessment covers the morning (08:00-09:00) and evening (17:00-18:00) peak hours and an average hour for the period in between (the inter-peak hour).

12.2.4 The combined impacts and effects from construction of HS2 associated with Chalk Farm Road (CFA2, Camden Town and HS1 Link) and Adelaide Road (CFA3, Primrose

Hill to Kilburn) have been included in the assessment in this CFA. Where the activity in this area affects adjacent CFAs, these are identified in this assessment for completeness but the effects are reported in the relevant CFA.

12.2.5 The impact of construction traffic has been assessed on the assumption that all excavated material from worksites will be removed by road. The potential to use rail is being investigated, which would reduce the impacts of construction traffic.

12.3 Environmental baseline

Existing baseline

12.3.1 Existing conditions in the vicinity of Euston station have been determined through site visits, specially commissioned transport surveys and liaison with TfL and other stakeholders to source transport models and accident data. All transport modes have been surveyed including private vehicles, public transport, walking, cycling and taxis, with the data supplemented by information from TfL.

12.3.2 Traffic surveys of all roads in the vicinity of Euston station were undertaken in June and July 2012 comprising junction turning counts and queue surveys, automatic traffic counts, traffic signal timing and saturation flow surveys and journey time surveys. This was supplemented by traffic and transport data obtained from other sources where available, including from TfL. The highway peak hours in the study area were identified as 08:00-09:00 and 17:00-18:00.

12.3.3 Public footway surveys (treated similar to PRoW for the purposes of the ES) were undertaken in September 2012 to establish their usage by pedestrians and cyclists (non-motorised users). The surveys included all footpaths used by public and roads that will cross the route of the Proposed Scheme, and any additional footpaths used by the public and roads that will be affected by the Proposed Scheme. The surveys were designed to capture the following information:

- classified pedestrian and cycle counts (by direction); and
- details of footpaths used by the public derived from a sample questionnaire survey.

12.3.4 CFA1 contains the following paths used by the public, which have been treated in the same way as PRoW for the purposes of the ES:

- the path between A400 Hampstead Road leading into St. James's Gardens;
- a section of the path on the pedestrian section of Harrington Street; and
- two paths across Euston Square Gardens (one to the east and one to the west).

12.3.5 There are several strategic routes that pass through the area. Euston station lies immediately north of the A501 Euston Road, which is part of the TfL Road Network (TLRN), owned and maintained by TfL. The station is bounded by A501 Euston Road to the south, A4200 Eversholt Street to the east and A400 Hampstead Road to the west. Roads around Euston station carry a significant amount of traffic as well as pedestrian flows, which is to be expected given their proximity to the station. The A501 Euston Road is currently subject to delays and congestion at peak times.

12.3.6 Euston station has 216 basement public car park spaces, but with relatively low utilisation. In addition, there are 326 staff parking spaces located on the parcels deck, the majority of which are allocated to train operating companies and other service companies including food, engineering and station facility providers. On-street parking is present on surrounding streets comprising resident permit holders, pay and display, motorcycle bays, disabled spaces, loading bays, car club bays and taxi parking.

12.3.7 Euston station generates approximately 340 combined two-way service and delivery vehicle movements per day to support its function as a station and its ancillary services including retail and catering services.

12.3.8 Relevant accident data for the road network subject to assessment has been obtained from TfL for the three year period from 2009 to 2011. This has been assessed with any clusters identified and examined.

12.3.9 Euston station is served by 12 public bus routes, with the majority of routes serving Euston bus station including four terminating routes. These services provide a maximum combined service frequency of 127 buses per hour between Monday and Friday. There are also a number of routes passing through the area around Euston station on A501 Euston Road, A4200 Eversholt Street and A400 Hampstead Road.

12.3.10 There is one existing designated coach bay on the west side of the railway station on Cardington Street opposite the Ibis Hotel Euston.

12.3.11 There are a number of London Cycle Network (LCN) routes on streets around Euston. Surveys undertaken in July 2012 indicated a tidal flow of cyclists from Euston station. The surveys indicate that the majority of onward cycle trips across the whole day are to the south of A501 Euston Road, with the highest proportion heading in a south-east direction towards Holborn and the City. Cycle demand is higher during the weekday peak hours than the Saturday peak hours. A survey of cyclists at the station recorded a total of approximately 190 combined two-way cycle movements into and out of the station in the morning peak hour.

12.3.12 Euston station provides main line National Rail commuter and intercity services and direct interchange with London Underground (LU) Victoria line and Northern line (Bank and Charing Cross branches) services, buses and taxis. The average number of existing National Rail passengers per day is 65,170 from trains and 67,700 to trains[104].

12.3.13 As shown in Table 17, some 24,680 passengers alight from existing National Rail services in the morning peak period (three hours), with 11,580 of those in the peak hour. In the evening peak period (three hours), some 23,980 board and with 9,030 of those in the peak hour.

[104] Source for this and the following Table: DfT Statistics, 2012 (https://www.gov.uk/government/organisations/department-for-transport/series/rail-statistics) accessed: 2 October 2013.

Table 17: Existing National Rail passenger demand at Euston station

	Morning peak period 07:00-10:00	Morning peak hour 08:00-9:00	Evening peak period 16:00-19:00	Evening peak hour 18:00-19:00
From trains	24,680	11,580	11,530	4,100
To trains	8,510	3,380	23,980	9,030

12.3.14 The main entrance to the Euston underground station is in the Euston station concourse, with a secondary access via an underground footway from existing platforms 8 to 11. The surface level pedestrian movements outside the station include people walking to nearby destinations, interchanging with bus services and taxis and also street level links with the Circle, Hammersmith & City and Metropolitan line Underground services at Euston Square underground station. Pedestrians wishing to interchange between Euston and Euston Square underground stations have to cross a busy junction with Melton Street.

12.3.15 Some 12,700 passengers interchange from existing National Rail services to London Underground services (Euston and Euston Square Underground stations) in the morning peak period (three hours), with nearly 6,000 of those in the peak hour, as shown in Table 18.

Table 18: London Underground passenger movements at Euston station[105]

	Morning peak period 07:00-10:00	Morning peak hour 08:00-9:00	Evening peak period 16:00-19:00	Evening peak hour 18:00-19:00
From trains				
To Northern line	6,490	3,010	2,420	1,000
To Victoria line	3,410	1,440	3,160	1,390
To Euston Square	2,790	1,540	720	340
Total	12,700	5,990	6,300	2,729
To trains				
From Northern line	1,350	420	6,140	2,640
From Victoria line	2,130	830	4,430	1,580
From Euston Square	550	150	2,160	730
Total	4,030	1,390	12,740	4,950

12.3.16 There are no navigable waterways in the area that will be affected by the Proposed Scheme and this aspect is not considered further in this assessment.

Future baseline

12.3.17 Future baseline traffic volumes for the years of assessment 2021, 2026 and 2041, have been derived from TfL's CLoHAM. Future demand was provided by TfL, based on the

[105] Source: TfL Survey Data 2010 (Arup analysis).

London Transportation Studies, which assumes London Plan growth. Consented highway and public transport schemes have been included in the relevant future baseline scenarios. Growth in passenger numbers has been derived from TfL's Railplan model for 2026 and 2041, which includes long-distance rail demand from DfT's PLANET model. No Railplan forecasts are available for 2021.

Construction

12.3.18 Individual construction activities by road have been assessed against 2021 baseline traffic flows, irrespective of when they occur during the construction period. Future baseline traffic volumes in the peak hours are forecast to grow by around 2% by 2021 compared to 2012. Changes to rail or London Underground services as a result of construction activities have been assessed against 2026 baseline conditions.

Operation (2026)

12.3.19 Future baseline traffic volumes in the peak hours are forecast to grow by around 4% by 2026 compared to 2012. Future baseline public transport flows arriving at Euston by rail in the morning peak 07:00-10:00 period are forecast to increase by 19% as shown in Table 19 compared to 2012. In the evening peak 16:00-19:00 period, public transport flows leaving Euston by rail are forecast to increase by 23% compared to 2012.

Operation (2041)

12.3.20 Future baseline traffic volumes in the peak hours are forecast to grow by around 7% by 2041 compared to 2012. Future baseline public transport flows arriving at Euston by rail in the morning peak 07:00-10:00 period are forecast to increase by 46% compared to 2012. In the evening peak 16:00-19:00 period, public transport flows leaving Euston by rail are forecast to increase by 58% compared to 2012.

Table 19: Baseline rail passenger demand at Euston station[106]

	Morning peak period 07:00-10:00			**Evening peak period 16:00-19:00**		
	2012 baseline	2026 baseline	2041 baseline	2012 baseline	2026 baseline	2041 baseline
From trains	24,682	29,441	36,092	11,530	12,374	15,961
To trains	8,513	11,995	14,543	23,981	29,583	37,789

[106] 2012 Baseline from https://www.gov.uk/government/organisations/department-for-transport/series/rail-statistics; 2026 and 2041 Baseline from TfL Railplan model.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The following measures (as detailed in Section 2) have been included as part of the engineering design of the Proposed Scheme and will avoid or reduce effects on transport users:

- heavy goods vehicle (HGV) routeing as far as possible along the strategic road network and using designated roads for access. These features are shown on Map CT-05-001 (Volume 2, CFA1 Map Book);
- site workers to use public transport to access the site with no on-site workers' parking;
- the A400 Hampstead Road bridge will require reconstruction. The bridge currently carries a six lane road. Reconstruction will involve removing one half of the width and replacing that, before repeating for the other half. Throughout reconstruction, one lane of traffic will be kept open in each direction. A footway will be maintained at all times during construction. Two temporary utilities bridges will be provided during construction one of which will provide a route for cyclists;
- the proposed sub-surface pedestrian route under Euston Square Gardens and across A501 Euston Road and the connections to the Euston Square underground station platforms will be constructed using open cut excavation techniques and will include diversion of various utilities that will require the temporary closure of the eastbound and westbound bus lanes on A501 Euston Road. Construction will be phased across the road, in order to maintain two lanes in each direction, compared to the existing three lanes in each direction;
- passenger access by car will be retained with temporary facilities for passenger drop-off in A4200 Eversholt Street, although no public car parking will be provided during construction phases;
- the taxi facility will be relocated to A4200 Eversholt Street within 400m of its current position before moving to its permanent location on Cobourg Street as part of the Proposed Scheme in quarter three 2022. The detailed arrangements for temporary taxi operations will be developed with TfL and Camden Council; and
- cycle parking capacity will be maintained and specific temporary cycle parking locations proposed in consultation with TfL and LBC, as required. Any Barclays cycle docking stations affected by construction will be relocated.

12.4.2 The draft CoCP will seek to reduce deliveries of construction materials and equipment, thus minimising construction lorry trip generation, especially during peak traffic periods. The draft CoCP will include HGV management and control measures.

12.4.3 The number of private car trips to and from the site (both workforce and visitors) will be minimised with no provision for workers' parking. This objective will be supported through an over-arching framework travel plan[107] 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 encouraging the use of sustainable modes of transport.

12.4.4 The measures in the draft CoCP include clear controls on vehicle types, hours of site operation, and routes for heavy goods vehicles, to reduce the impact of road-based construction traffic. In order to achieve this, generic and site specific traffic management measures will be implemented on or adjacent to public roads, bridleways and footpaths used by the public affected by the Proposed Scheme, as necessary.

12.4.5 Specific management measures will include: the core site operating hours, as set out in the draft CoCP, will be 08:00-18:00 on weekdays and 08-00-1300 on Saturdays. Site staff and workers will generally arrive before the morning peak hour and depart after the evening peak hour, although certain specific construction activities will require extended working hours for reasons of engineering practicability (draft CoCP Section 5.2).

12.4.6 Planned Network Rail track possessions will be used to facilitate civil engineering works affecting the existing rail network. These possessions will be generally limited to weekends and mid-week nights to facilitate those construction activities planned outside the core working hours and to reduce disruption to rail passengers.

Assessment of impacts and effects

Temporary effects

12.4.7 The following section considers the impacts on traffic and transport and the consequential effects resulting from construction of the Proposed Scheme. It identifies, as appropriate, effects in adjacent CFAs.

12.4.8 The main impacts of the Proposed Scheme during the construction phase result from: additional construction traffic; changes to the highway network due to road closures, utility works and local diversions which will affect highway vehicles, buses, taxis, cyclists and pedestrians; changes to the layout of the station due to construction work which will affect passengers moving through the station; and possessions and blockades on the National Rail network and LU platform closures.

12.4.9 More specifically the temporary traffic and transport impacts in the Euston area will be:

- construction vehicle movements to/from compounds as shown in Table 20;
- long-term temporary road closures and associated diversions;

[107] 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.

- permanent road closures with replacement at Cobourg Street, A400 Hampstead Road and Granby Terrace bridge;
- removal of some parking and loading; and
- possessions and blockades on the National Rail network mainly during mid-week and at night-time and temporary LU platform closures on both branches of the Northern Line and Victoria Line.

12.4.10 Construction activities will result in a number of temporary, mainly partial, road closures with some roads rebuilt on an altered alignment. The details of these closures and alignment changes are described in Section 2.4.

12.4.11 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, and movement of excavated materials.

12.4.12 Details of construction compounds are provided in Section 2.4. The duration of when there will be busy transport activity at each site is shown in Table 20. This represents the period when the construction traffic flows will be greater than 50% of the peak flows. Also shown is the estimated number of daily vehicle trips during the peak month of activity, the lower end of the range shows the average number of trips and the upper end the peak flows. The assessment scenario has assumed the peak month for the combination of activities, i.e. not necessarily the peak activity at each individual site.

Table 20: Typical vehicle trip generation for construction site compounds in this area

Compound type	**Location**	**Access**	**Indicative start set up date**	**Estimated duration of use**	**Estimated period 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	Euston Square Gardens (west)	Melton Street and A501 Euston Road	Q1 2016	11 years	5 months	20 – 35	230 – 315
Main	National Temperance Hospital	A400 Hampstead Road	Q1 2016	11 years	17 months	40-60	410 – 590
Satellite	Granby Terrace overbridge	Initially Stanhope Street via Robert Street and after mid 2018 via Granby Terrace Bridge	Q1 2016	11 years	10 months	30 – 45	300 – 455
Satellite	Mornington Street overbridge	Mornington Terrace	Q1 2016	4 years (from start to end but in two 18 month phases)	14 months	<10	<10 – 10
	Mornington Terrace Sidings		Q3 2015	2 years			
Satellite	A400	A400	Q1 2016	11 years	17 months	<10	15 – 20

Compound type	Location	Access	Indicative start set up date	Estimated duration of use	Estimated period with busy vehicle movements (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
	Hampstead Road overbridge (north and south)	Hampstead Road & Barnby Street		(north) 6 years (south)			
Satellite	Royal Mail NW1 delivery office	A4200 Eversholt Street	Q1 2016	11 years (from start to end but in two phases)	7 months	<10	45 – 60
Satellite	Euston Square Gardens (east)	A4200 Eversholt Street	Q1 2016 and Q1 2020	11 years (from start to end but in two phases)	6 months	<10	<10
Satellite	Gordon Street	A501 Euston Road	Q1 2016	11 years	9 months	<10	20 – 25
Satellite	Lancing Street	A4200 Eversholt Street	Q3 2020	6 years	6 months	<10	<10
Satellite	Carriage Shed and Park Village East	Initially Stanhope Street via Robert Street and after mid 2018 via Granby Terrace Bridge	Q1 2016	11 years	17 months	<10	35 – 50

12.4.13 A lorry holding area at ZSL London Zoo coach park has been assessed to support the Euston station construction works. Initial discussions have taken place with Royal Parks and the operation of the lorry holding area will be subject to on-going investigation and consultation.

12.4.14 Drummond Street is identified as a construction route but will only be used for a small number of specific construction activities. This feature is shown on Map CT-05-001 (Volume 2, CFA1 Map Book). The volume of trips will be small and will not generate any additional traffic effects to those reported.

12.4.15 Initially vehicle access to the Granby Terrace overbridge and Carriage shed and Park Village East satellite compounds will be from A400 Hampstead Road via Robert Street and Stanhope Street. On completion of Granby Terrace bridge in mid-2018 the bridge will reopen for construction traffic only enabling the majority of construction vehicles to access these compounds from A400 Hampstead Road via Granby Terrace. The bridge will then open to general traffic in mid-2021.

12.4.16 There is an interaction with CFA2 and CFA3 in terms of lorry routeing and effects of road closures. Where these activities affect adjacent CFAs, these are identified in this assessment for completeness but the effects are reported in the relevant CFA.

12.4.17 Details of the construction programme are provided in Section 2.4 (figure 8). In order to assess the different combinations of advance works, utility diversions and construction lorry movements through the construction period, the effects have been considered for three distinct temporal phases:

- scenario 1, 2017. This corresponds with advance works and utilities on the highway network together with around 70% of the maximum construction traffic;
- scenario 2, 2019. This corresponds with the main station works together with maximum (100%) construction traffic and the short-term highway works at Chalk Farm Road (CFA2) and Adelaide Road (CFA3); and
- scenario 3, 2021. This corresponds to the completion of the majority of advance works on the highway with around 90% of the maximum construction traffic.

12.4.18 Because the advance works, utility diversions and construction lorry movements differ for each of these scenarios, the assessment includes the effects of all three phases. Where impacts are not common across all scenarios, the effects are still assessed. The three scenarios include those highway interventions and utility works shown in Table 21.

Table 21: Construction highway works

	Scenario 1 (2017)	**Scenario 2 (2019)**	**Scenario 3 (2021)**
Main works			
Gordon Street closed	Yes	Yes	Yes
Euston station underground car park closed	Yes	Yes	Yes
Varndell Street closed to vehicles at A400 Hampstead Road	Yes	Yes	Yes
Eastern end of Starcross Street, Drummond Street, Euston Street and Stephenson Way closure at Cobourg Street	Yes	Yes	Yes
Cardington Street closed	Yes	Yes	Yes
Melton Street closed	Yes	Yes	Yes
A400 Hampstead Road bridge/A400 Hampstead Road temporary substitution and reduction to two lanes	Yes	Yes	Yes
Granby Terrace bridge closed	Yes	Yes	No
Mornington Street bridge closed	Yes	Yes	No
Park Village East closed	Yes	Yes	No
Barnby Street closed	Yes	No	No
Construction of A501 Euston Road subway and Euston Square connection	No	No	Yes
Utilities			
Diversion of various services via Albert Street and Robert Street	Yes	No	No
Diversion of various services via Parkway and A5205 Prince Albert Road	Yes	No	No
Diversion of a sewer in A4200 Eversholt Street	Yes	No	No
Diversion of various utilities in A501 Euston Road and Gordon Street	No	Yes	No

	Scenario 1 (2017)	Scenario 2 (2019)	Scenario 3 (2021)
Other			
Lorry holding area at ZSL London Zoo	No	Yes	Yes
Euston station taxi facility – relocation to A4200 Eversholt Street	Yes	Yes	No
CFA2, Camden Town HS1 Link intervention: Chalk Farm Road – closed section	No	Yes	No
CFA3, Primrose Hill intervention: Adelaide Road – closed section	No	Yes	No

12.4.19 In addition to the station and directly rail related works, a series of other highway works will be required during construction of the Proposed Scheme mostly associated with utility works. These include:

- provision of connections to two UK Power Networks substations in the Pentonville and Camden areas, (a proposed substation in Calshot Street and St. Pancras substation) which will be undertaken in short sections along the proposed routes, with each section expected to take less than four weeks in duration. The routes are not, at any stage, expected to be fully closed to vehicular traffic;
- utility works in the A503 Delancey Street area to divert telecommunication cables;
- possible utility works required on Endsleigh Gardens should any space constraints arise during the utility works on A501 Euston Road, which if needed would require sections of Endsleigh Gardens to be closed to facilitate the works;
- possible utility works required on Mornington Terrace should any space constraints arise during the works on Park Village East, which if needed would require sections of Mornington Terrace to be closed to facilitate the works;
- possible sewer replacement and lining works along Augustus Street;
- utility works required on North Gower Street, Gower St, and Gower Place to allow 132kV electricity cables to be diverted across A501 Euston Road. It is not envisaged that these works will result in a road closure; and
- further utility works with possible closures may be required on the following roads: Aldenham Street; Polygon Road; Lancing Street; Drummond Crescent; and Doric Way.

12.4.20 Any partial or full road closures as a result of these works will be limited to a period of less than approximately four weeks. Therefore, the effect of these utility works will not be significant and has not been considered further as part of the assessment of the highway network.

12.4.21 As described in Table 21, the utility works will include the replacement of gas mains on A4200 Eversholt Street. It is also possible that a Thames Water sewer, also on A4200 Eversholt Street, may be diverted along Phoenix Road and Chalton Street. However, should this sewer diversion be required, the works on Phoenix Road and Chalton

Street are not expected to coincide with the works on A4200 Eversholt Street. The impact and effect of these utility works will not be significant and has not been considered further as part of the assessment of the highway network.

12.4.22 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials and movement of excavated materials. In the busiest month there are estimated to be approximately 740 combined two-way vehicle movements per day across the study area. The split of construction vehicles is expected to be 90% HGV and 10% LGV and cars.

12.4.23 A number of vehicle access points to the construction sites will be required and so the construction vehicle movements will be spread over a number of roads. The majority of construction traffic is expected to access the main compound at the National Temperance Hospital and the Granby Terrace overbridge satellite compound. The National Temperance Hospital main compound will be accessed from A400 Hampstead Road. The Granby Terrace overbridge satellite compound will initially be accessed from A400 Hampstead Road via Robert Street and Stanhope Street. On completion in mid-2018, Granby Terrace bridge will reopen for site use only. The bridge will then be used to access the Granby Terrace overbridge satellite compound.

12.4.24 It is envisaged that the A41 will provide HGV access and egress routes for excavated material and contaminated waste to and from sites north of London. Smaller numbers of HGV will enter and leave the site from the east (A13 – demolition and concrete), the west (A40 – demolition and concrete), the south (A4201 – concrete) and to and from York Way (concrete).

12.4.25 Construction vehicles accessing worksites and the impact of temporary road closures and diversions will result in changes in daily traffic flows on a number of roads. These will lead to a significant increase in delays[108] to vehicle occupants at a number of locations. The junctions with significant increases in delay, the construction scenario during which the effect occurs and the CFA in which effect takes place are listed below:

CFA1

- A5205 Prince Albert Road/A4201 Parkway (major adverse effect) – scenario 2;
- A501 Euston Road/Euston bus station access (major adverse effect) – scenario 1, 2 and 3;
- A501 Euston Road (westbound)/A400 Hampstead Road (major adverse effect) – scenario 1, 2 and 3;
- A4200 Eversholt Street/A4200 Grafton Place (major adverse effect) – scenario 1, 2 and 3;

[108] 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.

- A5205 St. John's Wood Road/B507 Lisson Grove (major adverse effect) – scenario 1;
- A501 Euston Road/B504 Judd Street (major adverse effect) – scenario 1 and 2;
- A401 Theobald's Road/A5200 Grays Inn Road (major adverse effect) – scenario 1, 2 and 3;
- Tavistock Square/Bedford Way (major adverse effect) – scenario 1 and 3;
- A4201 Albany Street/Robert Street (major adverse effect) – scenario 1 and 2;
- A5200 Grays Inn Road/A201 Swinton Street (moderate adverse effect) – scenario 1, 2 and 3;
- A400 Tottenham Court Road/Torrington Place (minor adverse effect) – scenario 1, 2 and 3;
- Outer Circle/B525 Avenue Road (minor adverse effect) – scenario 2;
- A5204 Cavendish Place/A4201 Langham Place (minor adverse effect) – scenario 1 and 2;
- A400 Hampstead Road/Drummond Street (minor adverse effect) – scenario 2;
- A5 Edgware Road/Aberdeen Place (minor adverse effect) – scenario 3; and
- A4200 Eversholt Street/A400 Oakley Square (minor adverse effect) – scenario 3.

CFA2

- A501 Pentonville Road/Claremont Square (major adverse effect) – scenario 1;
- A502 Chalk Farm Road/A502 Hawley Road (minor adverse effect) – scenario 1;
- A400 Kentish Town Road/Hawley Crescent (minor adverse effect) – scenario 2; and
- A4201 Parkway/Arlington Road (minor adverse effect) – scenario 2.

CFA3

- A502 Haverstock Hill/Parkhill Road (major adverse effect) scenario 2; and
- Regent's Park Road/Oval Road (major adverse effect) – scenario 2.

12.4.26 Construction of the Proposed Scheme is forecast to result in increases in daily traffic flow, (more than 30% for HGV or all vehicles) that will in turn cause a significant increase in pedestrian severance[109] resulting from these increased flows, the location of these roads in CFA1 are shown in Table 22. The locations of roads outside CFA1 are shown in Table 23.

[109] In the context of this Traffic and Transport section, severance is used to relate to a change in ease of access for non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed to access.

Table 22: Significant increases in daily traffic flow resulting in pedestrian severance

Location	CFA	Increase in daily traffic flow more than 30% for all vehicles		Increase in daily traffic flow more than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
A4201 Albany Street	CFA1	moderate adverse	2	moderate adverse	2 and 3
Albert Street	CFA1	moderate adverse	1	n/a	n/a
Arlington Road	CFA1 & 2	moderate adverse	1, 2 and 3	major adverse	2 and 3
B525 Avenue Road	CFA1 & 3	moderate adverse	2	n/a	n/a
Chalton Street	CFA1	major adverse	1, 2 and 3	n/a	n/a
Churchway/Grafton Place	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
Drummond Street, west of Hampstead Road	CFA1	moderate adverse	1 and 2	n/a	n/a
A501 Euston Road	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
A4200 Eversholt Street/Euston Square	CFA1	moderate adverse	1, 2 and 3	moderate adverse	1, 2 and 3
A400 Gower Street	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
Grafton Way	CFA1	moderate adverse	1 and 2	n/a	n/a
B506 Great Portland Street	CFA1	n/a	n/a	moderate adverse	1 and 2
Greenland Road	CFA2	major adverse	1 and 2	major adverse	1 and 2
Hallam Street	CFA1	n/a	n/a	moderate adverse	1 and 2
A400 Hampstead Road	CFA1	n/a	n/a	moderate adverse	2 and 3
B504 Judd Street	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
Longford Street east of A4201 Albany Street	CFA1	minor adverse	1 and 2	n/a	n/a
A404 Harrow Road	CFA1	n/a	n/a	moderate adverse	1, 2 and 3
Mornington Crescent	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
Mornington Street	CFA1	major adverse	3	major adverse	3
North Gower Street	CFA1	moderate adverse	1, 2 and 3	n/a	n/a
Osnaburgh Street	CFA1	n/a	n/a	moderate adverse	2
Outer Circle	CFA1	major adverse	1 and 2	n/a	n/a
A5202 Pancras Road	CFA1	moderate adverse	2	n/a	n/a
Park Square West	CFA1	minor adverse	1	n/a	n/a
Parkway	CFA1 & 3	n/a	n/a	moderate adverse	2
Prince Albert Road	CFA1 and 3	n/a	n/a	minor adverse	3
Polygon Road	CFA1	major adverse	1, 2 and 3	n/a	n/a
Robert Street	CFA1	n/a	n/a	moderate adverse	1, 2 and 3
A5205 St Johns Wood Road	CFA1	n/a	n/a	moderate adverse	1, 2 and 3
Stanhope Street (north of Robert	CFA1	moderate adverse	1, 2 and 3	moderate adverse	1, 2 and 3

Location	CFA	Increase in daily traffic flow more than 30% for all vehicles		Increase in daily traffic flow more than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
Street)					
Tavistock Place	CFA1	minor adverse	1 and 2	n/a	n/a
Torrington Place	CFA1	moderate adverse	1, 2 and 3	moderate adverse	1, 2 and 3
Wellington Road	CFA1	n/a	n/a	moderate adverse	2 and 3

Table 23: Significant increases in daily traffic flow resulting in pedestrian severance (outside CFA1)

Location	CFA	Increase in daily traffic flow more than 30% for all vehicles		Increase in daily traffic flow more than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
Albert Terrace	CFA3	moderate adverse	1	n/a	n/a
Arlington Road	CFA1 & 2	moderate adverse	1, 2 and 3	major adverse	2 and 3
B525 Avenue Road	CFA1 & 3	moderate adverse	2	n/a	n/a
Bishops Bridge Road	CFA4	n/a	n/a	moderate adverse	2
Camden Gardens	CFA2	moderate adverse	2	moderate adverse	2
Castle Road	CFA2	minor adverse	1	moderate adverse	2
Castlehaven Road	CFA2	major adverse	2	major adverse	2
Chalk Farm Road	CFA2 & 3	moderate adverse	2	moderate adverse	2
Farrier Street	CFA2	major adverse	2	n/a	n/a
Ferdinand Street	CFA3	minor adverse	2	n/a	n/a
A41 Finchley Road	CFA3	n/a	n/a	moderate adverse	2 and 3
Gloucester Avenue	CFA3	major adverse	2	major adverse	2
Greenland Road	CFA2	major adverse	1 and 2	major adverse	1 and 2
Haverstock Hill	CFA3	major adverse	2	major adverse	2
Kentish Town Road	CFA2	n/a	n/a	moderate adverse	2
Oval Road	CFA2	minor adverse	2	n/a	n/a
Parkway	CFA1 & 3	n/a	n/a	moderate adverse	2
Primrose Hill Road	CFA3	n/a	n/a	moderate adverse	2
Primrose Hill Road/ Englands Lane, north of Adelaide Road	CFA3	minor adverse	2	major adverse	2
Prince Albert Road	CFA1 & 3	n/a	n/a	minor adverse	3
Prince of Wales Road, eastbound	CFA3	moderate adverse	2	moderate adverse	2
Regents Park Road	CFA3	minor adverse	1 and 2	moderate adverse	2
Rosslyn Hill	CFA3	n/a	n/a	moderate adverse	2
Rousden Street	CFA2	minor adverse	2	n/a	n/a
Royal College Street	CFA2	moderate adverse	2	n/a	n/a

Location	CFA	Increase in daily traffic flow more than 30% for all vehicles		Increase in daily traffic flow more than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
St John's Wood Park	CFA3	moderate adverse	2	n/a	n/a
A5202 St Pancras Way	CFA2	n/a	n/a	moderate adverse	2

12.4.27 Unless mentioned above, these traffic flow increases do not result in a significant increase in congestion.

12.4.28 The closure of roads around the station during construction of the Proposed Scheme will also have beneficial effects in reducing daily traffic flow, (more than 30% for HGV or all vehicles). This will in turn cause a significant reduction in pedestrian severance resulting from these reduced flows. The locations of these roads in CFA1 are shown in Table 24. The locations of these roads outside CFA1 are shown in Table 25.

Table 24: Significant decreases in daily traffic flow resulting in reduced pedestrian severance (CFA1)

Location	CFA	Decrease in daily traffic flow less than 30% for all vehicles		Decrease in daily traffic flow less than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
A502 Camden High Street	CFA1 and 2	moderate beneficial	2	moderate beneficial	2
Endsleigh Gardens	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Gordon Street – Gordon Square	CFA1	moderate beneficial	1, 2 and 3	moderate beneficial	1, 2 and 3
Mornington Place	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Mornington Terrace	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Pratt Street	CFA1 and 2	moderate beneficial	1	moderate beneficial	1
Robert Street	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Stanhope Street (south of Robert Street)	CFA1	moderate beneficial	2	n/a	n/a
Stephenson Way	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Tavistock Place (east of Marchmont Street)	CFA1	moderate beneficial	1, 2 and 3	n/a	n/a
Tavistock Square	CFA1	n/a	n/a	moderate beneficial	1, 2 and 3

Table 25: Significant decreases in daily traffic flow resulting in reduced pedestrian severance (outside CFA1)

Location	CFA	Decrease in daily traffic flow less than 30% for all vehicles		Decrease in daily traffic flow less than 30% for HGV	
		Significant effect	Construction Scenario	Significant effect	Construction Scenario
A502 Camden High Street	CFA1 and 2	moderate beneficial	2	moderate beneficial	2
Harmood Street	CFA3	moderate beneficial	2	moderate beneficial	2
Jamestown Road	CFA2	moderate beneficial	2	moderate beneficial	2
Kentish Town Road	CFA2	major beneficial	2	n/a	n/a
Pratt Street	CFA1 and 2	moderate beneficial	1	moderate beneficial	1
Prince of Wales Road, between Grafton Road and Talacre Road westbound	CFA3	major beneficial	2	n/a	n/a

12.4.29 Passenger drop-off by car at Euston station will be retained with temporary facilities provided on A4200 Eversholt Street.

12.4.30 There will be a temporary loss of approximately 153 on-street parking spaces as a result of the construction of the Proposed Scheme, HGV routeing and utility works, although these are not necessarily concurrent. Included in this total are residential permit holder bays (77), permit holder bays (22), pay and display bays (53), and loading bays (one). In a number of locations there are alternative parking spaces within 250m and some of these are not currently well used.

12.4.31 The Proposed Scheme will have a range of impacts on parking amenity, based on the relatively long duration of the loss of parking, offset by the good availability of spaces in the local area. In summary, the effects are:

- Robert Street (moderate adverse effect) with conversion of residential permit holder bays to offset the loss of residential permit holder bays on Stanhope Street;
- Stanhope Street (minor adverse effect);
- Mackworth Street (moderate adverse effect);
- Varndell Street (moderate adverse effect);
- Harrington Street (moderate adverse effect);
- Granby Terrace (moderate adverse effect);
- Park Village East (major adverse effect);
- Mornington Terrace (moderate adverse effect);
- Drummond Street (minor adverse effect);

- Stephenson Way (minor adverse effect);
- Starcross Street (minor adverse effect); and
- Lancing Street (minor adverse effect).

12.4.32 A total of 29 parking bays located in the southbound bus lane on A4200 Eversholt Street will be suspended due to utility works and the provision of temporary station taxi facilities. This will have a moderate adverse effect.

12.4.33 In addition, a total of 26 parking bays may be suspended on Drummond Crescent to provide a secondary taxi rank during construction. Included in this total are residential permit holder bays (nine), pay and display bays (two) and motorcycle bays (15). If this temporary taxi rank is introduced, it would have a moderate adverse effect.

12.4.34 There will also be a loss of some off-street or private parking due to construction works.

12.4.35 A section of Park Village East will be closed to traffic preventing vehicular access to off-street parking at a number of properties resulting in the loss of approximately 31 off-street parking spaces. This will have a major adverse effect.

12.4.36 Due to the construction of a temporary utilities bridge connecting Hampstead Road to the Ampthill Estate, approximately ten private parking spaces within the Ampthill Estate will be temporarily suspended. This will have a minor adverse effect.

12.4.37 The demolition of the existing car park at Euston station will result in loss of three disabled parking spaces, but these spaces will be reprovided and the effect is not significant.

12.4.38 The impact on accident and safety risk has been reviewed. Increases in flows on major roads and through certain junctions could bring a commensurate increase in accident risk. There will be other roads with reductions in traffic flows with potentially beneficial effects. During construction there will be a minor adverse effect on accident risk as a result of expected changes in traffic flows at the following locations:

- A501 Euston Road (between Churchway and Dukes Road;
- A501 Euston Road/A400 Tottenham Court Road;
- A501 Euston Road/A4200 Eversholt Street/A4200 Upper Woburn Place;
- A4200 Eversholt Street/Lidlington Place;
- A501 Euston Road/A5202 Pancras Road; and
- A400 Hampstead Road/Drummond Street.

12.4.39 The existing Euston bus station is expected to remain fully operational during construction and is expected to change to its proposed layout with minimal disruption to bus services.

12.4.40 While there are not expected to be significant impacts on the existing Euston bus station operations during construction, works will be required to the junction of Melton Street and A501 Euston Road to construct the new access to the linear bus station proposed between Melton Street and A4200 Eversholt Street.

12.4.41 Works will also require the temporary closure of bus lanes and the relocation of some existing bus stops/facilities, including removal of the southbound bus lane on A4200 Eversholt Street; A400 Hampstead Road bridge removal of the northbound and southbound bus lanes; A501 Euston Road removal of the eastbound and westbound bus lanes.

12.4.42 The removal of these bus lanes is not predicted to increase bus journey times by more than 10% and the effects will therefore not be significant.

12.4.43 The relocation of bus stops and bus facilities is not generally expected to have a significant effect as alternative facilities will be available to passengers within 100m for most roads. The exception is a moderate adverse effect on two bus stops on the A400 Hampstead Road bridge (near Silverdale, Regent's Park Estate), which may have to be relocated by 100-200m.

12.4.44 In combination with works in CFA1, other works in the Camden Town HS1 Link area (CFA2) and Primrose Hill to Kilburn (Camden) area (CFA3), including closures and associated bus diversions associated with the Adelaide Road and Chalk Farm Road closures, will have significant effects on public transport delays. These comprise:

- bus route C2 – moderate effect in the AM peak, major adverse effect in the PM peak (CFA1 and 3);
- bus route 168 (northbound) – minor adverse effect in the AM and PM peak (CFA1 and 2);
- bus route 24 (northbound) – minor adverse effect in the AM and PM peak (CFA1 and 2); and
- bus route 31 – moderate adverse effect in the AM and PM peak (CFA2 and 3).

12.4.45 A number of interventions on the existing rail network are proposed to allow interface with the high speed railway to be established. Two main types of intervention are proposed. Firstly, possessions to maintain safety while civil engineering works are taking place over, under or adjacent to the existing railway. Secondly, possessions to enable alterations to be made to the existing railway to accommodate the Proposed Scheme.

12.4.46 Railway works will be planned with Network Rail to ensure that disruption to passengers and freight is minimised as far as reasonably practicable. This includes measures such as:

- careful programming of works to coincide with possessions that are planned for the general maintenance of the existing railway;
- planning works so that they will be undertaken in short, overnight stages when passenger services will not be disrupted; and
- programming longer closures at weekends or bank holidays to minimise the number of passengers affected.

12.4.47 There will be a large number of individual interventions in the Euston area. These would be included in a number of standard possessions which vary in duration depending on the scale and complexity of the works planned. These range from: mid-

week night possessions, through to weekend possessions and bank holiday weekend possessions and a longer 16 day blockade of platform 15. The great majority of the possessions will have little or no impact on the operation of Euston and its rail services as they are relatively minor localised works, such as work on and adjacent to track not in use overnight or at weekends when station use is less intense. In addition, many of the interventions will be combined to reduce the frequency of potential disruption. It is expected that there will only be approximately 20 possessions that would have the potential for substantial disruption to passengers, which includes some weekend closures. While affecting users of the station, individually these are not considered significant. Nonetheless, since the possessions will occur over the period of construction, their cumulative impact is considered to have a moderate adverse significant effect. They will also have the potential to result in route-wide effects on the West Coast Main Line and this is considered further in Volume 3, Route Wide.

12.4.48 At the beginning of the Euston station enabling works, which are not expected to exceed eight months during 2016, it will be necessary to cancel some National Rail services into Euston station. These are London Midland stopping services to and from Watford, which stop at Bushey and Harrow & Wealdstone. Three trains per day will be cancelled during this period, namely:

- two arrivals during the morning peak; and
- one departure during the evening peak.

12.4.49 Users of these services will be affected but the percentage change in journey time will be lower than 10%. This is considered a minor adverse effect.

12.4.50 Passenger routes within Euston station between platforms, concourse and surface connections and interchange will be affected throughout the construction period. The proposed phasing indicates that, except in one instance, interchange routes and surface connections can be maintained with increases in travel distance of less than 200m. The number of travellers affected will be high and some diversions will be for periods in excess of four months resulting in a moderate adverse effect.

12.4.51 One period has been identified where increases in travel distance of 200m to 400m are experienced. This relates to Euston underground station during 2024, when all passengers entering or exiting the underground station will experience an increased walking distance of 250m. This affects a large number of travellers for four months giving a moderate adverse effect.

12.4.52 Euston underground station already experiences substantial crowding and congestion and this will increase, by 2026 and beyond, as demand at Euston Underground station increases regardless of HS2. The escalators from interchange level to the platforms are likely to exceed capacity with or without the Proposed Scheme. Further works will be needed to address these issues regardless of the Proposed Scheme.

12.4.53 The Proposed Scheme includes extensive improvements to accommodate the additional passengers from the Scheme. These improvements will have the significant benefits of helping to address the current underlying issues and accommodating much of the organic growth in passengers using Euston underground stations before and beyond 2026. The beneficial effects of these improvements on the operation of Euston station are considered in section 12.5.

12.4.54 The improvements, including a new ticket hall and concourse, additional escalators and lifts down to each of the underground station platforms together with substantially increased circulation space, will be constructed to improve access, circulation and capacity for Euston underground station.

12.4.55 Construction of improvement works will require some closures of the underground platforms as follows:

- On the Victoria line and the Bank branch of the Northern line, northbound platforms will need to close simultaneously during construction of the new escalator barrel, lowering of the ticket hall and construction of cross passage connections. Trains on these lines will not stop at Euston for a five-month period in early to mid-2022;
- The southbound Northern line (Bank branch) platform will need to close during construction of the new escalator barrel, lowering of the ticket hall and cross passage connections. Trains on this line will not stop at Euston for a three-month period from late 2021 and early 2022;
- Partial platform closures on the southbound Victoria line will be required to construct the new cross passage connection and a new lift. However, it is envisaged that trains will still be able to stop at Euston during these works; and
- On the Charing Cross branch of the Northern line, simultaneous northbound and southbound platform closures will be required during construction of the lower lift shaft, lower lobby, cross passage and stair connection. Trains on this line will not stop at Euston for a three-month period in early 2023.

12.4.56 The effect on end to end journey times will be greatest for the Northern line (Bank branch) southbound platform closure, followed by the Victoria line and Northern line (Bank branch) northbound platform closure. The effect will be least for Northern line (Charing Cross branch) northbound and southbound platform closures.

12.4.57 These platform closures will result in disruption to passengers during these periods. With the Victoria line and Northern line Bank branch platforms closure, passengers who would have interchanged at Euston will be likely to interchange between the Northern line and Victoria Line at Warren Street or Kings Cross or instead use the Northern Line Charing Cross branch. Some passengers would enter or leave the underground at Warren Street station and walk to or from Euston station.

12.4.58 With the Northern line Bank branch southbound platform closure, passengers travelling towards the City who would have interchanged at Euston will be likely to use the Charing Cross branch of the Northern line towards Kennington and then the Bank branch towards London Bridge or use the Metropolitan, Hammersmith & City or Circle lines to Moorgate before interchanging to the Northern line. Alternatively, passengers will use the Northern line and Victoria line and interchange at King's Cross St. Pancras.

12.4.59 With the Northern line Charing Cross branch northbound and southbound platform closures, passengers will be likely to interchange at Camden Town between the two Northern line branches: or use the Bakerloo and Victoria lines via Oxford Circus or the Piccadilly line via King's Cross St. Pancras. Some passengers would enter or leave the underground at Warren Street station and walk to or from Euston station.

12.4.60 In order to minimise disruption, the closures will be programmed so that they do not overlap. Mitigation could include advance warning of platform closures through the media and TfL's journey planner, together with announcements on affected lines and signage at stations along these lines informing passengers of available alternatives. Bus services could be modified in the Euston and Warren Street area to assist passengers walking between the stations and wider changes could be appropriate to provide alternative routes to and from Euston station.

12.4.61 The platform closures with the exception of the Victoria line southbound will affect more than 20 trains per hour and impact more than 10,000 passengers/day. For passengers needing to change route, the average percentage change in end-to-end journey times is likely to be less than 10%. However, based on the duration of platform closures, the number of passengers who will be affected and the expected congestion that will result, the effect is considered moderate significant.

12.4.62 As described in Section 2.4, permanent and long period temporary road closures will lead to increases in journey distance for pedestrians and consequential severance. There will be significant effects at the following locations:

- Granby Terrace bridge (major adverse effect);
- Varndell Street (minor adverse effect);
- Cardington Street (minor adverse effect);
- Melton Street (minor adverse effect);
- Drummond Street (minor adverse effect);
- Cobourg Street (minor adverse effect);
- Euston Street (minor adverse effect);
- Starcross Street (minor adverse effect); and
- Stephenson Way (minor adverse effect).

12.4.63 Any disruption to cycle routes through and around the station will not have a significant effect on the majority of routes, due to the small changes in journey times and the low number of cyclists affected. Temporary cycle routes will be developed in consultation with TfL and LBC. Routes where there will be significant effects are:

- closure of Melton Street and Cardington Street will increase the journey time of some cyclists by about two minutes (based on 400m diversion via A400 Tottenham Court Road and A400 Hampstead Road) and the partial loss of LCN unofficial route 6a, which results in a moderate adverse effect; and
- closure of Granby Terrace will increase the journey times of some cyclists by two to three minutes resulting in a minor adverse effect.

12.4.64 The temporary relocation of taxi facilities to A4200 Eversholt Street will result in a minor adverse effect. While the time to walk to the taxi facilities from the station will increase by three to four minutes (an additional distance of up to 400m), there will be a beneficial effect in removing the facilities from the existing poorly ventilated location in the basement of the station.

12.4.65 It is expected that Barclays Cycle Hire docking stations will be relocated at Drummond Street, A501 Euston Road and A400 Hampstead Road near Cartmel.

12.4.66 There will be no significant effect on other cycle parking at Euston station. Parking locations affected by construction activities will be relocated and the existing total number of cycle parking spaces will be maintained during the construction phase.

Cumulative effects

12.4.67 The assessment includes the cumulative effects of planned development during construction by taking this into account within the background traffic growth.

12.4.68 The assessment also includes in-combination effects by taking into account traffic and transport impacts of works being undertaken in neighbouring CFA areas. Construction traffic flows of 10 cars/LGV and 50 HGV per day generated from Chalk Farm Road satellite compound in CFA2 and 10 cars/LGV and 50 HGV per day as generated by the Adelaide Road vent shaft main compound in CFA3 have been included in the assessment.

Permanent effects

12.4.69 Any permanent effects of construction have been considered in the operations phase assessments for traffic and transport in Section 12.5. This is because the impacts and effects of the forecast increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

12.4.70 The implementation of the draft CoCP in combination with the construction workforce travel plans will 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.

12.4.71 Rail bus replacement services would also be provided as necessary when rail possessions are in place.

12.4.72 Most signalised junctions in central London are under adaptive control which will optimise the signal stages in real time. Therefore, many of those junctions with an identified minor effect will be mitigated through adaptive control, although this is less effective where there is a substantial overall net increase in traffic through the junction.

12.4.73 No further traffic and transport mitigation measures during construction of the Proposed Scheme are considered necessary.

12.4.74 Investigation will continue to establish whether movement of some excavated material by rail is feasible and the scope for this is discussed in Section 2.

Summary of likely significant residual effects during construction

12.4.75 Construction activities both route wide and at Euston station, will lead to public transport delay due to the need for interventions on the existing rail network (route wide), cancellation of some Euston to Watford London Midland services and temporary routes across Euston station concourse. Works at Euston underground station will require the temporary closure of the Victoria line and Northern line (Bank

branch) northbound platforms, the southbound Northern line platform and the north and southbound Northern line (Charing Cross branch). Three bus routes will be affected, bus route C2 (southbound and northbound), bus route 168 (northbound) bus route 24 (northbound).

12.4.76 Construction activities will result in disruption to passengers at Euston station as a result of relocation of the station taxi facilities and the need to divert passenger routes at the station. Works will also require the relocations of Hampstead road Silverdale bus stop.

12.4.77 Changes in traffic flows will result from construction traffic, local road closures and relocation of taxi operations. This will cause increased difficulty for pedestrians crossing the road. Increases in traffic flows will mainly be concentrated on some roads to the east of Euston station in the Somers Town and King's Cross area, particularly around the A4200 Eversholt Street; on the A501 Euston road between Gordon Street and King's Cross; to the south in the Bloomsbury area to the west of Gordon Street particularly A400 Tottenham Court road northbound and A400 Gower Street southbound together with the roads in between; in Regent's Park and in Camden Town areas on roads around Parkway; and on the A41 and other construction lorry routes. Reductions in traffic flow will result in improvements for pedestrians crossing the road. The diversion impacts of road closures result in decreases in traffic will mainly be concentrated on roads to the south of Gordon Street in the Bloomsbury area, in particular, on Gordon Street, Gordon Square, Woburn Place and Southampton Row; to the immediate west of Euston station as a result of the closure of Cardington Street; in the Regent's Park area to the north west of the station; and to the east of Camden Town in particular on Royal College Street.

12.4.78 Impacts arising from the Proposed Scheme on parking and loading, where facilities are identified to be heavily used, are at the following locations: Robert Street; Stanhope Street; Mackworth Street; Varndell Street; Harrington Street; Granby Terrace; Park Village East; Mornington Terrace; Drummond Street; Ampthill estate; A4200 Eversholt Street; Drummond Crescent; Lancing Street; Stephenson Way; and Starcross Street.

12.4.79 The most intensive peak periods of construction will affect pedestrians and cyclists at Melton Street, Cardington Street and Granby Terrace Bridge.

12.4.80 Significant impacts on accidents and safety risks have been identified at the following locations: A501 Euston Road (between Churchway and Dukes Road); A501 Euston Road/A400 Tottenham Court Road; A501 Euston Road/A4200 Eversholt Street/A4200 Upper Woburn Place; A4200 Eversholt Street/Lidlington Place; A501 Euston Road/A5202 Pancras Road; and A400 Hampstead Road/Drummond Street.

12.4.81 Severance to users of non-motorised modes will be experienced at the following locations: Granby Terrace Bridge; Varndell Street; Cardington Street; Melton Street; Drummond Street; Euston Street; Cobourg Street; Starcross Street; and Stephenson Way.

12.4.82 The significant effects that result from construction of the Proposed Scheme are shown on Map TR-03-001 (Volume 5, Traffic and Transport, CFA1 Map Book).

12.5 Effects arising from operation

12.5.1 This section presents the likely environmental effects of the operation of Phase One of HS2 in 2026. The 2041 assessment includes the Proposed Scheme but with HS2 Phase two demand in 2041.

Avoidance and mitigation measures

12.5.2 The following measures have been included as part of the design of the Proposed Scheme and will avoid or reduce impacts on transport users:

- the station has been designed to meet Network Rail and LUL station design criteria and meets these requirements by providing concourse and platform space to accommodate rail passenger demand up to 2041, including the HS2 Phase Two demand;
- the design of the concourse allows for additional loading of train services and for growth beyond 2041 meeting Network Rail and LUL design standards;
- the design of the station will give improvements in accessibility, compared with the existing station and reduce crowding levels in the concourse, with additional and improved access points which will be aligned with the surrounding street network;
- a new northern entrance to the station from Hampstead Road providing improved facilities for taxi and car set down, cycle parking, links to bus services and local community access to the station;
- new escalators and lifts to provide access between the concourse and the high speed platforms;
- relocation and remodelling of Euston underground station ticket hall to increase passenger area, together with the provision of new escalators serving both the branches of the Northern line and the Victoria line to improve platform access;
- a pedestrian subway under A501 Euston Road with a new entrance and ticket hall for Euston Square Underground station in Gordon Street to reduce pedestrian journey time across A501 Euston Road;
- new pedestrian subway between Euston station and Euston Square Underground station with a new eastern entrance to Euston Square station and improved interchange and general access to the Hammersmith & City, Circle and Metropolitan lines;
- reconfiguration of the bus station into a new 'linear bus street' at the front of Euston station. The bus station could also accommodate an increased frequency of through bus routes;
- a new bus stand north east of the station accessed off A4200 Eversholt Street to enable a larger number or increased frequency of buses to serve the station The bus stand will provide eight additional parking spaces for buses that could accommodate approximately four new terminating bus routes;

- the new east west bridge between A4200 Eversholt Street and A400 Hampstead Road to the north of the station, which will benefit cyclists and pedestrians providing additional east-west connectivity across Camden;
- there will be a substantial increase in the number of cycle parking spaces for station users and it is expected that 200 additional Barclays Cycle Hire docking stations will be provided to cater for the increased demand for cycle parking at Euston station;
- improved cycle routes on roads around Euston station. A north-south cycle route will be provided as a replacement for the partial loss of LCN route 6a (Cardington Street/Melton Street);
- provision for taxis to drop off in A4200 Eversholt Street and at the new northern station entrance with pick up at the southern end of Cobourg Street. This system will improve operational efficiency of taxi facilities with managed taxi share, which will help reduce empty taxi travel;
- no public car parking provided at the station to promote sustainable travel;
- pick-up and drop-off facilities sized to accommodate the future demands including provision for private cars to set down at the new northern entrance; and
- new short-term pick-up and drop-off facility for mobility impaired passengers at the northern concourse entrance with links to assisted travel services within the station.

12.5.3 The Proposed Scheme is shown on Map CT-06-001 (Volume 2, CFA1 Map Book).

Assessment of impacts and effects

12.5.4 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 2.5 of this report).

12.5.5 The main impacts of the Proposed Scheme can be summarised as:

- increases to rail passengers arriving and departing Euston station with consequential increases in onward travel by LU, bus, cycle, walk and taxi;
- permanent road closures and associated diversions around the Euston station including closures to vehicles to all or parts of Cardington Street, Melton Street, Stephenson Way, Drummond Street, Euston Street, Varndell Street at A400 Hampstead Road, Harrington Street, Hampstead Road (a minor road which is not the A400 Hampstead Road), bus station access and Gordon Street;
- the removal or reduction of parking and loading at Cardington Street, Euston Street, Drummond Street, Cobourg Street and Mornington Crescent;
- the replacement of four paths which will be reprovided either as part of the public realm, public open space or on slightly different alignments.

12.5.6 The design of the Proposed Scheme and its operation creates a number of significant beneficial effects, which can be summarised as:

- increased capacity for rail passengers to and from Euston station resulting from HS2 services. This is a major beneficial effect;
- improved journey times on HS2 between Euston and the Midlands and Manchester, with a journey time saving of 35 minutes with the Proposed Scheme. This is a major beneficial effect. With Phase Two, there are anticipated journey time savings of 50 minutes to Leeds and 1 hour to Manchester;
- released capacity on the WCML, easing pressure on other passenger rail services and freeing up space for freight. This is a major beneficial effect;
- lower crowding levels on trains to and from Euston station as a result of increases in train frequencies with high capacity HS2 trains. This is a major beneficial effect;
- with Phase Two, the transfer to Euston station of passengers of high speed services who previously would have arrived at King's Cross and St. Pancras International from the north of England will result in some relief to these stations. This is a moderate beneficial effect;
- improvements in passenger performance and accessibility showing that the Proposed Scheme can accommodate additional demand whilst reducing 2041 crowding levels from Level of Service(LoS)[110] E to LoS A in the new station concourse. This is a major beneficial effect;
- introduction of step free access throughout Euston and Euston Underground stations. This is a moderate beneficial effect;
- increased passenger area and improved platform access as a result of improvements to Euston underground station ticket hall. This is a major beneficial effect;
- the construction of new escalators and lifts down to the Underground station platforms improving access, circulation and capacity for Euston Underground station. This is a major beneficial effect;
- improved facilities and access to Euston Square station as a result of the provision of a new LU ticket office in Gordon Street and subway connection. This is a major beneficial effect; and
- increasing capacity for bus routes as a result of an improved linear bus station and a bus stand on A4200 Eversholt Street.

[110] Fruin Level of Service is a metric which classifies crowding (pedestrians per metre of clear footway width per minute – ppmm) on a sliding scale from A (very comfortable) through to F (low comfort).

- improvements to cycle and walk routes on roads surrounding the station including the new east west link, a new north south cycle route and a new shared pedestrian/cycle traffic free route at the northern end of Gordon Street.

12.5.7 HS2 improvements substantially increase use of Euston station, on top of underlying growth. Table 26 sets out the forecast use of the station.

Table 26: Forecast rail and London Underground passengers at Euston

	Morning peak period 07:00-10:00		Evening peak period 16:00-19:00	
	2026 forecast	2041 forecast	2026 forecast	2041 forecast
National Rail alighting at Euston baseline	29,440	36,100	12,370	15,960
National Rail alighting at Euston including HS2	36,300 (+23%)	56,420 (+56%)	14,620 (+18%)	28,090 (+76%)
HS2 alighting (included in National Rail)	10,450	24,670	8,050	18,980
LU boarders baseline (inc. Euston Sq.)	36,420	41,860	35,820	41,650
LU boarders with HS2 (inc. Euston Sq.)	42,610 (+8%)	56,780 (+36%)	38,500 (+7%)	52,800 (+27%)
Station exit baseline	18,090	22,440	8,370	10,630
Station exit with HS2	20,120 (+11%)	28,240 (+26%)	6,150 (-27%)	8,660 (-19%)

12.5.8 With the introduction of the Proposed Scheme (HS2 Phase One) in 2026, rail passengers alighting at Euston station during the morning peak period are forecast to increase from 29,440 to approximately 36,300 passengers (23% increase), compared with the 2026 future baseline. Arrivals at Euston on high speed services in 2026 are forecast to be approximately 10,450.

12.5.9 By 2041, morning peak period baseline rail passengers will be forecast to increase to 36,100. With the introduction of HS2 Phase Two, it is estimated that rail passengers alighting at Euston station will increase to approximately 56,420 (56% increase), compared with the 2041 future baseline. This includes 5,200 passengers arriving at Euston by London Underground services, who would travel on rail services into King's Cross station in the absence of the Proposed Scheme. Arrivals at Euston on high speed services in 2041 are approximately 24,670.

12.5.10 With the introduction of the Proposed Scheme (HS2 Phase One) in 2026, onward morning peak London Underground boarders are forecast to increase from 36,420 in the Baseline to 42,610 (17% increase) with the Proposed Scheme and those who exit Euston station to from 18,090 in the Baseline to 20,120 (11% increase) with the Proposed Scheme.

12.5.11 By 2041 morning peak baseline London Underground boarders are forecast to increase to 41,860 and those who exit the station to 22,440. With the introduction of HS2 Phase Two, London Underground boarders would increase to 56,780 (36% increase) and people exiting Euston station would increase to 28,240 (26% increase).

12.5.12 Similar increases are forecast for the evening peak period, as shown in Table 26.

12.5.13 Euston station and the underground lines serving it will be at or above capacity in 2026 and 2041. However, Euston Square underground station and the Metropolitan, Circle and Hammersmith and City lines are much less well used. A key part of the Proposed Scheme is to improve access to Euston Square underground station,

which will capitalise on this available capacity and reduce pressure on the current underground lines directly serving Euston, providing an attractive alternative route to the City.

12.5.14 The increase in rail users at Euston station with HS2 Phase One in 2026 (i.e. the Proposed Scheme) and the HS2 Phase Two assessment in 2041 and consequent increases in London Underground users will result in increased passenger volumes on the Northern line (Charing Cross branch) and Victoria line at Euston and the Circle, Hammersmith & City and Metropolitan lines via Euston Square underground station.

12.5.15 This is shown in Figure 11 and Figure 12 which indicate the change in passengers boarding at Euston and Euston Square. The % figures represent the proportion of underground passengers using each line in 2026 and 2041 respectively. Of particular note is the increased relative share of Euston Square for passengers boarding these services, which increases from 14% to 24% with the Proposed Scheme, and from 15% to 28% by 2041. This demonstrates the significant beneficial effects of improved access to Euston Square underground station in providing an alternative route for passengers accessing both HS2 and classic rail services.

12.5.16 The result is likely to be increased journey times for passengers using the Northern line Charing Cross branch and Victoria line, due to delays in boarding trains. The Northern line Bank branch would improve slightly in 2026 and all changes are relatively small, apart from the increased use of Euston Square station.

Figure 11: LU southbound boarders at Euston and eastbound at Euston Square stations, 07:00-10:00, 2026 (% represents proportion using each line)

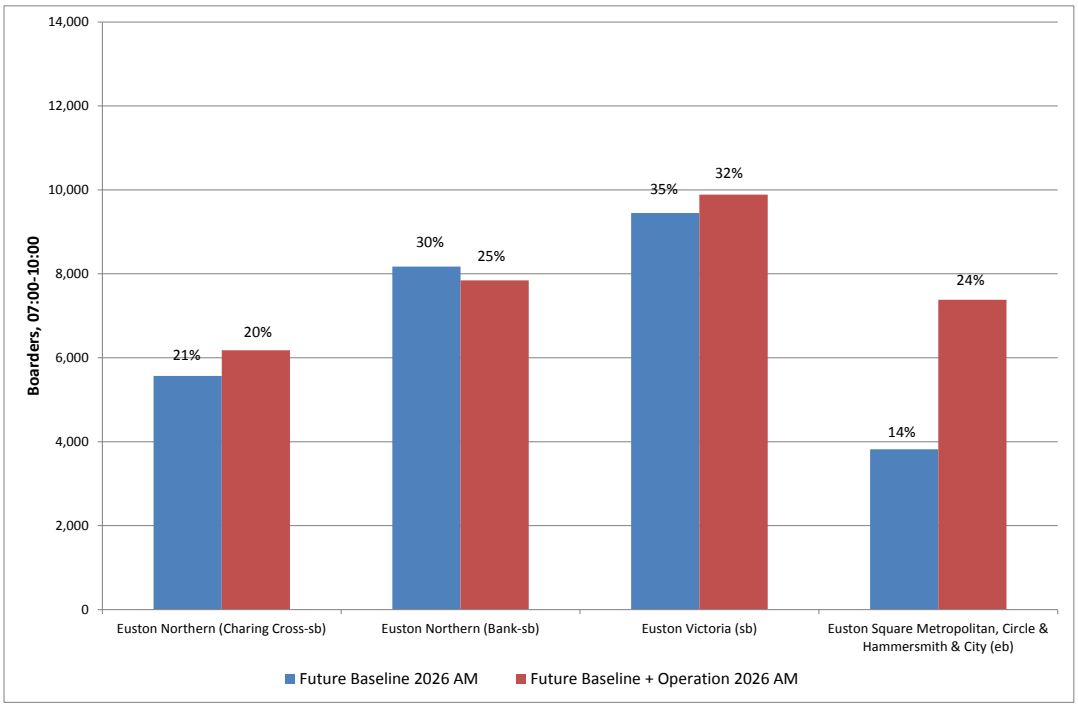
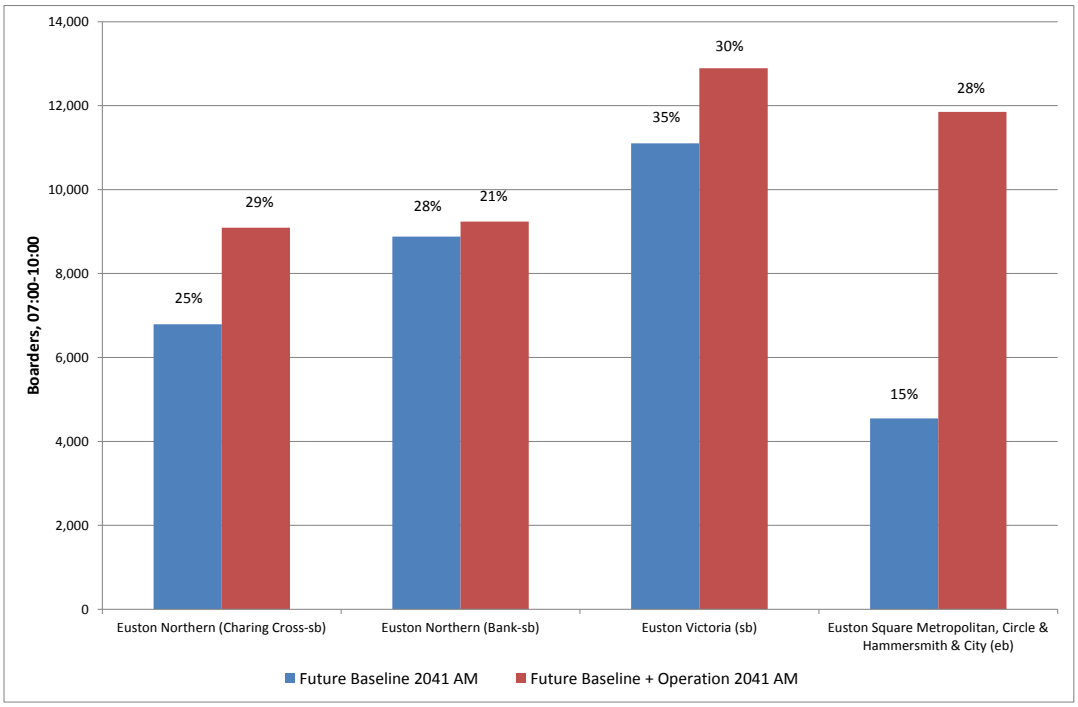


Figure 12 LU southbound boarders at Euston and eastbound at Euston Square stations, 07:00-10:00, 2041 (% represents proportion using each line)



12.5.17 Despite the planned London Underground upgrades, passenger congestion is already predicted to be high in the forecast baseline situation in 2026 – around five passengers/m2 on the southbound Northern line (Bank branch) and the Victoria line; crowding on the Northern line (Charing Cross branch) and Circle, Hammersmith & City and Metropolitan lines at Euston Square is lower at around three passengers/m^2 and two passengers/m^2, respectively. This is illustrated in Figure 13 and Figure 14 which show crowding south of Euston in the AM peak period for the 2026 and 2041 Future Baselines respectively. The new subway connection between Euston station and Euston Square LU station results in increased interchange between Euston station and the Circle, Hammersmith & City and Metropolitan lines. As a consequence, operation of Phase One of HS2 is forecast to increase crowding only slightly on the Northern line (Bank branch) and Victoria line, but have a larger effect on crowding levels on the Northern line (Charing Cross branch), which has more available capacity.

12.5.18 There will be a larger increase in use of the Circle, Hammersmith & City and Metropolitan lines, capitalising on the new link provided and remaining within planned capacity.

12.5.19 By 2041, crowding is forecast to increase to approaching six passengers/m^2 on the southbound Northern line (Bank branch) and the Victoria line platforms, around four passengers/m^2 on the Northern line (Charing Cross branch) and around 2.5 passengers/m^2 on the Circle, Hammersmith & City and Metropolitan lines. Figure 13 indicates that crowding on the southbound Northern line (Bank branch) and the Victoria line will only increase slightly as a result of Phase Two operation, with crowding increasing more on the southbound Northern line (Charing Cross branch) and eastbound Circle, Hammersmith & City and Metropolitan from Euston Square, both of which have a much lower level of crowding than the Bank branch and Victoria Line. In particular, the Circle, Hammersmith & City and Metropolitan lines together

remain below 4 passengers/m^2 and have sufficient capacity to cater for additional demand.

Figure 13: AM Peak crowding 2026 LU lines southbound south of Euston (future baseline (2026)/future baseline 2026 + Proposed Scheme)

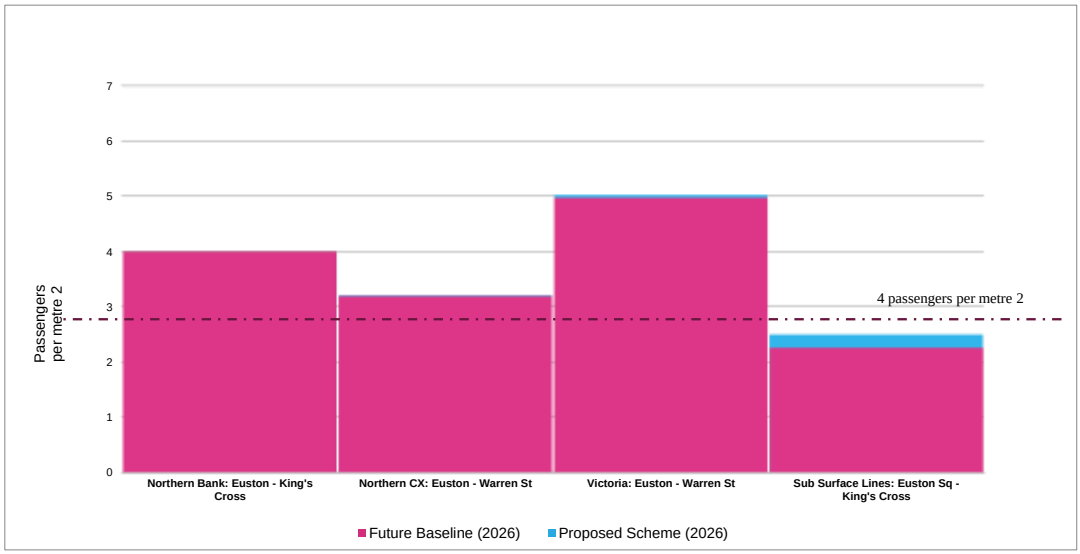
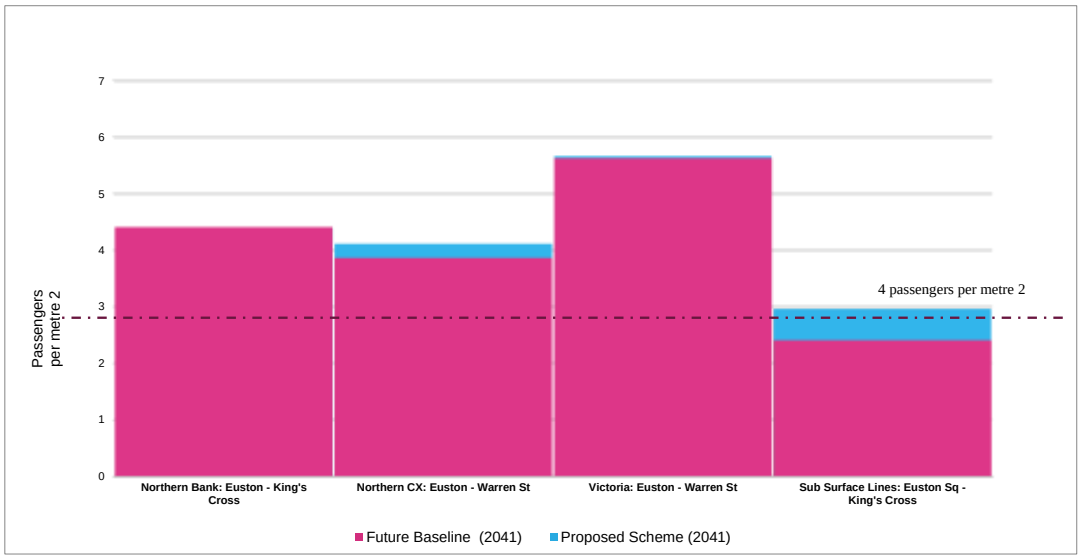


Figure 14: AM Peak crowding 2041 LU lines southbound south of Euston (future baseline (2041)/future baseline 2041 + Proposed Scheme)



12.5.20 While the highway assessment was undertaken based on the Proposed Scheme, the public transport assessment, using Railplan, was based on the design without an access to the existing station concourse from a northern entrance and with access to Euston underground station to/from the Euston Square Gardens entrance/exit. In order to ascertain the effects of the changes, a sensitivity test was undertaken for the revised design of the Proposed Scheme for the 07:00-10:00 period. The sensitivity indicated:

- those passengers previously using the Euston Square Gardens exit would be reallocated, primarily to the Gordon Street exit, but also to the main Euston station exit. There would be no net change in passengers entering and exiting Euston station; and

- the number of additional trips to and from conventional rail services that would leave Euston station via the A400 Hampstead Road north-west exit is not significant.

12.5.21 The small scale of these changes does not affect the assessment of significant effects.

12.5.22 The additional passengers as a result of HS2 Phase One and HS2 Phase Two will cause further LU crowding and increase interchange times for passengers in 2026 and 2041. Although the change in end to end journey times is less than 10%, on the basis that the number of travellers affected for all London Underground lines is high, the effect on public transport delay is considered minor adverse in 2026 and moderate adverse in 2041.

12.5.23 There are concerns at both Euston mainline and underground stations, in relation to their ability to manage current demand, including the following locations:

- the escalator to the southbound Victoria line and Northern line (Bank branch) platforms during the morning peak (throughput greater than 100 passengers per minute);
- restricted circulation for most pedestrians on the existing station concourse during the evening peak; and
- the escalator from northbound Victoria line and Northern line (Bank branch) platforms during the evening peak (throughput greater than 100 passengers per minute).

12.5.24 Forecast growth without HS2 Phases One and Two predicts performance in these three critical areas will deteriorate significantly by 2026 and further by 2041. As such, these facilities would need to be upgraded, irrespective of the Proposed Scheme. The Proposed Scheme incorporates significant improvements, which will help address these underlying concerns.

12.5.25 The Proposed Scheme has been evaluated for 2026 and 2041 operations using both static and dynamic modelling techniques. These analyses demonstrate a high level of passenger performance throughout the design showing that the interchange design for the Proposed Scheme will accommodate the additional demand generated at Euston whilst reducing congestion in comparison to the baseline scenarios. This reduces 2041 crowding levels from LoS E to LoS A in the new station concourse. On this basis, there will be a significant beneficial effect.

12.5.26 Mode share analysis has been undertaken to support assessment of the forecast demand on the transport network. The mode share for cycling and walking has been informed by analysis of current mode share trends with the mode share values reflecting future policy.

12.5.27 The mode share for taxi has been derived from analysis of the current (2012 baseline) situation and reflects the higher taxi mode share associated with longer distance rail services. The mode share for private vehicle movements reflects the removal of the basement car parking facility at Euston station. Given the absence of car parking and the low level of car pick up/set down demand, the main change to traffic generated by the Proposed Scheme is in relation to taxis. Table 27 shows the forecast peak hour taxi

movements to and from the station for 2026 Phase One and Table 29 for 2041 Phase Two. Set in the context of local traffic flows, these are relatively small changes.

Table 27: 2026 Hs2 Phase One Forecast peak hour taxi set down and pick up (vehicles) from all rail

	Morning peak hour 08:00-09:00		**Evening peak hour 17:00-18:00**	
	Pick-up from station	**Drop-off at station**	**Pick-up from station**	**Drop-off at station**
Conventional Rail + LU	165	63	130	201
HS2 Phase One	120	140	121	177
Total	285	203	251	378

Table 28: 2041 Hs2 Phase Two Forecast peak hour taxi set down and pick up (vehicles) from all rail

	Morning peak hour 08:00-09:00		**Evening peak hour 17:00-18:00**	
	Pick-up from station	**Drop-off at station**	**Pick-up from station**	**Drop-off at station**
Conventional Rail + LU	211	78	176	266
HS2 Phase Two	283	307	285	383
Total	494	385	461	648

12.5.28 Assessment of the Proposed Scheme includes these taxi operations together with the realignment and/or reconfiguration of highways around Euston station including realignment of A400 Hampstead Road, Granby Terrace bridge and Mornington Terrace bridge to accommodate the Proposed Scheme.

12.5.29 The operational impacts on roads and footways in the Euston area will be:

- permanent road closures and associated diversions around Euston station at the following locations:
  - Cardington Street will be permanently closed to vehicles and pedestrians for its entire length;
  - Melton Street (south of Cardington Street) will be permanently closed to vehicles and pedestrians from the junction with Euston Street to the new bus station access;
  - Stephenson Way (northern end) will be permanently closed to vehicles and pedestrians at the junction with Euston Street. Connection may be maintained with realigned Cobourg Street;
  - Drummond Street will be permanently closed to vehicles and pedestrians between Cardington Street and Cobourg Street, though connection may be maintained with realigned Cobourg Street;
  - Euston Street will be permanently closed to vehicles and pedestrians between Cardington Street and Cobourg Street, though connection may be maintained with realigned Cobourg Street;
  - Varndell Street will be permanently closed to vehicles at the junction with A400 Hampstead Road, but pedestrian and cycle access will be maintained;

- Harrington Street will be permanently closed at the junction with Granby Terrace;
- a minor road called Hampstead Road (which is not the A400 Hampstead Road) will be permanently closed to vehicles and pedestrians between junction with Cardington Street and A400 Hampstead Road;
- the bus station access will be permanently closed to vehicles and pedestrians from the junction with A501 Euston Road to the new bus station;
- Gordon Street will be permanently closed to vehicles at the junction with A501 Euston Road, but pedestrian and cycle access will be maintained; and

- the removal or reduction of parking and loading at Cardington Street, Euston Street, Drummond Street, Cobourg Street and Mornington Crescent.

12.5.30 The diversion of traffic associated with these changes, combined with the increases to taxi flows leads to flow changes on the highway network which will result in changes to delays at junctions. The junctions with significant increases in delay in 2026 are predicted to be:

CFA1

- B506 Great Portland Street/New Cavendish Street (minor adverse effect) – PM peak;
- A400 Tottenham Court Road/Torrington Place (minor adverse effect) – PM peak;
- A501 Euston Road/Euston bus station access (minor adverse effect) – AM peak;
- A501 Euston Road/A400 Hampstead Road (minor adverse effect) – AM peak;
- A5200 Grays Inn Road/A201 Swinton Street (minor adverse effect) – PM peak;
- A501 Euston Road/A400 Gower Street (minor adverse effect) – AM peak;
- A4201 Albany Street/Osnaburgh Terrace (moderate adverse effect) – PM Peak;
- A400 Gower Street/Torrington Place (major adverse effect) – PM peak; and
- A401 Theobald's Road/A5200 Gray's Inn Road (major adverse effect) – PM peak.

12.5.31 The junctions with significant increases in delay in 2041 are predicted to be:

CFA1

- B506 Great Portland Street/New Cavendish Street (minor adverse effect) – PM peak;
- A501 Euston Road/B504 Judd Street (minor adverse effect) – AM peak;
- A501 Euston Road/A400 Gower Street (minor adverse effect) – AM peak;
- A40 New Oxford Street/A400 Tottenham Court Road (minor adverse effect) – AM peak;

- A501 Euston Road/Chalton Street(minor adverse effect) – AM peak;
- A501 Euston Road/A5200 York Way (minor adverse effect) – AM peak;
- A501 Euston Road/A4200 Eversholt Street (minor adverse effect) – PM peak;
- A501 Euston Road/Euston bus station access (minor adverse effect) – AM peak;
- A5205 St. John's Wood Road/B507 Lisson Grove (major adverse effect) AM peak;
- A400 Gower Street/Torrington Place (major adverse effect) – PM peak;
- Tavistock Square/Bedford Way (major adverse effect) – AM peak;
- A5200 Grays Inn Road/A201 Swinton Street (major adverse effect) – PM peak;
- A400 Tottenham Court Road/Torrington Place (major adverse effect) – AM and PM peak;
- A501 Euston Road (eastbound)/A400 Hampstead Road (major adverse effect) – AM and PM peak; and
- A501 Euston Road (westbound)/A400 Hampstead Road (major adverse effect) – AM peak.

CFA2

- A5200 York Way/Market Road (moderate adverse effect) – PM peak.

12.5.32 The reconfiguration of roads around the station with the Proposed Scheme including the permanent closure of some roads together with increases in 2026 and 2041 demand associated with the Proposed Scheme is forecast to result in significant increases in peak hour traffic flow (more than 10% for all vehicles) that will result in a significant increase in pedestrian severance resulting from these increased flows. The locations of these roads in CFA1 are shown in Table 29. The locations of these roads outside CFA1 are shown in Table 30.

Table 29: Roads with increased Traffic Flow resulting in increased pedestrian Severance, 2026 and 2041 (CFA1)

Road name	CFA	2026		2041	
		AM	PM	AM	PM
A4201 Albany Street	CFA1	Moderate adverse	Moderate adverse	Major adverse	Major adverse
Arlington Road	CFA1 & 2	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
B525 Avenue Road, south of A5205 Prince Albert Road	CFA1	None	Minor adverse	None	Minor adverse
B401 Bow Street	CFA1	None	None	Minor adverse	None
Byng Place	CFA1	None	None	Minor adverse	None
Chalton Street	CFA1	None	None	Moderate adverse	None
Churchway/Grafton Pl	CFA1	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Crawford Street	CFA1	Moderate adverse	None	Moderate adverse	None

Road name	CFA	2026		2041	
		AM	PM	AM	PM
B512 Crowndale Road	CFA1	Minor adverse	None	Moderate adverse	None
A503 Delancey Street	CFA1	Moderate adverse	None	Moderate adverse	None
Devonshire Street	CFA1	None	None	Moderate adverse	Moderate adverse
Drummond Street	CFA1	Minor adverse	Minor adverse	None	Moderate adverse
B401 Endell Street	CFA1	None	None	Minor adverse	None
Endsleigh Gardens	CFA1	Moderate adverse	None	None	None
A501 Euston Road	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
Euston Street	CFA1	None	Moderate adverse	None	Moderate adverse
A4200 Eversholt Street/Euston Square	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
A41 Gloucester Place	CFA1	None	None	None	Moderate adverse
Goods Way	CFA1	None	Moderate adverse	None	Moderate adverse
Gordon Square	CFA1	None	None	Minor adverse	None
A400 Gower Street	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	None
Grafton Way	CFA1	None	Moderate adverse	None	Moderate adverse
Granby Terrace	CFA1	None	None	Moderate adverse	None
A5200 Gray's Inn Road	CFA1	None	Moderate adverse	Moderate adverse	Moderate adverse
Great Cumberland Place	CFA1	None	None	None	Moderate adverse
B506 Great Portland Street	CFA1	None	None	Minor adverse	None
B507 Grove End Road	CFA1	None	None	Minor adverse	None
B502 Guilford Street	CFA1	None	Minor adverse	None	Moderate adverse
Hampstead Road	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
Homer Street/Row	CFA1	None	None	Moderate adverse	None
Howland Street	CFA1	None	Minor adverse	None	Moderate adverse
B504 Judd Street	CFA1	None	Moderate adverse	Moderate adverse	Moderate adverse
B503 King's Cross Road	CFA1	None	Minor adverse	None	None
Longford Street east of A4201 Albany Street	CFA1	Moderate adverse	None	Major adverse	None
B524 Marylebone High Street	CFA1	None	None	None	Moderate adverse
A404 Harrow Road	CFA1	None	None	Minor adverse	None
Midland Road	CFA1	None	Minor adverse	None	Minor adverse
Mornington Crescent	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Major adverse

Road name	CFA	2026		2041	
		AM	PM	AM	PM
Mornington Street	CFA1	Major adverse	Major adverse	Major adverse	Major adverse
New Cavendish Street	CFA1	Minor adverse	Minor adverse	Minor adverse	Minor adverse
North Gower Street	CFA1	None	Moderate adverse	Moderate adverse	Major adverse
Old Marylebone Road	CFA1	Moderate adverse	None	Moderate adverse	None
Osnaburgh Street	CFA1	Moderate adverse	None	Moderate adverse	None
Outer Circle	CFA1	None	None	Moderate adverse	Major
B524 Paddington Street	CFA1	None	None	Minor adverse	None
A5202 Pancras Road	CFA1	None	Moderate adverse	None	Moderate adverse
Park Square East	CFA1	Minor	None	Moderate	Moderate
Park Village East	CFA1	Major adverse	None	Major adverse	Moderate adverse
Parkway	CFA1 & 2	Moderate adverse	None	Moderate adverse	None
A4201 Portland Place	CFA1	None	None	Moderate adverse	None
Pratt Street	CFA1	Minor adverse	None	Minor adverse	None
Red Lion Street	CFA1	None	None	None	Minor adverse
Seymour Place	CFA1	None	None	Minor adverse	None
Seymour Street	CFA1	None	None	None	Minor adverse
Stanhope Street	CFA1	Moderate adverse	None	Moderate adverse	Moderate adverse
Tavistock Place	CFA1	None	None	None	Moderate adverse
Tavistock Square	CFA1	None	None	Moderate adverse	None
B524 Thayer Street	CFA1	None	None	None	Moderate adverse
A401 Theobalds Road	CFA1	None	None	None	Moderate adverse
Torrington Place	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
A400 Tottenham Court Road	CFA1	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
A4200 Upper Woburn Place	CFA1	None	Moderate adverse	None	Moderate adverse

Table 30: Roads with increased Traffic Flow resulting in increased pedestrian Severance, 2026 and 2041 (outside CFA1)

Road name	CFA	2026		2041	
		AM	PM	AM	PM
Abbey Road	CFA3	None	None	Moderate adverse	None
Albert Street, north of A503 Delancey Street	CFA2	None	None	Moderate adverse	None
Arlington Road	CFA1 & 2	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
Caledonian Road	CFA2	None	Minor adverse	None	Moderate adverse
Camden Park Road	CFA2	None	None	None	Moderate adverse
Oval Road	CFA2	None	None	Moderate adverse	None
Parkway	CFA1 & 2	Moderate adverse	None	Moderate adverse	None
Sussex Gardens	CFA4	Moderate adverse	None	Minor adverse	None
York Way	CFA2	None	Minor adverse	None	Moderate adverse

12.5.33 The reconfiguration of roads around the station with the Proposed Scheme including the permanent closure of some roads is forecast to result in significant decreases in daily traffic flow, (more than 10% for all vehicles) that will in turn cause a significant reduction in pedestrian severance resulting from these decreased flows. The locations of these roads in CFA1 are shown in Table 31. The locations of these roads outside CFA1 are shown in Table 32.

Table 31: Roads with decreased Traffic Flow resulting in reduced pedestrian Severance, 2026 and 2041 (CFA1)

Road name	CFA	2026		2041	
		AM	PM	AM	PM
A4200 Southampton Row	CFA1	Moderate beneficial	None	Major beneficial	Moderate beneficial
A4200 Woburn Place – Russell Square	CFA1	Moderate beneficial	None	Major beneficial	Moderate beneficial
B506 Bedford Square	CFA1	Moderate beneficial	None	Moderate beneficial	None
Bedford Way	CFA1	None	None	Moderate beneficial	None
B502 Bernard Street	CFA1	None	Moderate beneficial	None	None
Byng Place	CFA1	None	Moderate beneficial	None	Moderate beneficial
A502 Camden High Street	CFA1 and 2	Moderate beneficial	Moderate beneficial	Moderate beneficial	Major beneficial
B400 Chancery Lane	CFA1	Moderate beneficial	None	Moderate beneficial	None
Cleveland Street	CFA1	Moderate beneficial	None	Moderate beneficial	None
Conway Street	CFA1	Moderate beneficial	None	Moderate beneficial	None
B512 Crowndale Road	CFA1	Moderate beneficial	None	None	None
Endsleigh Gardens	CFA1	None	Moderate beneficial	None	Moderate beneficial

Road name	CFA	2026		2041	
		AM	PM	AM	PM
Gordon Square	CFA1	Major beneficial	Moderate beneficial	Major beneficial	Moderate beneficial
Gordon Street – Gordon Square	CFA1	Major beneficial	Major beneficial	Major beneficial	Moderate beneficial
Granby Terrace	CFA1	None	Moderate beneficial	None	Moderate beneficial
B506 Great Portland Street	CFA1	None	Major beneficial	None	Major beneficial
Harrington Square	CFA1	Major beneficial	None	None	Minor beneficial
A301 Kingsway Underpass	CFA1	Moderate beneficial	None	None	None
Longford Street east of A4201 Albany Street	CFA1	None	Moderate beneficial	None	None
Malet Street	CFA1	Moderate beneficial	None	Major beneficial	None
B404 Monmouth Street	CFA1	None	None	Minor beneficial	None
B506 Montague Place	CFA1	None	None	Moderate beneficial	None
Mornington Crescent	CFA1	Moderate beneficial	None	None	None
Oakley Square	CFA1	Moderate beneficial	None	Major beneficial	None
Outer Circle, opposite Primrose Hill	CFA1	None	Moderate beneficial	None	None
A4201 Park Crescent	CFA1	None	None	Moderate beneficial	None
Park Village East	CFA1	Moderate beneficial	Major beneficial	None	Moderate beneficial
Plender Street	CFA1	None	Moderate beneficial	Moderate beneficial	Moderate beneficial
A5205 Prince Albert Road	CFA1 and 3	None	Moderate beneficial	None	None
Robert Street	CFA1	None	Moderate beneficial	Major beneficial	Moderate beneficial
Russell Square	CFA1	None	None	Moderate beneficial	None
A5202 St Pancras Way	CFA1 and 2	Moderate beneficial	None	Moderate beneficial	None
Stanhope Street	CFA1	None	Moderate beneficial	None	None
A4 Strand	CFA1	Moderate beneficial	None	None	None
Tavistock Place	CFA1	Major beneficial	Moderate beneficial	Major beneficial	None
A401 Theobalds Road	CFA1	None	None	None	Moderate beneficial
University Street	CFA1	None	Moderate beneficial	None	Moderate beneficial
Warren Street	CFA1	Moderate beneficial	None	Moderate beneficial	None
Wellington Road	CFA1	None	None	Moderate beneficial	None
York Street	CFA1	Moderate beneficial	None	None	None

Table 32: Roads with decreased Traffic Flow resulting in reduced pedestrian Severance, 2026 and 2041 (outside CFA1)

Road name	CFA	2026		2041	
		AM	PM	AM	PM
Agar Grove	CFA2	None	Moderate beneficial	None	Moderate beneficial
Bayham Street	CFA2	Moderate beneficial	None	Major beneficial	Moderate beneficial
A502 Camden High Street	CFA1 and 2	Moderate beneficial	Moderate beneficial	Moderate beneficial	Major beneficial
Camden Road	CFA2	None	None	None	Moderate beneficial
Camden Street	CFA2	Minor beneficial	None	Moderate beneficial	None
Copenhagen Street	CFA2	None	None	None	Moderate beneficial
Greenland Road	CFA2	None	None	None	Moderate beneficial
A5205 Prince Albert Road	CFA1 and 3	None	Moderate beneficial	None	None
A5202 St Pancras Way	CFA1 and 2	Moderate beneficial	None	Moderate beneficial	None

12.5.34 It is envisaged that there will be a permanent loss of approximately 88 on-street parking spaces due to the enlarged station footprint, together with 100 spaces associated with the demolition of the Hotel Ibis and its car park. There will be small reductions in a number of locations, but the only substantial on-street loss is the pay and display bays on Cardington Street. The loss of the spaces associated with the enlarged station footprint as part of the Proposed Scheme has therefore been assessed as not significant.

12.5.35 The Proposed Scheme will result in the permanent removal of 216 spaces from the public car park at Euston station.

12.5.36 The permanent loss of off-street parking at Euston station is considered a major adverse effect, although restricting parking at central London stations will promote sustainable travel to Euston station.

12.5.37 Increased flows on major roads and through certain junctions can bring a commensurate increase in accident risk. In 2026 during operation of the Proposed Scheme there are some links/junctions where there will be significant effects on accident risk, as a result of the expected changes in daily traffic flows:

- A501 Euston Road (between Churchway and Dukes Road) link (minor adverse effect);
- the junction of A501 Euston Road/B504 Judd Street/Midland Street (minor adverse effect);
- the junction of A400 Hampstead Road/Robert Street (minor adverse effect);
- the junction of A400 Hampstead Road/Drummond Street (minor adverse effect);
- the junction of A501 Euston Road/A400 Tottenham Court Road (minor adverse effect in 2041 only); and

- A4201 Albany Street (minor significant effect in 2041 only).

12.5.38 A501 Euston Road and A400 Hampstead Road have provision for safe crossing facilities at junctions and signalised pedestrian crossings which will help to mitigate these minor adverse effects.

12.5.39 The Proposed Scheme will provide an improved linear bus station at the south of the station, in addition to a bus stand on A4200 Eversholt Street to the north-east of the station. The remodelled bus station, at 200m long, will be approximately twice the length of the existing bus station. The combination of the northern bus standing area and the remodelled bus station will provide flexibility in bus routeing and opportunities to reduce wasted bus mileage.

12.5.40 The 'south to east' bus route 91 currently bypasses the bus station when travelling from east to south. The Proposed Scheme will enable the 91 bus to stop at the bus station from both directions. Bus route 59 will continue to serve the bus station in both directions. Both bus routes 59 and 91 will turn right from A501 Euston Road into the bus station when travelling from south to east. Bus route 253 will also be diverted to leave the bus station via A501 Euston Road, Churchway and Grafton Place.

12.5.41 The effect of these bus route changes and diversions, as well as some additional bus delay on the route as a whole result in the following significant effects:

- route 253 (northbound) – moderate adverse effect in the AM and PM peak hour with the Proposed Scheme in 2026 and 2041;
- route 91 (southbound) – moderate adverse effect in the AM and PM peak hour with the Proposed Scheme in 2026 and 2041;
- route 91 (northbound) – moderate adverse effect in the PM peak in 2041;
- route 59 (southbound) – moderate adverse effect in the PM peak in 2041; and
- route 59 (northbound) – moderate adverse effect in the PM peak in 2041.

12.5.42 There will be no other significant effects on public transport delays within this area.

12.5.43 The Proposed Scheme includes substantial improvements for pedestrians, including:

- expanded public space at Euston station's south entrances, which will eliminate level changes and improve step free access;
- improved linear bus station that will be more permeable to pedestrian movement;
- improved crossings of A501 Euston Road with a new pedestrian phase and green man/red man signals at the junction with the bus station;
- subway linking Euston station to Euston Square station, which will reduce demand on busy footways and will include lifts that will provide step free access;
- subway linking Euston station to Gordon Street, which will reduce demand on busy crossings and will include lifts that will provide step free access;

- north end of Gordon Street will be closed to motor vehicles, to create a shared pedestrian/cycle traffic free route;
- northern station entrance that will improve walking accessibility from the north and connections with Hampstead Road bus services;
- new station entrance on A4200 Eversholt Street to improve station accessibility;
- improved pedestrian and cycle crossings of A400 Hampstead Road; and
- east-west bridge across the railway corridor north of Euston station, which will reduce walking journeys by up to 400m or 5 minutes and provide new permeability across the station.

12.5.44 Four paths are affected by the Proposed Scheme:

- the path between A400 Hampstead Road leading into St. James's Gardens will be permanently closed replaced by a new area of public realm at the northern station entrance;
- the pedestrian section of Harrington Street will be permanently closed and replaced by a new area of public open space; and
- two paths across Euston Square Gardens, (one to the east and one to the west) will be permanently closed and then reprovided as new routes of equivalent status.

12.5.45 The paths across St James's Gardens and Euston Square Gardens will be reprovided and the path on Harrington Street is associated with buildings to be demolished. Therefore, the effects on these paths are not significant.

12.5.46 Predictions of cycle use to and from Euston station are based on the current profile of cycling destinations and a 7% target modal share. When compared to the 2026 future baseline the AM peak hour (08:00-09:00), the Proposed Scheme is expected to increase cycle flows by about 50 to the station and about 225 from the station, and the PM peak hour (17:00-18:00) cycle flows are expected to increase by about 170 to the station and about 40 from the station. When compared to the 2041 future base the AM peak hour cycle flows are expected to increase by about 330 to the station due to the HS2 Phase Two demand and about 670 from the station, and the PM peak hour cycle flows are expected to increase by about 1,040 to the station and about 210 from the station.

12.5.47 Increased demand for cycle parking at Euston station will be met by providing considerably more cycle parking facilities in the overall station design. The station currently provides 234 spaces and this will be increased to some 2,000 spaces with the Proposed Scheme. The cycle parking spaces provided in HS2 Phase One are a substantial uplift above existing facilities which promote growth in cycling. Specific cycle parking locations will be proposed in collaboration with TfL and LBC. A phased approach to cycle parking capacity is proposed. This will deal with both demand generated by the Proposed Scheme and baseline demand. This would not otherwise be provided and is a major beneficial effect. In additional, it is expected that 200

additional Barclays cycle docking stations will be provided, dispersed in streets around the station.

12.5.48 All existing cycle routes will be reinstated. Euston station will be served by two proposed cycle routes which will meet in the public space at the northern entrance and will pass the station's main cycle parking.

12.5.49 The first route, a north-south 'quietway'[111] cycle route from Mornington Crescent to Tavistock Place/Gordon Square, will replace the unofficial LCN route 6a. It will include a combination of shared bus and cycle lanes, protected cycle lanes, shared cycle/pedestrian routes, segregated cycle track and improved crossing of the A501 Euston Road.

12.5.50 The second new cycle route, an east-west 'quietway' from Regent's Park to King's Cross, will include a combination of shared cycle/pedestrian routes, improved crossings of A400 Hampstead Road and A4200 Eversholt Street and a new link in the cycle network across the east-west bridge.

12.5.51 The east-west bridge will reduce cycling journeys by up to 400m or two minutes. By linking westward to Regent's Park Outer Circle and eastward to Ossulston Street, the new east west 'quietway' would relieve pressure on the crowded east-west Tavistock Place cycle track. It could form part of the Central London Bike Grid and 'Circle Line quietway'. Although the exact number of cyclists and pedestrian that will use the east west link bridge is unknown at this stage it is expected to have a major beneficial significant effect.

Cumulative effects

12.5.52 The assessment includes for the cumulative effects of planned development during operation.

12.5.53 The assessment also includes for in-combination effects by taking into account transport impacts as a result of the Proposed Scheme in neighbouring CFA areas. There are no effects from adjacent CFAs.

Other mitigation measures

12.5.54 Changes in traffic flows will lead to an increase in delays to vehicle occupants at a number of junctions in 2026 and 2041. However, most signalised junctions in central London are under adaptive control which will optimise the signal stages in real time. This means that many of those junctions with a minor significant effect will be mitigated through adaptive control, although this is most effective where there is no net increase in traffic through the junction.

12.5.55 A review of pedestrian crossing timings and signal equipment could facilitate improved area connectivity and permeability in collaboration with LBC and TfL.

12.5.56 A station travel plan will be developed as a tool for improving access to and from Euston station.

[111] A 'quietway' is defined in The Mayor's Vision for Cycling London, GLA, March 2012, as a cross-London network of high-quality guided routes on low-traffic back streets.

- The scope of the travel plan will include:
  - access and egress to the station for passenger travel;
  - employee travel, including rail staff and others working on the site such as retail staff, security and policing, and cleansing contractors; and
  - servicing and maintenance including deliveries.
- The objectives of the travel plan can be summarised as:
  - to encourage access by walking, cycling and public transport;
  - to monitor facilities and infrastructure that supports access by walking, cycling and public transport within the station site and its surrounding area;
  - to manage taxi travel to the site by providing and monitoring dedicated and controlled facilities for pick up and drop off; and
  - to work in partnership with the local authority and other stakeholders to develop measures and promotional strategies to encourage sustainable travel.

12.5.57 A reduction of movement through residential areas could be achieved by supporting LBC's aspirations for 20mph zones and associated local traffic calming.

Summary of likely significant residual effects during operation

12.5.58 There will be beneficial impacts of the Proposed Scheme as a result of improved journey times on HS2 to the Midlands and beyond; lower crowding levels on trains to and from Euston station as a result of increases in train frequencies; and released capacity on other rail services easing pressure on the WCML with resultant reliability benefits.

12.5.59 The Proposed Scheme will lead to public transport delay due to bus route changes and diversions, as well as some additional bus delay, on the following bus routes: route 253 (northbound); route 91 (southbound); route 91 (northbound); route 59 (southbound and northbound). Additional demand on the LU network will lead to delay on London Underground lines at Euston station.

12.5.60 The Proposed Scheme will provide benefits at stations and interchanges associated with the transfer to Euston station of passengers of high speed services who previously would have arrived at King's Cross and St. Pancras International from the north of England resulting in some relief to these stations; improvements in accessibility and reduced crowding levels in the new Euston station concourse; increased passenger area and improved platform access as a result of improvements to Euston Underground station ticket hall and the provision of new escalators; introduction of step free access through-out Euston and Euston Underground stations; improved facilities and access to Euston Square station as a result of the provision of a new LU ticket office and subway connection; and increasing capacity for bus routes as a result of the improved linear bus station and a bus stand on A4200 Eversholt Street.

12.5.61 With Phase Two, the transfer to Euston station of passengers of high speed services who previously would have arrived at King's Cross and St. Pancras International from the north of England would result in some relief to these stations.

12.5.62 Changes in traffic flows will result from permanent road closures, changes to the local road network and relocated and increased taxi operations. Increases in traffic flows will mainly be concentrated on some roads to the east of Euston station in the Somers Town and King's Cross area, to the immediate west of the station, as well as in the Regent's Park and Camden Town areas. In addition there will be increases in traffic on some roads to the south of the A501 Euston Road, in the Bloomsbury area.

12.5.63 Reductions in traffic flows will result in improvements for pedestrians crossing the road. The diversion impacts of road closures result in decreases in traffic which will mainly be concentrated on some roads to the south of Gordon Street, in the Bloomsbury area, and in the Camden Town area.

12.5.64 Impacts arising from the Proposed Scheme on parking and loading are expected due to the removal of parking associated with Euston station car park.

12.5.65 The Proposed Scheme includes increased cycle parking capacity and improvements to cycle and walk routes on roads surrounding the station which lead to reductions in delay and improvements to amenity and ambience.

12.5.66 Impacts on accidents and safety risks have been identified at the following junctions: A501 Euston Road (between Churchway and Dukes Road) link; A501 Euston Road/A400 Tottenham Court Road; A501 Euston Road/B504 Judd Street/Midland Street; A400 Hampstead Road/Robert Street; A400 Hampstead Road/Drummond Street; and A4201 Albany Street link.

12.5.67 The introduction of the east west link bridge in the Proposed Scheme will reduce severance leading to a major beneficial effect for pedestrians and cyclists.

12.5.68 The significant effects that result from operations of the Proposed Scheme in 2026 and with HS2 Phase Two demand in 2041 are shown on Map TR-04-001 (Volume 5, Traffic and Transport, CFA1 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:

- Grand Union Canal (The Regent's Canal) – the section of canal in the Euston area is commonly known as the Regent's Canal;
- the Chalk Principal aquifer; and
- three Secondary A aquifers.

13.1.3 Key environmental issues relating to water resources and flood risk include:

- the potential impacts to surface water quality;
- the potential impacts to the quality of shallow groundwater; and
- potential impacts to surface water and sewer flood risks from works at Euston station.

13.1.4 Volume 5: Appendix WR-001-000 contains a report on the route-wide effects including:

- generic assessments on a route-wide basis;
- stakeholder engagement;
- in combination effects;
- a draft operation and maintenance plan for water resources and flood risk;
- a Water Framework Directive[112] (WFD) compliance assessment; and
- a route-wide Flood Risk Assessment (FRA).

13.1.5 Detailed reports on water resources and flood risk within this area are also contained in the Volume 5 appendices. These include:

- Appendix WR-002-001: Water Resources Assessment report; and
- Appendix WR-003-001: Flood Risk Assessment.

[112] 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.

13.1.6 Map Series WR-01 to WR-03 showing some of the details, environmental baseline and design features referred to in this report and are all contained in Volume 5, Water Resources and Flood Risk Assessment Map Book.

13.1.7 Discussions have been held with the Environment Agency and the Canal & River Trust (formerly British Waterways) and Thames Water Utilities Ltd (in relation to the presence of public water supply boreholes).

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 Addendum presented in 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 route centreline of the Proposed Scheme, except where there is clearly no hydraulic connectivity. For surface water features in urban areas, the extent was reduced to 500m. Outside 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 judgment has been used in selecting the appropriate limit to the extension of spatial scope required. This spatial scope is described as the study area.

13.2.3 Water Framework Directive (WFD) classification data has been made available by the Environment Agency. For surface water bodies that do not have a WFD status class shown in the relevant River Basin Management Plan (RBMP), the status class has been taken as the status class for the first downstream water body for which a status class is reported. Where groundwater does not have a WFD status class shown in the relevant RBMP, these are referred to as 'not assessed by the Environment Agency'.

13.2.4 Limited data are available with regard to water quality and no additional surveys were carried out for this assessment.

13.2.5 A reasonable understanding of conditions likely to be encountered in below ground construction is available from existing sources documenting the geology and hydrogeology of the study area and groundwater level data from the Environment Agency. No monitoring of groundwater levels was undertaken as part of this assessment.

13.2.6 Two-dimensional surface water hydraulic modelling has been undertaken as part of the design of the expansion of Euston station. The limitations associated with flood risk within this study area are described in detail in the flood risk assessment in Volume 5: Appendix WR-003-001.

13.3 Environmental baseline

Existing baseline – surface water resources

Surface water features

13.3.1 The route does not cross any watercourses within the area, which is located within the Thames River Basin District (RBD) and is covered by the river basin management plan (RBMP)[113].

13.3.2 Although more than 500m from the route, the Proposed Scheme includes utility works in the vicinity of the Regent's Canal in the section of the canal below Kentish Town Lock at Camden (WFD water body "Regent's Canal lower section")[114].

13.3.3 The canal is currently used for navigation by both commercial and leisure users.

13.3.4 Surface runoff currently drains into the Thames Water Utilities Ltd combined sewer network. The water quality of runoff would be expected to reflect the urban nature of the Euston area. Runoff may therefore be contaminated to varying levels with sediment, oil and other contaminants associated with urban catchments.

13.3.5 The current surface water baseline is shown on Map WR-01-001 (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-002-001. Table 33 includes features potentially affected by the Proposed Scheme.

Table 33: Surface water features potentially affected by the Proposed Scheme

Water feature	Location description (Volume 5, Water Resources Map Book map reference)	Watercourse classification[115]	WFD water body and current overall status	WFD status objective (by 2027 as in RBMP)	Receptor value[116]
Grand Union Canal (Regent's Canal)	The Regent's Canal is located north of Regent's Park and close to the boundary of this study area See Map WR-01-001, F5	Artificial	Regent's Canal, lower section. (GB70610510) Moderate	Good potential	High

Water Framework Directive status

13.3.6 The WFD status classification provided by the Environment Agency is indicated in Table 33.

[113] Environment Agency River Basin Management Plan, Thames River Basin District, December 2009.
[114] The Environment Agency's Detailed Rivers Network (DRN) indicates a culverted watercourse at a minimum distance of 500m east of the route at Euston. The reach has been included in the DRN to ensure connectivity between Highgate Ponds and the Thames within the DRN. It is shown on map WR-01-001 as an underground river. However it is considered that the watercourse is a part of the sewer network and is not a surface water feature. It has therefore not been included in this assessment.
[115] 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.
[116] For examples of receptor value see Table 43 in the SMR addendum (Volume 5: Appendix CT-001-000/2).

Abstractions and permitted discharges

13.3.7 There are no licensed surface water abstractions within 500m of the route in the study area. There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20 cubic metres per day.

13.3.8 There are no current consented surface water discharges within 500m of the route in the study area.

Existing baseline – groundwater resources

Geology and hydrogeology

13.3.9 The location of private abstractions, geological formations and indicative groundwater levels are shown on Map WR-02-001 (Volume 5, Water Resources and Flood Risk Assessment Map Book).

13.3.10 The geological formations within the Euston area are described further in Section 8 of this report and are shown in a schematic geological cross-section in Map WR-02-001 (Volume 5, Water Resources and Flood Risk Assessment Map Book).

13.3.11 A summary of the superficial and bedrock geology and hydrogeology is presented in Table 34. Unless otherwise stated, the geological groups listed are all crossed by the route.

Table 34: Summary of geology and hydrogeology in CFA1

Geology	Distribution	Formation description	Aquifer classification	WFD water body and current overall status	Predicted WFD status objective (by 2027 as in RBMP)	Receptor value
Superficial deposits						
Thames Catchment Subgroup (Maidenhead Formation, Langley Silt Member)	Outcrops in a thin band on the northern margin of the Lynch Hill Gravel Formation in the southern part of the study area. (not penetrated by the Proposed Scheme)	Clay and silt	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Thames Catchment Subgroup (Maidenhead Formation, Lynch Hill Gravel Member)	Outcrops across the southern part of the study area close to the southern corner of the existing Euston station	Sand and gravel	Secondary A aquifer	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Bedrock						
Thames Group (comprising the London Clay Formation. The Harwich Formation may also be present at the base)	Across entire study area	Stiff grey clay, sandy or silty in some horizons	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Lambeth Group (Upnor, Reading and Woolwich Formations)	Assumed to underlie London Clay Formation throughout the study area	Lenses and interbedded layers of clay, silty sand and shelly silty clay at the top, sand and gravel towards the base	Unproductive (top)/Secondary A (base)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low (top) Moderate (base)
Thanet Sand Formation	Assumed to underlie the Lambeth Group throughout the study area	Greenish and brownish grey, silty, fine-grained sand	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
White Chalk Subgroup	Assumed to underlie Thanet Sand Formation throughout the study area	Firm white chalk with marl seams and flint bands	Principal	Mid Chilterns Chalk (GB40601G601200) Poor	Good	High

Superficial deposits

13.3.12 Superficial deposits comprising the Langley Silt Member and the Lynch Hill Gravel Member of the Maidenhead Formation are present in the southern part of the study area.

13.3.13 The Lynch Hill Gravel Member is classified as a Secondary A aquifer, but is considered to be of low value due to its limited extent and potentially poor water quality. The Langley Silt Member is classified as unproductive strata.

Bedrock aquifers

13.3.14 The London Clay Formation underlies the whole of the study area. It is a blue-grey clay that weathers to a brown colour in its upper part. The geological succession beneath the London Clay Formation comprises, in turn:

- the Harwich Formation, a thin sandy deposit which may be present in some locations;
- the Lambeth Group (also termed the Woolwich and Reading Formations) which comprises mixed sands and clays, and pebble deposits in some locations;
- the Thanet Sand Formation, a dense greenish or brownish grey sand; and
- the Cretaceous Chalk Group, a succession of soft white limestone units.

13.3.15 The geological formations within this study area are described in Section 8, Land quality and further details are included in Volume 5: Appendix WR-002-001.

Water Framework Directive status

13.3.16 No WFD classification has been given by the Environment Agency to the superficial deposits.

13.3.17 The London Clay Formation is classified by the Environment Agency as unproductive strata.

13.3.18 The Lambeth Group and Thanet Sand Formation are not assessed by the Environment Agency. However, these may be in hydraulic continuity with the underlying Chalk aquifer, which is classified as being part of the Mid-Chilterns Chalk groundwater body.

Abstractions and permitted discharges

13.3.19 The Environment Agency reports that there are five private licensed groundwater abstractions from the underlying Chalk within the study area. Details are presented in Volume 5: Appendix WR-002-001. The abstractions are classified as high value receptors. No unlicensed groundwater abstractions have been identified from the data available. There is the potential for unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m^3 per day.

13.3.20 The Environment Agency reports that there is a public water supply (PWS) with a source protection zone (SPZ) in this study area, approximately 840m west of the route (refer to Map WR-02-001, Volume 5, Water Resources and Flood Risk Assessment

Map Book for the location of the SPZ). The SPZ only just intrudes into the study area, most of it is in the adjacent study area CFA03 (Primrose Hill to Kilburn).

13.3.21 The Environment Agency records show that there are four current consented discharges to groundwater within 1km of the route as set out in Volume 5, Appendix WR-002-001.

Surface water/groundwater interaction

13.3.22 There are no significant groundwater/surface water interactions within 1km of the route in the study area.

Water dependent habitats

13.3.23 No water dependent habitats have been identified in the study area.

Existing baseline – flood risk

River flooding

13.3.24 The agreed data set for river flooding is the Environment Agency Flood Zone Mapping.

13.3.25 The route will not cross over any Environment Agency designated Main river or Ordinary watercourses within this study area according to the DRN as shown in Map WR-01-001 (Volume 5, Water Resources and Flood Risk Assessment Map Book).The entire study area is within Flood Zone 1.

Surface water flooding

13.3.26 The locally agreed surface water flooding dataset is from the modelling activities undertaken as part of the Drain London project for the production of the London Borough of Camden (LBC) Preliminary Flood Risk Assessment[117] (PFRA) and the LBC Surface Water Management Plan[118]. The Environment Agency Flood Map for Surface Water (FMfSW) has also been reviewed to inform the assessment of surface water flood risk, and is shown in Map WR-01-001 (Volume 5, Water Resources and Flood Risk Assessment Map Book).

13.3.27 The North London Strategic Flood Risk Assessment[119] (SFRA) reports that a large area in the north of LBC was affected by surface water flooding in 1975 and again in August 2002 as a result of heavy rainfall inundating the public sewer system. A retaining wall collapsed onto the railway in the approach to Euston station during this flooding event and caused a closure of the station[120].

13.3.28 There are parts of the study area that have a high risk of surface water flooding during rainfall events up to and including the 1 in 200 year return period (0.5% annual probability) event. The existing railway, immediately to the north of Euston station, is predicted to flood at a 1 in 30 year return period (3.3% annual probability) and to depths of up to 1.5m during the 1 in 200 year return period rainfall event. The roads

[117] Halcrow (2011), London Borough of Camden Preliminary Flood Risk Assessment.
[118] Halcrow (2013) Surface Water Management Plan, London Borough of Camden.
[119] Mouchel (2008), North London Strategic Flood Risk Assessment.
[120] London Borough of Camden (2003), Floods in Camden: Report of the Floods *Scrutiny Panel.*

surrounding the station infrastructure are also shown to be at risk of localised surface water flooding. More detailed information on the risk of surface water flooding can be found in the Flood Risk Assessment in Volume 5: Appendix WR-003-001.

Sewer flooding

13.3.29 The agreed datasets for sewer flooding are Thames Water Utilities Ltd records in the LBC PFRA and the North London SFRA.

13.3.30 Thames Water Utilities Ltd historical sewer flooding records show that there have been a number of sewer flooding incidents in the study area. The LBC PFRA states that sewer flooding occurred within LBC in August 2004, September 2005 and July 2007. Specific locations of these flood incidents are not given.

Artificial water bodies

13.3.31 Flooding from artificial water bodies, such as canals and reservoirs, may occur as a result of failure of a retaining structure that impounds water. The agreed dataset for flooding due to reservoir failure is the Environment Agency Reservoir Inundation Map, as shown in Map WR-01-001 (Volume 5, Water Resources and Flood Risk Assessment Map Book).

13.3.32 There are no reservoir flood extents on the Environment Agency Reservoir Inundation Map within the study area.

13.3.33 The Grand Union Canal (The Regent's Canal) lies within the study area to the north of Regent's Park. There are no raised sections of canal in this study area and hence there is no risk of inundation from failure. The crossing of the canal (SWC-CFA3-01 as shown in Map WR-01-003, Volume 5, Water Resources and Flood Risk Assessment Map Book) will be located within the Primrose Hill to Kilburn (Camden) area (CFA3), as shown in Map WR-01-003 (Volume 5, Water Resources and Flood Risk Assessment Map Book), and is therefore not considered further in this report.

Groundwater flooding

13.3.34 The agreed dataset for groundwater flooding is the LBC PFRA. Where this dataset does not include sufficient information on the risk of flooding from groundwater the British Geological Survey (BGS) maps showing the susceptibility to groundwater flooding have been reviewed.

13.3.35 There are no historical incidents of groundwater flooding within the study area. The LBC PFRA identifies area to the south-west of Euston station with an increased potential for elevated groundwater. BGS geological mapping shows there are superficial deposits of Lynch Hill Gravel in this area.

Future baseline

13.3.36 Volume 5 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. 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.

Climate change

13.3.37 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.

13.3.38 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.

13.3.39 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.

13.4 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 examples illustrate how avoidance and mitigation measures will, in many cases, 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-002-001 and WR-003-001.

13.4.3 Drainage from Euston station, the cutting north of the station and associated infrastructure will be discharged, under agreement, to Thames Water Utilities Ltd sewers and so avoid permanent impacts on surface water features in this area.

13.4.4 The tunnelling methodology will be selected to avoid significant groundwater ingress into the tunnels. As the tunnel in this study area is mainly in London Clay there is no anticipated requirement to control and remove significant quantities of groundwater (dewatering). However, if dewatering is required, it will be done in consultation with the Environment Agency.

13.4.5 Retaining wall construction is likely to penetrate the superficial Lynch Hill Gravel deposits, in the southern corner of the redevelopment at Euston station. This wall has the potential to increase the risk of groundwater flooding outside of the construction area within the superficial deposits.

13.4.6 A flood wall will be constructed between the high speed railway and the existing railway, in Euston station and its approach, to ensure that surface water will be kept

separate, and will reduce the risk of flooding to the Proposed Scheme. Surface water flooding in the area surrounding the extended Euston station is formed of isolated areas of ponding in topographic low points, that have no connectivity. There will be no deflection of overland flow outside the station caused by the Proposed Scheme. There will be no increase in the off-site risk of flooding from surface water as a result of the Proposed Scheme.

13.4.7 The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme. It will provide effective management and control of the impacts during the construction period.

13.4.8 Implementation of the measures defined in Section 16 of the draft CoCP, including detailed method statements will ensure that there will be no impacts on surface water quality or flows associated with construction such as the utility works near the Regent's Canal. Any piled foundations that pass into the Lambeth Group and Thanet Sand Formation are unlikely to affect groundwater quality significantly. Application of the measures set out in the draft CoCP, will ensure groundwater quality is not adversely affected by ensuring appropriate pollution control mechanisms will be in place during construction of the piled retaining walls and foundations. Appropriate guidance will be adhered to, including the Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention[121]. Groundwater and surface water monitoring plans will be prepared, where piling could affect below ground contamination. The contractor will be required to consult with the Environment Agency regarding the response procedures to be implemented in the event of works affecting groundwater levels or quality.

13.4.9 Section 16 of the draft CoCP requires contractors to obtain the necessary consents from Thames Water Utilities Ltd to enable discharge of surface water runoff to the public sewer network from construction compounds, such as at Euston station, preventing an increase in the risk of sewer flooding.

13.4.10 Euston station is located within an area at risk of surface water flooding. As stated in Section 16 of the draft CoCP, such areas will have site specific flood risk management plans prepared prior to construction.

Assessment of impacts and effects

13.4.11 This section describes the significant effects following the implementation of avoidance and mitigation measures.

13.4.12 Details of the potential impacts that will not have significant effects are provided in the Water Resources Assessment report in Volume 5: Appendix WR-002-001 and Flood Risk Assessment in Appendix WR-003-001.

13.4.13 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).

[121] Environment Agency (2001), Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution.

13.4.14 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, groundwater or water dependant habitats. Further information is contained in Volume 3: Route-wide Effects Assessment.

Temporary effects

Surface water

13.4.15 The assessment shows that there will be no significant temporary adverse effects on surface water resources during the construction period.

Groundwater

13.4.16 The assessment shows that there will be no significant adverse effects on groundwater, groundwater abstractions or discharges in the study area during construction.

Flood risk

13.4.17 The assessment shows that there will be no significant increase in risks resulting from all sources of flooding during the construction process and therefore no significant temporary adverse effects.

Cumulative effects

13.4.18 There are no committed developments that have been identified which will result in significant cumulative effects.

Permanent effects

Surface water

13.4.19 No significant adverse effects to surface water resources have been identified during the assessment.

Groundwater

13.4.20 The assessment shows that there will be no significant permanent adverse effects on groundwater, groundwater abstractions or discharges in the study area.

Flood risk

13.4.21 The assessment shows that there will be no significant increase in risks resulting from all sources of flooding as a result of construction and therefore no significant permanent adverse effects.

Cumulative effects

13.4.22 There are no committed developments that have been identified which will result in significant cumulative effects.

Other mitigation measures

13.4.23 There are considered to be no other mitigation measures required for water resources or flood risk.

Summary of likely significant residual effects

13.4.24 Following mitigation, no significant residual adverse effects to water resources and flood risk have been identified during construction.

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 water courses and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1.

13.5.2 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 water courses and groundwater bodies are described in Volume 1 and in the draft operation and maintenance plan for water resources and flood risk included in Volume 5 Appendix WR-001-000.

13.5.3 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.

13.5.4 Surface water runoff and drainage systems from permanent infrastructure will be designed to attenuate runoff before being discharged to the Thames Water Utilities Ltd sewer network. This attenuation will also serve to reduce the risk of contaminated runoff entering Thames Water Utilities Ltd sewers as a result the operation of the Proposed Scheme.

Assessment of impacts and effects

13.5.5 There are considered to be no significant adverse effects to surface water, groundwater or flooding arising from operation of the proposed scheme.

Other mitigation measures

13.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

14 Ancillary works for potential over7site development

14.1 Introduction

14.1.1 The Proposed Scheme, described in Section 2 and assessed in sections 3 to 13, provides for a fully functioning and free-standing Euston station and a high speed railway.

14.1.2 The Proposed Scheme design for Euston station and approach, which is the basis of that assessment, does not, however, preclude the future planning, design and construction of over site development (OSD). The hybrid Bill contains ancillary works which if constructed as part of and at the same time as construction of the Proposed Scheme at Euston will enable the future construction of OSD to take place. Any future OSD would have to be the subject of a separate planning application, accompanied by a separate ES.

14.1.3 It has been considered sensible to undertake a separate environmental assessment of the likely environmental effects of incorporating such ancillary works for OSD into the construction of the Proposed Scheme. This will ensure that any likely significant residual effects of the ancillary works are properly reported.

14.1.4 These ancillary works would, if constructed, replace certain elements of the free-standing station, for instance, the architectural roof in the Proposed Scheme would not be built. Ancillary works would be built on land within the relevant hybrid Bill limits.

14.2 Scope of the assessment

14.2.1 The environmental assessment is based on preliminary feasibility studies, which have identified areas within the Proposed Scheme footprint, where HS2 Ltd's technical and programme criteria for permitting OSD, set out in Section 2, can be met. These areas would be over the entire high speed side of the station, the combined concourse and part of the high speed station approach. The only areas of potential ancillary works not assessed are those where there are significant technical constraints, which would affect the viability of future OSD.

14.2.2 The assessment has considered the construction of the Proposed Scheme including ancillary works to support OSD, in three distinct areas, as shown on Figure 15:

- Area A: the construction of supporting structures, principally foundations and columns and a working deck[122] over the entirety of the high speed part of the station and over the existing station concourse. These would be constructed as an alternative to the station roof structure included in the Proposed Scheme;
- Area B: the construction of supporting structures, principally foundations and columns and a working deck over the high speed tracks to the north of the

[122] A minimal deck on top of which the OSD structure will be built.

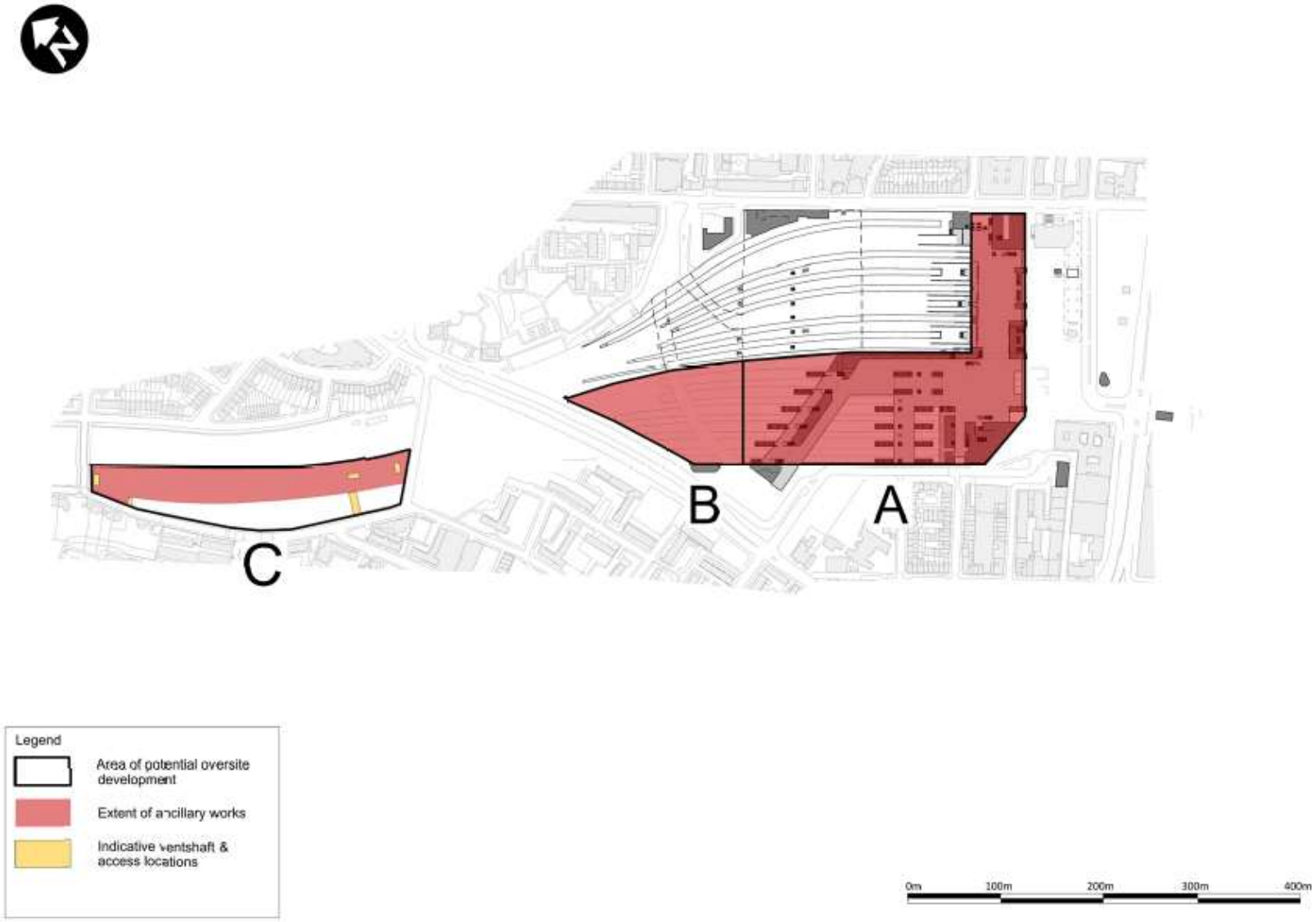
station, as far as Hampstead Road Bridge. These works would be additional to those included in the Proposed Scheme; and

- Area C: the construction of supporting structures, principally foundations and columns and a working deck, over the high speed tracks between Granby Terrace Bridge and Mornington Street Bridge. These works would be additional to those included in the Proposed Scheme. The land to the west, between the high speed alignment and Park Village East, would also become available for development. There would be no requirement for ancillary works over this land, apart from access links from Park Village East to the working deck.

14.2.3 Within each of these areas, OSD might only be taken forward on part of the area. This will only be determined when detailed studies of engineering feasibility and viability have been completed both by HS2 Ltd and the promoter of any OSD.There are other potential OSD areas identified in the draft Euston Area Plan (EAP). These are either outside the ancillary works powers in the hybrid Bill or have significant challenges to viability and technical design. The area between Hampstead Road Bridge and Granby Terrace Bridge, above the high speed tracks, has not been assessed because of the complex track layouts and future maintenance requirements that are likely to preclude cost effective provision of support structures for OSD. The area between the high speed tunnel portal and Mornington Street Bridge has not been assessed, because the additional tunnel ventilation and fire safety requirements that would arise are considered to adversely affect the financial viability of OSD in this area. Opportunities for OSD and any associated enabling works above the existing classic platforms are not assessed in this report, as these are beyond the scope of the hybrid Bill.

14.2.4 This section of the environmental assessment compares the likely effects of the Proposed Scheme with ancillary works with the likely significant effects of the Proposed Scheme without ancillary works, as reported in Sections 3 to 13.

Figure 15: Areas assessed for over site development ancillary works



14.3 Description of the ancillary works assessed

14.3.1 This description of the ancillary works is based on preliminary design of the OSD working deck. The level of design was sufficient to estimate quantities of materials and identify the principal changes from the programme for the Proposed Scheme without ancillary works. The ancillary works are those necessary to enable OSD to be constructed without major impact on the operational railway. The building heights described and shown on the cross-sections in Figure CT-20-010 (Volume 2 CFA1 Map Book) are indicative and are based on assumptions about structural loadings of decks and columns. Assumptions about the size of structural elements allowed estimates to be made of quantities of materials needed to build these ancillary works. The ancillary works assessed in each area are shown in Figure 16 and are described below.

Area A

14.3.2 It has been assumed that a concrete working deck would be constructed at a level of 36.5m AOD, about 12m above existing ground level at Cobourg Street, and could be up to 42,700m^2 in area. This deck would form the roof to the station and would become the working platform for the construction of the OSD above. The deck could support buildings up to a height of about 12 storeys.

14.3.3 The construction would comprise additional piled foundations, pile caps, enhanced vertical structures and the working deck. Any transfer structures to connect the OSD structures to the support points provided as part of the working deck would be provided by the developers and have not been assessed. There would be local projections above the working decks for ventilation and roof-mounted plant.

14.3.4 Across the front of the station, there are some additional considerations and this area has been considered in three zones as shown in cross section AA in Figure CT-20-010.

14.3.5 The eastern accommodation building zone has severe constraints to foundations because of the underlying underground station. The zone could support a seven storey building. It would be necessary to remove the existing basement raft and replace it with a stronger foundation raft. The roof would be configured as a working deck.

14.3.6 The conventional concourse zone is subject to similar foundation constraints and also limitations in respect of column spacing. Consequently, this zone would only be capable of supporting two storeys above the working deck. The ancillary works would comprise removal and reconstruction of the foundation raft, construction of columns and replacement of the proposed roof with a working deck.

14.3.7 The high speed railway zone is capable of supporting a substantial building, up to 23 storeys. Ancillary work in this area would comprise additional piles, caps, additional and enhanced vertical structures and the construction of the working deck. In the Proposed Scheme without ancillary works, this zone includes the western accommodation building. This five storey building could be included in the Proposed Scheme with ancillary works but its roof would be replaced with the working deck.

14.3.8 The western accommodation building extends above 36.5m AOD and is not subject to the same span limitations as the concourse areas. A development of similar height to that considered feasible over the high speed concourse area is possible. This building would require enhanced foundations, pile caps and structure. The roof would be

replaced with the working deck. Some amendments to the current layout of this building would be required to accommodate the additional vertical structures.

Area B

14.3.9 A working deck, which could be up to 12,900m² in area, would be constructed at ground level and would form a roof for the high speed platforms, replacing the proposed canopies. The proposed pad foundations in this area would be replaced by piles and pile caps with columns passing through the platforms. Buildings could be built to a maximum height of 12 storeys above deck level.

Area C

14.3.10 It has been assumed that only the high speed tracks would be decked over, with any works to deck between the high speed alignment and Park Village East being provided under a separate planning permission. The deck would be at a similar level to existing ground level and the ancillary works could be up to 11,700m² in area, within the overall boundary of area C which has an area of about 18,900m². The Proposed Scheme in this area already incorporates significant structural support, so additional foundations would generally not be required, but the vertical structure provided to support a deck would have to follow the underlying layout of the high speed dive under structure beneath. A 1.8m high containment parapet along the eastern edge of the deck would be required. The deck could support buildings of up to 12 storeys.

14.3.11 Additional ventilation measures would have to be provided, such as vent shafts, along with fire brigade access. The access points would be located on Park Village East and would be supported by associated compounds that would allow vehicle access for purposes of maintenance and repair of plant. These measures have been included in the assessment.

14.3.12 The ancillary works would be constructed principally from in-situ cast concrete and pre-cast concrete elements. An analysis of the additional volume of excavated materials, for the enlarged piles and raft, and of the materials required for construction of the ancillary works has been undertaken. In area A, the ancillary works would replace the roof structure of the station and an allowance has been made for this in the assessment.

Programme for ancillary works

14.3.13 The construction programme for the Proposed Scheme with ancillary works can, in principle, be completed within the overall programme for the Proposed Scheme without ancillary works.

14.3.14 The principal effect on the programme would be a delay of six months to the excavation and then the construction of the high speed platforms, while piles are constructed to support the working deck.

14.3.15 High speed train services would still commence in late 2026. The refurbishment of the existing conventional concourse may be completed four to six months after high speed trains come into service, depending on the design of the foundations in this area and the ability to effectively manage pedestrian flows around the station during the construction phase.

14.3.16 The ancillary works for Area C would take around nine months during 2020, but could be undertaken with no change to the overall programme in this location.

Construction waste

14.3.17 The additional quantity of construction waste generated by the Proposed Scheme with ancillary works is predicted to be 46,000 tonnes. Performance of similar projects indicates that about 4,600 tonnes would be disposed of to landfill. The quantity of excavated material would be little different from that from the Proposed Scheme.

Operation

14.3.18 Operation of the Proposed Scheme with ancillary works would be as described for the Proposed Scheme without ancillary works.

14.4 Assessment of the environmental effects of the Proposed Scheme with ancillary works

14.4.1 This assessment has followed the approach to assessment used elsewhere in the ES, but, where necessary, professional judgement has been used to draw conclusions, and is based on the assessment of the Proposed Scheme without ancillary works, set out in Sections 3 to 13. The baseline environment, future baselines and avoidance and mitigation measures reported in those sections apply also to this assessment. These would include the application of the draft CoCP.

Air quality

14.4.2 During construction, no significant residual effects from dust will arise. Based on the traffic analysis, reported below, it is likely that the ancillary works would extend the time periods over which significant effects occur on certain roads, as set out in Section 4. As peak traffic flows are not likely to be higher than those assessed for the Proposed Scheme, it is considered that transport emissions would be below the peak values identified in the assessment of the Proposed Scheme without ancillary works.

14.4.3 During operation, there would be no change from the effects reported in Section 4.

Community

14.4.4 During construction of areas A and B, the Proposed Scheme with ancillary works would give rise to the same significant effects as are reported in Section 5. The construction of area C would extend the period of exposure to construction traffic and noise for certain residents of Park Village East, who are predicted to experience in-combination effects which will coincide for approximately six months. Therefore this will result in a significant effect on residential amenity for approximately 50 properties.

14.4.5 There would be no change to the significant effects reported in Section 5 in relation to the demolition of residential property, commercial and business premises, community facilities and open space.

14.4.6 During operation there would be no significant effects, the same as reported in Section 5.

Cultural heritage

14.4.7 During construction, the Proposed Scheme with ancillary works would give rise to the same temporary significant effects as are reported in Section 6. Although the ancillary works in area A would alter the setting of 1-9 Melton Street and the Bloomsbury conservation area, there would be no change to the permanent significant effects reported in Section 6.

14.4.8 During operation there would be no significant effects, the same as reported in Section 6.

Ecology

14.4.9 During construction, the Proposed Scheme with ancillary works would give rise to the same temporary significant effects as are reported in Section 7. There would be no permanent significant effects, the same as reported in Section 7.

14.4.10 During operation there will be no significant effects, the same as reported in Section 7.

Land quality

14.4.11 The assessment in Section 8 concludes that during the construction of the Proposed Scheme without ancillary works, there would be a negligible effect on potential receptors. The ancillary works in area A may require deeper, as well as larger diameter piles, but the potential impact of penetrating the aquifer has already been taken into account in the assessment of the Proposed Scheme without ancillary works.

14.4.12 During operation there would be no significant effects, the same as reported in Section 8.

Landscape and visual assessment

Construction landscape assessment

14.4.13 The construction works associated with the Proposed Scheme with ancillary works would fall within the same footprint as the Proposed Scheme without ancillary works. Overall the working deck over the station would be lower than the free standing station roof and there would be no entrance canopies.

14.4.14 Although there would be changes in the overall programme of works, the scale of the works would be similar and the effects on landscape character reported in Section 9 for the Proposed Scheme would be unchanged.

Construction visual assessment

14.4.15 The construction works associated with the ancillary works will fall within the same footprint as the Proposed Scheme without ancillary works. Although there would be changes in the overall programme of works, the scale of the works would be similar and the visual impacts and effects reported for the Proposed Scheme in Section 9 would be unchanged.

Operation landscape assessment

14.4.16 The overview of the likely effects of the Proposed Scheme with ancillary works on the landscape resource during operation addresses the year 1 scenario.

14.4.17 The scale of the ancillary works deck in area A along Cobourg Street, without the roof, entrance canopy and western accommodation building in the Proposed Scheme, would be similar in height to the existing residential properties, although the overall scale would still not be in keeping with the local residential scale in this part of the Euston Road Commercial Area LCA. Similarly the deck in area B would not affect the setting of the Euston West Post War Residential LCA.

14.4.18 Although the ancillary works in area C, including the working deck and associated ventilation and plant buildings, would be close to the Regent's Park conservation area and the Regent's Park Georgian Residential LCA the presence of the additional elements would not affect the overall landscape setting of either area.

14.4.19 The predicted significant effects identified in Section 9 for the Proposed Scheme on the landscape resource would be unchanged with the additional elements and omissions associated with the ancillary works.

Operation visual assessment

14.4.20 The scale of the ancillary works for the deck in area A would not change the predicted effects for the visual receptors identified in section 9. The deck over the high speed tracks in areas B and C would be visible from viewpoints on Mornington Street, Mornington Terrace, Gillfoot and Dalehead residential blocks and Barnby Street properties in the Ampthill Estate. Views from the residential blocks in the Regent's Park Estate will be screened at lower levels by the Hampstead Road Bridge and from Park Village East by the replaced parapet wall. The deck and parapets would be a visible element viewed in the context of the widened railway corridor. The presence of the deck, although a new component in the view, would be largely characteristic of the existing setting.

14.4.21 The proposed ventilation plant and access buildings and parapets in area C would present a new built element in the direct line of view from residential properties on Mornington Terrace and Park Village East.

14.4.22 For the following viewpoints, the predicted significant effects identified for the Proposed Scheme without ancillary works would be unchanged if the ancillary works were implemented:

- Viewpoint 004.2.004: View west from Dalehead, Gillfoot and Oxenholme. The new elements introduced with the ancillary works would be seen against the backdrop of the existing and extended railway corridor, which would stretch across the entirety of the view;
- Viewpoint 004.2.005: View south-west from Mornington Crescent (numbers 1 to 12) and Hampstead Road (numbers 261 to 263), where the magnitude of change may increase from medium to high (depending on the locations chosen for the ventilation and access buildings and the overall height). The buildings will represent a substantial change locally in close proximity to the visual receptor as there would be no intervening screening vegetation and the built elements would be in the direct frame of view. However, as the context of the existing view includes the carriage shed, the significance of the effects would remain as reported in Section 9; and

- Viewpoint 004.2.007: View west from Mornington Terrace where the buildings may locally represent a substantial change in close proximity to the visual receptor as there would be no intervening screening vegetation and the built elements would be in the direct frame of view from a small number of properties.

14.4.23 There are certain other viewpoints where the magnitude of change may increase from low to medium (dependant on the locations of the ventilation and access buildings and their height), which include:

- Viewpoint 003.2.002: View looking east from Park Village East (between Granby Terrace and Mornington Street Bridge), where the vent buildings on the deck would be notable new elements in the direct frame of view. The access points and the built elements will adversely affecting the quality of the existing view. The medium magnitude of change, assessed alongside the high sensitivity of the receptor will result in a moderate and significant effect.

Socio-economics

14.4.24 During construction, the Proposed Scheme with ancillary works would give rise to the same effects on businesses as are reported in Section 10. The capital costs for the Proposed Scheme with ancillary works are greater than the Proposed Scheme without ancillary works. This would generate a small increase in the number and duration of construction employment opportunities, compared to those generated by the Proposed Scheme without ancillary works. The significant residual effects during construction would be the same as those reported in Section 10.

14.4.25 The Proposed Scheme with ancillary works would only be built if it is to be the basis of a viable OSD scheme which supports the objectives of the draft EAP. None of the benefits of that potential OSD are assessed in this ES. Of themselves, the ancillary works would give rise to no significant effects during operation, the same as reported in Section 10.

Sound, noise and vibration

Construction

14.4.26 The ancillary works would generate additional construction noise including piling and concreting plant to form the foundations and structures to support the working decks. These will add to noise emissions from the site and could impact neighbouring noise sensitive receptors, including those in the Cobourg Street, Regent's Park Estate and Park Village East areas. The assessment below is a qualitative assessment, without noise modelling.

14.4.27 Extensive additional piling would be required particularly in area A. Bored piling is proposed for the main works including forming the retaining walls and abutments with barrettes. If the additional piling is also bored, noise emission levels will be similar and the additional separation distance from noise sensitive receptors should imply lower noise levels. If the OSD work can be completed using similar piling methods within normal working hours, then the noise impacts would be the same as those predicted for the Proposed Scheme without ancillary works. The duration of noise impacts would be increased in line with the six month extension to the programme.

14.4.28 Indirect effects due to traffic diversions and construction traffic that may affect residential receptors would be similar to those reported for the Proposed Scheme without ancillary works. The traffic assessment for ancillary works identifies only one likely additional effect, an additional busy period in 2022 at the Granby Terrace Bridge satellite compound. However, traffic would be routed over Granby Terrace Bridge and not through the Regent's Park Estate. This additional construction peak does not change the assessment in Section 11.

14.4.29 During construction, the Proposed Scheme with ancillary works would give rise to the same temporary significant effects as are reported in Section 11.

Operation

14.4.30 At Euston station (area A) the effect of ancillary works for OSD would be neutral with regard to operational sound, when compared to the Proposed Scheme without ancillary works.

14.4.31 In area B and area C, the proposed working deck would effectively form a noise barrier that would be likely to reduce the exposure of nearby residents to sound from high speed trains. Receptors to the west of the railway cutting are also likely to be shielded from sound generated by conventional trains.

14.4.32 During operation significant effects would be the same as reported in Section 11.

Traffic and transport

14.4.33 During construction, the Proposed Scheme with ancillary works would give rise to some changes to the traffic and transport effects reported in Section 12. The amount of construction vehicle movements required to construct the Proposed Scheme including the delivery of plant and materials, movement of excavated materials and site worker trips, would be greater for the Proposed Scheme with ancillary works than the Proposed Scheme without ancillary works.

14.4.34 This would alter the timing of busy transport activity at each site compound. The estimated number of daily vehicle trips during the peak month of activity would also change for some site compounds. Table 35 shows the estimated dates and durations of when there would be busy transport activity at each construction compound for the Proposed Scheme with ancillary works. This represents the period when the construction traffic flows will be greater than 50% of the peak flows. Also shown is the estimated number of daily vehicle trips during the peak month of activity, the lower end of the range shows the average number of trips in the busy period and the upper end the peak month daily flows. The assessment scenario has assumed the peak month for the combination of activities, i.e. not necessarily the peak activity at each individual site.

Table 35: Typical vehicle trip generation for construction site compounds with ancillary works

Compound type	Location	Access	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	Euston Square Gardens (west)	Melton Street and A501 Euston Road	Q1 2016	11 years	8 months	15 – 25	170 – 265
Main	National Temperance Hospital	A400 Hampstead Road	Q1 2016	11 years	17 months	45-60	455 – 580
Satellite	Granby Terrace overbridge	Initially Stanhope Street via Robert Street and after mid 2018 via Granby Terrace Bridge	Q1 2016	11 years	18 months	25 – 35	260 – 340
Satellite	Mornington Street overbridge	Mornington Terrace	Q1 2016	4 years (from start to end but in two 18 month phases)	13 months	<10	<10 – 10
	Mornington Terrace Sidings		Q3 2015	2 years			
Satellite	A400 Hampstead Road overbridge (north and south)	A400 Hampstead Road and Barnby Street	Q1 2016	11 years (north) 6 years (south)	11 months	<10	25 – 35
Satellite	Royal Mail NW1 delivery office	A4200 Eversholt Street	Q1 2016	11 years (from start to end but in two phases)	7 months	<10	50 – 60
Satellite	Euston Square Gardens (east)	A4200 Eversholt Street	Q1 2016 and Q1 2020	11 years (from start to finish but in two phases)	6 months	<10	<10
Satellite	Gordon Street	A501 Euston Road	Q1 2016	11 years	9 months	<10	20 – 25
Satellite	Lancing Street	A4200 Eversholt Street	Q3 2020	6 years	6 months	<10	<10
Satellite	Carriage shed and Park Village East	Initially Stanhope Street via Robert Street and after mid 2018 via Granby Terrace Bridge	Q1 2016	11 years	10 months	<10	40-50

14.4.35 A summary of the changes to the periods of busy transport activity at each construction compound for the Proposed Scheme with ancillary works in comparison to the Proposed Scheme without ancillary works is shown in Table 36.

Table 36: A description of the effect of the Proposed Scheme with ancillary works on 'substantial' vehicle movements

Compound type	Location	A description of the effect of the Proposed Scheme with ancillary works on 'substantial' vehicle movements
Satellite	Euston Square Gardens (west)	Estimated duration with substantial vehicle movements extended by three months Peak month of activity lower due to extended period Average during busy period lower due to extended period
Main	National Temperance Hospital	Estimated duration with substantial vehicle movements the same Peak month of activity slightly lower Average during busy period slightly lower
Satellite	Granby Terrace overbridge	Estimated duration with substantial vehicle movements extended by eight months Peak month of activity lower due to extended period Average during busy period lower due to extended period
Satellite	Mornington Street overbridge	No significant change
	Mornington Terrace Sidings	
Satellite	A400 Hampstead Road Overbridge (north and south)	Estimated duration with substantial vehicle movements reduced by six months Peak month of activity higher due to shorter period Average during busy period higher due to shorter period
Satellite	Royal Mail NW1 Delivery Office	No significant change
Satellite	Euston Square Gardens (east)	No significant change
Satellite	Gordon Street	No significant change
Satellite	Lancing Street	No significant change
Satellite	Carriage Shed and Park Village East	Estimated duration with substantial vehicle movements reduced by seven months Peak month of activity higher due to shorter period Average during busy period slightly higher due to shorter period

14.4.36 The construction activity associated with the Proposed Scheme with ancillary works in 2022 would be a busier period for HGV movements for the entire year. For the Proposed Scheme without ancillary works, this busy period would be only six months long and from the Granby Terrace overbridge compound. This would be extended by a further six months for the proposed Scheme with ancillary works with movements from Granby Terrace overbridge and the National Temperance Hospital compounds.

14.4.37 For the Proposed Scheme without ancillary works in the busiest month, there are estimated to be approximately 740 combined two-way vehicle movements per day across the study area. For the Proposed Scheme with ancillary works there would be approximately 720 combined two-way vehicle movements per day across the study area. The split of construction vehicles is expected to be 90% HGV and 10% LGV and cars.

14.4.38 On completion of Granby Terrace Bridge in mid-2018, the bridge would reopen for construction traffic only, enabling the majority of construction vehicles to access these compounds from A400 Hampstead Road via Granby Terrace. For the Proposed Scheme without ancillary work, the bridge would open to general traffic in mid-2021. For the Proposed Scheme with ancillary works, the bridge would remain closed to general traffic for a longer period as a result of the addition of a third period of busy HGV activity at the Granby Terrace overbridge compound in mid-2022. With OSD ancillary works, the bridge would open to general traffic at the end of 2022.

14.4.39 Construction of the Proposed Scheme with ancillary works is forecast to result in the same significant effects as reported in Section 12, apart from an additional significant effect (moderate severance) at Park Village East. This significant effect would be a result of Park Village East being used by general traffic as a diversion route while Granby Terrace Bridge is open to site traffic only.

Water resources and flood risk

14.4.40 During construction, there would be no significant temporary or permanent significant effects for the Proposed Scheme with ancillary works, the same as reported in Section 13.

14.4.41 During operation there would be no significant effects, the same as reported in Section 13.

14.5 Need for additional mitigation measures if the ancillary works are implemented

14.5.1 If the Proposed Scheme with ancillary works is implemented, the measures set out in the draft CoCP would be applied. No specific additional mitigation measures would be needed for construction activity, beyond those for the Proposed Scheme without ancillary works. Where there are additional local permanent effects reported due to the ancillary works (e.g. in relation to the visual impacts), these would need to be given further consideration during the detailed design of the ancillary works, which would take account of the actual OSD being proposed. It may be possible to reduce or offset these effects by appropriate design of the OSD.

14.6 Summary of the likely significant residual effects if the ancillary works are implemented

14.6.1 The nature and severity of the significant residual effects of the Proposed Scheme with ancillary works would be different, in certain respects, from those assessed and reported in Sections 3 to 13 for the Proposed Scheme without ancillary works. In particular, the ancillary works for area C would give rise to significant residential amenity and traffic effects, during construction, and significant permanent visual effects on Park Village East that have not been identified for the Proposed Scheme without ancillary works.

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