M42 Junction 6 Improvement
Scheme Number TR010027
Volume 6
6.1 Environmental Statement
Chapter 3 – The Project

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

January 2019

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M42 Junction 6 Improvement Development Consent Order 202[ ]

6.1 Environmental Statement
Chapter 3 The Project

Regulation Number	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010027
Application Document Reference	6.1
Author	M42 Junction 6 Improvement Project Team and Highways England

Version	Date	Status of Version
1	January 2019	DCO Application

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3 The Project

3.1 Need for the project

3.1.1 England's strategic road network (SRN) drives local, regional and national economic activity by enabling new housing and business developments to come forward, encouraging trade and attracting investment.

3.1.2 The M42 motorway forms an integral part of the SRN, providing links to the M6, M6 Toll and M5 motorways in the West Midlands.

3.1.3 M42 Junction 6 provides a link between the M42 motorway and A45 Coventry Road (A45) providing strategic access to Birmingham (to the west) and Coventry (to the east). Junction 6 lies on the eastern edge of Birmingham, approximately 15km from the city centre, with its nearest town being Solihull.

3.1.4 M42 Junction 6 also lies at the heart of an area of dynamic growth and is surrounded by a unique mix of key strategic economic assets for both the local and wider community. It provides the main access to an expanding Birmingham Airport, Jaguar Land Rover (JLR), Birmingham International Railway Station, the National Exhibition Centre (NEC), the National Motorcycle Museum and National Conference Centre (NMM) and Birmingham Business Park. It will also be used by additional traffic generated by the proposed High Speed 2 (HS2) Birmingham Interchange Station and the aspirational Arden Cross development as proposed by UK Central.

3.1.5 Current congestion and journey reliability issues at Junction 6 are constraining investment and economic growth. In 2015, the Department for Transport (DfT) identified the need for improvements in their Road Investment Strategy 2015-2020 (RIS) [REF 3-1].This includes plans for a "*comprehensive upgrade of the M42 junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station*".

3.1.6 The DfT commissioned Highways England to undertake junction improvements as part of the RIS [REF 3-1]. Highways England has developed its proposals for the Scheme based on the planned development in the area and to ensure that the proposals would not preclude Arden Cross, envisaged to maximise the benefits HS2 will bring to the Midlands.

3.1.7 A planning application, PL/2015/51409/PPOL, for a proposed Motorway Service Area (MSA) has been submitted (June 2015) to Solihull Metropolitan Borough Council (SMBC) by Extra MSA Group [REF 3-2], and is currently pending determination. This proposed development includes a new Junction 5A on the M42 in broadly the same location as is proposed within the Scheme.

3.1.8 Subject to obtaining planning consent from SMBC, the final design and construction of the MSA will need to be coordinated with the Scheme.

3.1.9 Although the MSA currently does not benefit from planning consent, Highways England has engaged with the applicant for the MSA and has sought to ensure that, where practicable, the design of Junction 5A would not preclude delivery of the MSA, should the MSA be authorised by SMBC following the implementation of the Scheme.

3.1.10 To the north east of M42 Junction 6 is the site of Arden Cross, the proposed UK Central development, comprising an area of land identified for future development by others to maximise the growth opportunities that HS2 is expected to bring to the region.

3.1.11 Without significant infrastructure investment, M42 Junction 6 will be unable to accommodate the predicted traffic growth beyond 2019, which will constrain future investment and economic growth in the area. Further detail can be found in the Planning Statement [**TR010027/APP/7.1**].

3.2 Project objectives

3.2.1 To address the current constraints and issues associated with M42 Junction 6, the following objectives were identified for the Scheme:

a. Objective 1: promote the safe and reliable operation of the network;

b. Objective 2: increase the capacity of the junction;

c. Objective 3: improve access to key business and support economic growth;

d. Objective 4: helping walkers, cyclists and other vulnerable users of the network.

3.2.2 The Scheme achieves Objective 1 by improving the safety of the network by providing additional capacity, reducing driver stress and enabling safer access to and from the motorway.

3.2.3 The Scheme achieves Objective 2 by removing a significant amount of vehicles from the roundabout at M42 Junction 6. It would also provide improvements to Clock Interchange on the A45 Coventry Road west of M42 Junction 6, to increase its capacity and to ensure it can manage the increased traffic using it.

3.2.4 The Scheme achieves Objective 3 by providing a connection between the SRN, and the A45 Coventry Road, providing access to Birmingham (to the west) and Coventry (to the east). It provides the main access to Birmingham Airport, Birmingham International Railway Station, JLR, the NEC, the NMM and the Birmingham HS2 Interchange Station (expected to be operational by 2026).

3.2.5 Current congestion and journey time reliability issues on the M42 motorway and at M42 Junction 6 are significant constraints to future investment and economic growth. Improvement to the junction would encourage continued investment in the regional economy and support new corporate, commercial and residential opportunities, for example, the proposals by UK Central for a mixed-use development immediately north-east of M42 Junction 6, which would maximise the benefits that HS2 can bring to the region.

3.2.6 The Scheme achieves Objective 4 as it would improve the non-motorised user (NMU) routes in the area, providing improved access across the A45 to link with other NMU provisions in the area.

3.2.7 In addition to the main objectives listed above, the Scheme also has a number of secondary objectives as defined in the Planning Statement [**TR010027/APP/7.1**]. The secondary objective pertinent to the EIA is to deliver better environmental outcomes. The Scheme achieves this secondary objective by following the principles of the Highways England Environment Strategy [REF 3-3]. The applicable environmental measures are detailed in Chapters 6-15 and summarised in the NPSNN compliance table [**TR010027/APP/7.1**].

3.3 Project location

3.3.1 The extents of the Scheme against Ordnance Survey background mapping are illustrated on **Figure 3.1** [**TR010027/APP/6.2**].

3.3.2 The extents of the Scheme against aerial photography are illustrated on **Figure 3.2** [**TR010027/APP/6.2**].

3.3.3 The Scheme would be implemented within an area broadly defined by M42 Junction 7 to the north, Birmingham Airport and Catherine-de-Barnes village to the west, Middle Bickenhill and Hampton in Arden village to the east, and M42 Junction 5 to the south.

3.3.4 The Scheme lies within the administrative boundary of SMBC.

3.4 Future baseline scenario

3.4.1 The baseline scenario refers to the conditions that currently exist in the area within which the Scheme would be implemented, as presented in Chapter 2 Site and surroundings.

3.4.2 This section considers how these baseline conditions would change and evolve in the future, should the Scheme not be implemented.

Future development and traffic growth

3.4.3 The existing layout of M42 Junction 6 is forecast to be operating above its capacity by 2019, with consequent increases to congestion and delays.

3.4.4 Substantial growth is planned in the region, including expansion of existing businesses including JLR, NEC, Birmingham Airport and Birmingham International Railway Station. Additionally, new developments including HS2 Birmingham Interchange Station are planned to come forward, and potential exists for aspirational developments such as the UK Central development of Arden Cross to also come forward in the future.

3.4.5 Collectively, such developments are expected to lead to increased numbers of journeys being made by vehicle, and further demands being placed on M42 Junction 6 and the SRN as a result.

3.4.6 The Transport Assessment Report [**TR010027/APP/7.2**] provides details of the current performance of the network around M42 Junction 6, and the impact that these developments are likely to have on the network in the future.

Future environmental conditions

3.4.7 Changes to the existing baseline conditions may occur due to a combination of natural and human influences.

3.4.8 As explained in Chapter 5 EIA methodology and consultation, a review of these influences was undertaken using professional judgement and predictive modelling as part of the assessments reported within Chapters 6 – 15, the purpose being to identify the extent to which they may influence the current baseline conditions at different points in the future.

3.4.9 In relation to natural events, the review identified that:

a. the local landscape pattern is likely to develop and mature over time, which could result in gradual changes to local landscape character and its perception, the availability and composition of existing views, and the setting of heritage assets; and

b. existing weather patterns are likely to change over time, potentially resulting in changes in the behaviour of ecological species, the conditions of existing habitats, and the geomorphology of watercourses (for example through weather events causing erosion).

3.4.10 In relation to human influences, the review identified that other planned developments, major schemes and development allocations (see Chapter 16 Assessment of cumulative effects) may come forward in the future, and could result in the following changes to current environmental conditions:

a. changes in air quality and greenhouse gas emissions (arising from alterations to traffic volumes and vehicle movements on the road network, and from advances in vehicle emission technology and electric vehicles);

b. changes in the availability of material and mineral resources, and landfill capacity (arising from construction demands);

c. changes to land uses (arising from alterations to the current pattern and relationships of different land uses, modifications in agricultural practices, and changes in land ownership);

d. changes to landscape character (arising from the loss or alteration of existing components within the landscape that combine to form areas of distinctive character);

e. changes to visual amenity (arising from changes to the availability, quality and composition of views);

f. changes to heritage assets (arising from the introduction of new built form, infrastructure and other components into the setting of assets and key views, and from the removal of archaeological remains);

g. changes to geology, soils and hydrology (arising from the remediation of contaminated sites, pollution risk to surface water and groundwater, water quality changes, and the loss of agriculturally viable soil resources);

h. changes to noise (arising from alterations to traffic volumes and vehicle movements on the road network, and from the introduction of new development-related noise sources);

i. changes to biodiversity (arising from the severance or loss of land and components within the natural environment that support flora and fauna, and disturbance);

j. changes to people and communities (arising from employment opportunities during construction, and the loss of community land and facilities used by people);

3.4.11 The review also identified that changes in flood risk (arising from climate change and any associated severe or extreme weather events), and changes in policy (arising from the implementation of national and local planning policy objectives) may also occur as a result of human influence unconnected to other development projects.

3.4.12 Chapters 6 – 15 have considered the extent to which changes of the type noted above could materially alter current baseline conditions and, thereby, potentially change the nature and significance of the effects reported within the respective assessments.

3.5 Project description

Overview

3.5.1 The Scheme comprises the construction of a new grade separated junction (Junction 5A) on the M42 motorway, located approximately 1.8km south of the existing M42 Junction 6. Junction 5A would be a dumb-bell layout with south facing slip roads connecting the motorway with roundabouts located either side of the motorway. A 2.4km long dual two lane carriageway (referred to as the mainline link road) would connect the western roundabout at Junction 5A with the existing roundabout at Clock Interchange on the A45. Clock Interchange is approximately 850m west of M42 Junction 6. The eastern roundabout of Junction 5A would allow traffic travelling southbound on the mainline link road to join the southbound carriageway of the M42 motorway.

3.5.2 The General Arrangement Plans [**TR010027/APP/2.4**] illustrate the preliminary design of the Scheme and identify its key components and features. The Engineering Drawings and Sections [**TR010027/APP/2.8**] of the Development Consent Order (DCO) application present further Scheme design information.

3.5.3 The layout of Clock Interchange would be modified to accommodate the new connection with the mainline link road. An additional lane would be incorporated into the existing roundabout increasing the number of lanes around the roundabout from two to three. This would be achieved through the removal of the existing footpaths which run on the outer edge of the roundabout.

3.5.4 The A45 between M42 Junction 6 and Clock Interchange would be modified to reflect the changes to roads network in the immediate vicinity. This would include changes to the road markings layout, traffic signs layout on both carriageways and the provision of additional overhead gantries. A new pedestrian overbridge would be constructed to allow users to cross the A45, providing replacement crossing provision following the removal of an existing footpath on Clock Interchange.

3.5.5 M42 Junction 6 would be modified with two free flow links connecting the eastbound A45 onto M42 northbound motorway and the M42 southbound diverge slip road to the A45 eastbound slip road merge, and East Way. The existing free flow link road from the M42 northbound diverge to the A45 westbound would be closed. The north facing slip roads connecting M42 Junction 6 roundabout to the M42 would be modified and realigned.

3.5.6 Connections to the mainline link road, from the local road network would be provided at Catherine-de-Barnes and Bickenhill. North of Catherine-de-Barnes a merge slip road onto the northbound carriageway only, would be provided from the proposed Barber's Coppice Roundabout. A diverge slip road is provided from the southbound carriageway up to the proposed Bickenhill Roundabout which is located 750m north of the Barber's Coppice Roundabout and south west of Bickenhill Village. The existing Catherine-de-Barnes Lane would be realigned.

3.5.7 The signs and technology infrastructure on the M42 motorway between Junctions 5 and 7 would be modified to accommodate the new Junction 5A and improvements to the north facing slip roads at Junction 6.

Preliminary design

3.5.8 The design of the Scheme has evolved over time following a staged process of design-development, assessment and consultation. A description of this development process is presented in Chapter 4 Scheme history and alternatives; this describes the alternatives identified, and the assessment mechanism used in determining which of these alternatives provided the best fit to meet Highways England's objectives and minimise the impact of a scheme in the area.

3.5.9 A detailed description of the main Scheme components is provided in the following sections. The dimensions provided in the description below will be subject to change as part of detailed design development. Any changes will be limited to being within the Order Limits and any other constraints included in the draft DCO [**TR010027/APP/3.1**].

M42 Junction 5A

3.5.10 A new junction (M42 Junction 5A) is proposed approximately 1.8km south of M42 Junction 6.

3.5.11 M42 Junction 5A would comprise two roundabouts north of B4102 Solihull Road (Solihull Road), positioned either side of the M42 motorway and connected by a new bridge over the M42.

3.5.12 The two roundabouts would be 60m and 40m diameter on the western and eastern side on the M42 respectively. The western roundabout would be constructed on embankment, approximately 5m above existing ground. The eastern roundabout would be approximately 7.5m above existing ground on embankment. Both embankments would be constructed to a 1V to 2.5H[1] embankment slopes.

3.5.13 The bridge over the M42 connecting the east and western roundabouts would have an approximate span of 45m, with a two lane (3.65m lane widths) eastbound carriageway and one lane plus hard shoulder (3.7m lane width plus 3.3m hard shoulder) on the westbound carriageway.

3.5.14 The new junction would have south facing slip roads only, enabling M42 northbound traffic to exit the M42 motorway and join a mainline link road, and traffic travelling from the mainline link road to join the M42 motorway in a southbound direction.

3.5.15 The new M42 northbound diverge slip road would be 850m long, connecting the M42 motorway to the western roundabout at Junction 5A. It would consist of 2 3.65m wide lanes with 1m hard strips on both sides of the slip road. The two lanes would be separated by ghost island road markings. A 125m long existing sheet pile retaining wall on the M42 motorway would be demolished to accommodate the new slip road arrangement.

3.5.16 Between the tie in with the M42 motorway and approximately 100m before the roundabout, the slip road would be constructed in a cutting ranging from 3m beneath existing ground level near the connection with the M42 and rising up to existing ground level. The slope of the cutting would be 1V to 2.5H slopes. The deepest section of cutting would be 300m before the roundabout at a depth of 4.5m. Approximately 100m before the roundabout, the slip road would be built on top of an embankment climbing from at-grade level to 5m above existing ground level.

3.5.17 The construction of the slip road would impact on Aspbury's Copse ancient woodland. To minimise permanent landtake in this area, requirements for visibility have been reduced through adoption of a Departure from Standard[2] to have a restricted near side verge width of 2m to minimise the impact on the adjacent ancient woodland.

3.5.18 The new M42 southbound merge slip road would be approximately 750m long from the eastern roundabout to the tie in with the M42 motorway. It would consist of a single 3.7m wide lane and a 3.3m wide nearside hard shoulder and 0.7m wide offside hard strip with a 2.5m wide nearside and 2.3m wide offside verges.

[1] This term represents the gradient of the road embankments and earthwork cuttings. For example: 1V to 2.5H reflects a slope gradient that would rise vertically (V) at a ratio of 1 to a horizontal (H) run of 2.5.

[2] A Departure from Standard is an agreed reduction below desirable minimum parameters as specified in relevant design standard in the Design Manual for Roads and Bridges. Departures from Standard are subject to application to, and acceptance from Highways England technical specialists.

3.5.19 The slip road would be built on top of an embankment from the eastern roundabout up to 160m downstream where it would transition to a cutting. From the transition point up to the tie in with the M42 motorway, the slip road would be constructed in a cutting ranging from existing ground level up to 1.6m below ground level. The slope of the embankment and cutting would be 1V to 2.5H gradients. The slip road would merge directly with the hard shoulder of the motorway after which traffic would follow the existing dynamic hard shoulder running operational regime of the M42.

3.5.20 To facilitate the inclusion of the two new slip roads at Junction 5A, the existing Solihull Road overbridge would be replaced by a new overbridge with an approximate span of 65m. Solihull Road, which connects the nearby villages of Catherine-de-Barnes and Hampton in Arden, would be raised and extended from a point 325m west and 225m east of the M42 motorway to accommodate sufficient headroom clearance over the two south facing slip roads.

3.5.21 The horizontal alignment of Solihull Road would remain largely the same as the existing alignment to minimise landtake, although the new alignment would move off-line slightly to the north by 10m on approach to the overbridge, where the embankment height would be at its peak of 7.5m. This offset would contribute towards reducing the amount of landtake required within Aspbury's Copse ancient woodland, and mitigating adverse impacts on properties to the south of the existing Solihull Road. Furthermore, the embankment slopes would be constructed to a 1V to 2.5H arrangement to further contribute to the mitigation measures.

3.5.22 The realigned Solihull Road would consist of a single two lane carriageway with 2 3.65m wide lanes and a 4m verge width adjacent to the westbound carriageway and 2.5m verge width adjacent to the eastbound carriageway. The 4.0m verge adjacent to the westbound carriageway makes additional provision for a future 3m wide footway on the westbound carriageway. This provision has been made in agreement with SMBC as part of wider aspirations to improve NMU connectivity between Catherine-de-Barnes and Hampton in Arden, along Solihull Road.

Mainline link road and local roads

3.5.23 A 2.4km long mainline link road would connect M42 Junction 5A with Clock Interchange. The mainline link road would comprise of a dual two lane all-purpose carriageway with two 3.65m wide lanes and 1m offside and nearside hard strips on the northbound and southbound carriageway.

3.5.24 A minimum 2.5m wide central reserve would run between both carriageways. A minimum verge width of 2.5m would be provided on both sides of the carriageway. Both the verges and central reserve would be widened locally to accommodate forward visibility and stopping sight distance requirements.

3.5.25 The mainline link road would run from the north of the existing Solihull Road, from the western roundabout at Junction 5A and pass to the west of the nearby village of Bickenhill. The existing B4438 Catherine-de-Barnes Lane (Catherine-de-Barnes) would be realigned to retain connectivity between Catherine-de-Barnes and Bickenhill as well as the existing properties located on Clock Lane, south-west of Clock Interchange.

3.5.26 The mainline link road would cross beneath the realigned Catherine-de-Barnes Lane at two locations, a new accommodation overbridge and the existing free flow connector road to Airport Way from the A45.

3.5.27 With the exception of the approaches to tie-in with the western roundabout at Junction 5A and Clock Interchange, the mainline link road would be constructed in a cutting to minimise noise and visual impacts, and to reduce impact on the openness of the green belt. The earthworks running from the back of the verge to existing ground level would be constructed to 1V to 3H slopes.

3.5.28 Distance along the mainline link road is measured in meters (referred to as chainage). This runs from south to north, commencing from the western roundabout at Junction 5A at chainage 0.00 as illustrated on the Engineering Drawings and Sections [**TR010027/APP/2.8**] and as described in the following paragraphs:

3.5.29 At chainage 0.00 the mainline link road would connect with the western roundabout at Junction 5A, a drainage attenuation and treatment system would be located adjacent to the southbound carriageway and north-west of the western roundabout at Junction 5A.

3.5.30 Between chainage 0.00 to 100.00 approximately, the mainline link road would be constructed on an embankment ranging from 3m high at the tie-in with the western roundabout and gradually being lowered to at-grade level at chainage 100.00.

3.5.31 The mainline link road would continue into a 10.5m deep cutting at chainage 400.00.

3.5.32 Between chainage 400.00 and 850.00, the mainline link road would be connected with a single lane merge slip road onto the northbound carriageway originating from the new Barber's Coppice Roundabout. The existing rights of ways M122 and M123 would be stopped up at chainages 400.00 and 300.00 respectively and redirected across the proposed accommodation overbridge at chainage 350.00. The accommodation overbridge would have a span of approximately 30m and would be provided to maintain agricultural access and existing public right of way (PRoW) connectivity between footpaths M122 and M123, as illustrated in the draft DCO [**TR010027/APP/3.1**]. The mainline link road would continue to be lowered to a depth of 10.8m up to chainage 480.00 after which the alignment of the road would be raised as it passes east of Four Winds (a residential property) at chainage 550.00 to a depth of 5.5m approximately below existing ground at chainage 850.00.

3.5.33 The mainline link road would run approximately 120m (from the mainline link road to the façade of the club house) to the east of the existing Warwickshire Gaelic Athletic Association (WGAA) sports ground and would cross the path of the existing Catherine-de-Barnes Lane, bypassing properties on the existing Catherine-de-Barnes Lane located approximately 100m south of the intersection with St Peters Lane. Within this section, an existing property east of the existing Catherine-de-Barnes Lane (Heath End House) would be demolished to accommodate the mainline link road and cutting slopes.

3.5.34 Between chainage 850.00 and 1320.00 the mainline link road would be raised up to at-grade level, as the existing ground also rises between chainage 1080.00 and 1160.00, the mainline link road would reach a depth of 8.4m.

3.5.35 An earthworks bund would be located at the top of the cut slope parallel to the northbound carriageway between chainage 970m to 1400m approximately. This would provide additional screening and delineation between the carriageway and the private means of access to west of the WGAA facilities.

3.5.36 At chainage 850.00, a temporary two lane realignment of Catherine-de-Barnes Lane would be constructed to facilitate the construction of the new Catherine-de-Barnes Lane South overbridge at chainage 900.00 approximately. The bridge would have a span of approximately 82m. As the bridge is constructed and operational, the temporary two lane road would be demolished and removed.

3.5.37 Footpath M113, which spurs off west from the existing Catherine-de-Barnes Lane, approximately 150m north of the existing Catherine-de-Barnes intersection with St Peters Lane (south), would be severed by the mainline link road at chainage 1100.00 and would be stopped up and redirected via the realigned Catherine-de-Barnes Lane South overbridge onto the existing Catherine-de-Barnes Lane 100m south of the overbridge and subsequently redirected to the west of the GAA sports facility.

3.5.38 Between chainage 1320.00 and 1500.00 the mainline link road would be gradually lowered from at-grade level to a depth of 9m below existing ground. The existing ground is rising which would result in a greater depth of the carriageway at an increased rate along this section of the route.

3.5.39 West of Bickenhill village between chainage 1500.00 and 1850.00, the mainline link road would continue to be lowered at a gradual rate whilst the depth of the carriageway would rise to 5m below existing ground level. At chainage 1550.00 and 1660.00 approximately, footpaths M112 and M109 respectively would be stopped up and reconnected to the realigned Catherine-de-Barnes Lane via the new private means of access to the west of the mainline link road.

3.5.40 At chainage 1900.00 a 510m long two lane diverge slip road from the southbound carriageway of the mainline link road and connecting with the Bickenhill Roundabout would be constructed. A retaining structure would be constructed between chainage 1650.00 and 1850.00 to contain the adjacent realigned Catherine-de-Barnes Lane within the narrow constraints of the adjacent properties off St Peters Lane and the diverge slip road.

3.5.41 At chainage 1750.00 a new northbound diverge slip road would be constructed to join the connector road from the A45 Westbound to Airport Way. This would be 565m long and would be single 3.7m wide lane plus 3.3m hard-shoulder.

3.5.42 A temporary two lane realignment of Catherine-de-Barnes Lane to the junction with Clock Lane would be constructed at chainage 1900.00 approximately. This would facilitate the connection to Clock Lane from Catherine-de-Barnes Lane including the new Catherine-de-Barnes Lane North overbridge at chainage 1850.000 approximately. The bridge would have a span of approximately 75m.

3.5.43 At chainage 1875.00, a drainage attenuation and treatment system would be provided beyond the cut slope adjacent to the southbound carriageway. This would feature an underground storage tank and swales.

3.5.44 Between chainage 1900.00 and 2180.00 the depth of the road would rise to at-grade level. To the west of the mainline link road and east of the existing Clock Lane at chainage 2100.00, a new drainage attenuation and treatment system would be provided consisting of an underground storage tank with filter media, pump station and swales to provide attenuation and treatment for highway drainage.

3.5.45 Approximately 100m south of the existing Clock Interchange at chainage 2160.00, a free flow diverge slip road from the northbound carriageway would provide uninterrupted connectivity with the A45 westbound merge slip 425m west of Clock Interchange.

3.5.46 At approximately chainage 2250.00, the existing footway and cycleway running south east of Clock Interchange up to the existing Catherine-de-Barnes Lane would cross the path of the mainline link road and subsequently would be stopped up. The footway and cycleway is part of the Green Man Trail and provides continuous NMU access north to south crossing the A45 via Clock Interchange. The footway and cycleway would be redirected west of the mainline link road and south of the A45 before turning north towards the A45 where it would continue to run west before crossing over the bridge via a new pedestrian and cycleway overbridge which would be located east of the existing West Coast Main Line underbridge.

3.5.47 On approach to Clock Interchange, between chainage 2180.00 and 2320.00, the profile of the mainline link road would rise to meet the at-grade features of the existing Catherine-de-Barnes Lane which would be demolished and removed. The road would be constructed on embankment (up to 2m height) before running beneath the existing overbridge which carries the free flow link to Airport Way and connecting with Clock Interchange at chainage 2320.00.

Clock Interchange and approach roads

3.5.48 The mainline link road would connect to the A45 via a modified Clock Interchange, which would be widened to have three lanes from the existing two lane configuration, new traffic signals, and improvements to slip roads joining the interchange.

3.5.49 The carriageway would be widened from an existing 9m wide, two lane carriageway to a 10.95m wide, three lane carriageway. The widening works would displace the existing footway/cycleway which runs on the outer edge of the roundabout. Pedestrians and cycleway users would subsequently be diverted to the east of Clock Interchange onto the new pedestrian and cycleway overbridge which crosses the A45 west of the West Coast Main Line railway underbridge. Alternatively, pedestrians and cycleway users going towards Airport Way would use the new pedestrian and cycleway underpass crossing beneath the northbound diverge off the mainline link road to the free flow link to Airport Way.

3.5.50 On the approach to Clock Interchange from the mainline link road, a segregated left turn lane would enable traffic to bypass Clock Interchange and join the A45 going westbound.

3.5.51 North of Clock Interchange, the northbound carriageway of Bickenhill Lane between Clock Interchange and Bickenhill Lane roundabout would be widened from two lanes to three lanes (3.75m wide lanes). The southbound carriageway would be widened from three lanes to four lanes (3.7m wide lanes). The segregated left turn lane on the approach to Clock Interchange would be removed and all four lanes would run up to the roundabout up to the signal stop line. The existing footway and cycleway adjacent to the southbound carriageway would be widened.

3.5.52 To accommodate the widening works on Bickenhill Lane between Clock Interchange and Bickenhill Lane roundabout, the existing single carriageway (consisting of a 4m lane width and 2m wide hard shoulder) free flow link from the A45 eastbound to Bickenhill Lane would be realigned. The profile of the road would follow the existing road alignment with little embankment construction required to facilitate the off-line works.

3.5.53 The A45 eastbound diverge slip road approach to Clock Interchange would be widened from two lanes to three lanes approximately 100m in advance of the roundabout. The widening works would include an additional 3.75m wide lane on the nearside of the existing carriageway and localised verge widening to accommodate forward visibility requirements. The verge would be widened from 2.5m width at 100m upstream from the roundabout up to a maximum width of 6.5m at the signal stop line.

3.5.54 The A45 westbound diverge slip road approach to Clock Interchange would be widened from two lanes to three lanes approximately 45m in advance of the roundabout. The widening works would include an additional 4.2m wide lane on the nearside of the existing carriageway and localised verge widening to accommodate forward visibility requirements. The verge would be widened from 1.5m width at 100m upstream from the roundabout up to a maximum width of 7m at the signal stop line.

3.5.55 The A45 westbound merge slip road from Clock Interchange would be widened to accommodate the free flow link from the mainline link road. The merge road from the roundabout operates as a two lane carriageway merging into one before it merges with the A45, the additional lane would become a two lane merge slip separated by a ghost island road marking arrangement. An additional 3m widening would be included on the nearside verge of the slip road to accommodate the proposed footway and cycleway which connects the pedestrian footway and cycleway underpass with the existing NMU facilities on the A45 approximately 500m west of Clock Interchange.

3.5.56 The configuration on the existing free flow link road to Airport Way would be modified to fit in with the changes on the A45 and also accommodate the downstream connection with the northbound diverge slip from the mainline link road. The existing two lanes on the free flow link road would safely merge into one lane before the road crosses over the mainline link road. A new bus-stop would be provided on the free flow link road 75m west of the mainline link road underbridge. The northbound diverge slip from the mainline link road would merge with the free flow link road as a lane gain approximately 45m south of the crossing over the A45.

A45 Coventry Road – Clock Interchange to M42 Junction 6 roundabout

3.5.57 Modifications to the existing A45 would be limited to reconfiguration of the existing carriageway features including road markings, safety barriers and signs on overhead portal and cantilevers gantries.

3.5.58 A new pedestrian footway and cycleway overbridge would be provided over both carriageways of the A45 approximately 30m west of the West Coast Main Line railway underbridge. This would retain the north-south connectivity for pedestrians and cyclists across the A45 and compensate for the removal of the footway and cycleway at Clock Interchange. The existing sign gantry located 20m west of the railway underbridge would be relocated approximately 50m further west to ensure adequate visibility to the signs on the gantry otherwise restricted by the new overbridge.

3.5.59 An additional cantilever gantry structure over the A45 westbound carriageway would be provided at the westbound diverge slip to the M42 Junction 6 roundabout and M42 northbound free flow merge slip.

3.5.60 The existing directional sign gantry on the westbound carriageway would be revised to accommodate the upstream closure of the free flow link from M42 northbound diverge slip. The road markings on the A45 westbound would also be revised with the existing ghost island hatched markings removed and replaced with dashed line markings.

M42 Junction 6

3.5.61 The existing features at the roundabout on the M42 Junction 6 would be retained. The approach and departure carriageways off the roundabout would be modified to facilitate network resilience that would come about by the operations of the new Junction 5A. The existing traffic signals at the junction would be optimised based on forecast traffic flow.

3.5.62 The existing M42 northbound diverge slip road to A45 westbound free flow link would be closed to traffic. The M42 northbound diverge slip approach to the Junction 6 roundabout would be widened on the nearside edge to accommodate four lanes of traffic and the existing directional sign features would be altered to suit the changes to the road layout.

3.5.63 The A45 eastbound diverge slip to the Junction 6 roundabout would continue to operate under the current layout. An additional free flow link road diverging off the slip road to the M42 northbound carriageway would be provided consisting of a single lane carriageway 3.7m wide a 3.3m hard shoulder and a 2.5m wide nearside verge. The free flow link road would originate off the A45 eastbound diverge slip road 70m east of the West Coast Main Line railway underbridge. The free flow link road would run at-grade (with localised cutting up 0.5m deep) up to 250m east of the railway underbridge at which point the road would be lowered to cross beneath the existing South Way road by way of an underpass at a depth of 8.5m below existing ground level. The free flow link road would continue to be lowered to connect with the M42 northbound carriageway. The existing ground level also continues to drop until 120m north of the East Way overbridge on the M42 when the free flow link road would be at-grade with existing ground and running parallel with the M42 northbound merge slip from the Junction 6 roundabout. The free flow link road would connect with the M42 motorway approximately 1250m north of the centre of the M42 Junction 6 roundabout.

3.5.64 To facilitate the construction of the A45 eastbound diverge slip to the M42 northbound free flow link, the following works would be undertaken:

a. diversion and protection works to existing underground and overhead utilities;

b. the existing South Way access and egress at the NEC would be temporarily realigned in order to accommodate a multiphase construction process for the underpass structure;

c. approximately 250m north of the East Way overbridge, the existing drainage culvert for the Hollywell Brook would be extended on the western end of the M42 motorway to cross beneath the new free flow link road;

d. the earthworks side slopes beneath the East Way overbridge would be replaced with a retaining structure to provide additional space for the free flow link road to pass through;

e. an existing pedestrian footway and cycleway running 380m east from the Junction 6 roundabout would be removed; and

f. to mitigate the impact on the existing environmental bund adjacent to the M42 northbound merge slip between the connection with the M42 northbound and 450m further south upstream, the earthworks cut slopes would be steepened to a 1V to 1H slope using slope strengthening techniques. The remainder of the slip road would be constructed to 1V to 2.5H slopes in cutting and embankment.

3.5.65 The M42 northbound merge slip from the Junction 6 roundabout would be constructed to follow the existing profile. A two lane merge slip road with the lanes separated by a ghost island road marking layout would be provided. Both lanes would connect with lane 1 of the M42 motorway.

3.5.66 The M42 southbound diverge slip to Junction 6 would consist of a two lane (3.65m wide lanes with a 1m nearside and offside hard strip) parallel diverge originating approximately 1150m north of the centre of the M42 J6 roundabout. A separate diverge off the slip road located 400m south of the connection with the M42 and consisting of two lanes (3.65m wide lanes with 1m nearside and offside hard strips and a 2.5m wide verge) would connect with the relocated East Way roundabout. The primary diverge slip from the M42 southbound motorway would continue to run up to the Junction 6 roundabout. Approximately 170m north of the East Way overbridge, the slip road would widen from two lanes to three lanes from the offside carriageway. The nearside lane would separate from the slip road to connect with the A45 eastbound merge slip from the Junction 6 roundabout. The remaining two lanes would widen out to three lanes from the nearside of the carriageway approximately 100m from the stop line at the roundabout.

3.5.67 To facilitate the operation of the M42 southbound diverge slip the following features would be modified:

a. approximately 250m north of the East Way overbridge, the existing drainage culvert for the Hollywell Brook would be extended on the eastern end of the M42 motorway to cross beneath the new free flow link road;

b. the existing East Way roundabout would be removed and relocated approximately 115m north west of the existing East Way roundabout and 75m to the east of the existing East Way overbridge;

c. the new East Way roundabout would be constructed locally on an embankment up to 8m above existing ground level. Works would include the realignment and associated tie in works for each the spur of East Way carriageway and the private means of access to a parcel of land south of East Way;

d. the existing diverge slip to the existing East Way roundabout would be closed; and

e. the access to Middle Bickenhill Lane from the A45 eastbound merge slip would be closed, with the existing single lane egress from Middle Bickenhill Lane converted to a two lane access and egress from East Way. Additional signs would be provided directing traffic to access Middle Bickenhill Lane via the A452 Stonebridge Island roundabout.

3.5.68 Two new drainage attenuation ponds constructed of reed beds would be provided to the east of the M42 southbound diverge slip approximately 250m north of the East Way overbridge. A 3.5m wide access track to the attenuation features would be provided off the eastern approach to the new East Way roundabout.

3.5.69 The existing pedestrian footway and cycleway on the A45 westbound diverge slip to the Junction 6 roundabout would be widened to 3m to be in line with safe operational standards

M42 motorway

3.5.70 The M42 motorway currently operates as a Smart Motorway with dynamic hard shoulder running (DHSR) in operation on both carriageways. With the new Scheme, the motorway would continue to operate under a DHSR regime although modifications to the existing infrastructure would be required due to the proposed new Junction 5A and the modified north facing slip roads at Junction 6 including relocating existing emergency refuge areas (ERAs), gantries and cantilever structures.

3.5.71 To accommodate the new Junction 5A, the key features of the M42 motorway between Junctions 5 and 6 that would be modified, replaced and added are as follows:

a. on the M42 southbound carriageway approximately 800m north of the existing Junction 5, a new directional sign cantilever gantry would be provided to compensate for the removal of an existing directional sign cantilever 1200m north of Junction 5;

b. an existing portal gantry structure spanning both carriageways approximately 1km north of Junction 5 would be altered on the northbound carriageway side with the existing advanced motorway indicator signals (AMIs) removed and replaced with directional sign plates for the new Junction 5A. A new portal gantry, approximately 250m south of the River Blythe crossing, would be provided with fixed AMIs on the northbound carriageway side and an additional directional sign on the southbound carriageway;

c. a secondary directional sign on a cantilever gantry 50m south of the River Blythe underbridge would be constructed on the northbound carriageway;

d. an existing portal gantry fixed with matrix signals (MS4) and AMIs and spanning both carriageways 50m north of the River Blythe underbridge would be removed;

e. a new portal gantry approximately 225m north of the River Blythe underbridge would be provided with fixed AMIs and an MS4 on the northbound carriageway only;

f. approximately 30m north of the existing Friday Lane overbridge, an existing directional sign cantilever gantry on the southbound carriageway would be removed and a new portal frame gantry structure spanning both carriageways would be constructed fixed with AMIs and an MS4 on the southbound carriageway only;

g. between Friday Lane overbridge and Solihull Road overbridge, two portal frame gantries spanning both carriageways fixed with AMIs and MS4s, two cantilever structures fixed with an MS4 and Advance Direction Sign respectively on the northbound carriageway, two ERAs on the northbound carriageway and two ERAs on the southbound carriageway would be removed to accommodate the features of the new Junction 5A; and

h. a new ERA would be provided on the northbound carriageway within the vicinity of Solihull Road overbridge.

3.5.72 Between Solihull Road overbridge and Junction 6, the existing roadside infrastructure would be retained on both carriageways of the M42 motorway.

3.5.73 To the north of Junction 6 and between the existing East Way overbridge and Junction 7 the following key features of the M42 motorway infrastructure would be modified, removed and added to accommodate the realigned north facing slip roads from Junction 6:

a. approximately 1625m north of the existing East Way overbridge a new directional sign cantilever gantry would be provided on the southbound carriageway;

b. the existing portal gantry spanning both carriageways and ERAs on the northbound and southbound carriageways would be retained approximately 1400m north of East Way overbridge;

c. an existing directional sign cantilever gantry on the southbound carriageway 1150m north of the East Way overbridge would be removed;

d. on the northbound carriageway, a new cantilever gantry fixed with a matrix signal sign (MS3) would be provided. This would replace the existing cantilever structure located approximately 200m south;

e. the existing portal gantry approximately 975m north of East Way bridge would be altered to accommodate AMIs and an MS4 on the northbound carriageway and the existing ERA on the southbound carriageway would be removed to accommodate a safer approach to the Junction 6 southbound diverge slip;

f. a cantilever gantry structure fixed with a directional sign and an MS4 would be provided at the exit datum with the southbound diverge slip;

g. the existing ERA on the northbound carriageway and portal frame gantry which spans both carriageways approximately 650m north of East Way overbridge and another portal gantry spanning both carriageways approximately 230m further south would be removed to enable the safe connection of both north facing slip roads. A new portal gantry further south spanning both carriageways approximately 380m north of the East Way overbridge;

h. a directional sign cantilever gantry spanning the southbound diverge slip to Junction 6 would be provided for advanced information on lane designation on the slip road;

i. a further directional sign portal gantry would be provided on the southbound diverge slip at the diverge between the slip road towards the relocated East Way roundabout east of the M42 and the Junction 6 roundabout diverge slip, a final directional sign portal frame gantry would be provided on approach to the junction roundabout prior to the free flow link road to the A45 eastbound merge slip. An existing directional sign portal gantry structure on the diverge slip, 100m south of the East Way overbridge would be removed to accommodate the free flow link road to the A45 eastbound merge slip; and

j. on the M42, a portal gantry structure spanning both carriageways and fixed with AMIs and an MS4 would be constructed.

3.5.74 The road markings layout on both carriageways of the M42 between the Friday Lane overbridge and M42 Junction 7 would be modified to accommodate the new Junction 5A, including a dual four lane through junction running within the vicinity of Junction 5A. Modifications to the road marking layout within the vicinity of the north facing slip roads at junction 6 would also be required.

3.5.75 The installation of the all ERAs, gantries and cantilever structures would include foundation works and retaining structures, safety barriers and modifications to surface water and sub-surface drainage features which would be constructed within the existing highway boundary.

Catherine-de-Barnes Lane

3.5.76 Catherine-de-Barnes Lane would be realigned between Birmingham Dogs Home and Clock Interchange, and the existing connection to Clock Interchange would be closed. Local access would be provided only to St Peters Lane and Clock Lane.

3.5.77 The realignment of Catherine-de-Barnes Lane would commence approximately 275m south-west of the access road to Four Winds. It would run approximately 220m north-west to the new Barber's Coppice Roundabout. The carriageway would consist of two lanes each 3.65m wide. The adjacent pedestrian footway and cycleway would continue to follow the original route therefore separating from Catherine-de-Barnes Lane approximately 145m south-west of the new Barber's Coppice Roundabout. A pedestrian footway would cross Catherine-de-Barnes at the connection with Barber's Coppice Roundabout which would maintain connectivity of footpaths M122 and M123 running from the accommodation overbridge and connecting with the existing footpath on the old Catherine-de-Barnes Lane.

3.5.78 Realigned Catherine-de-Barnes Lane would run directly north to Barber's Coppice Roundabout. The carriageway width would be increased to 7.3m consisting of two 3.65m wide lanes.

3.5.79 The realigned Catherine-de-Barnes Lane between Barber's Coppice Roundabout and Bickenhill Roundabout is described as follows:

a. the Catherine-de-Barnes Lane would spur off the Barber's Coppice Roundabout directly north. The road would be lowered from 1.5m above existing ground level at Barber's Coppice Roundabout to at-grade level approximately 60m north of the roundabout and to the east of Four Winds;

b. after this point, the road would gradually be raised to 2.8m above ground level as it approaches the Catherine-de-Barnes Lane South overbridge approximately 380m north of Barber's Coppice Roundabout.;

c. between Barber's Coppice Roundabout and up to 15m before the southern bridge, the verge width would be 2.5m. Beyond this point, the pedestrian footway and cycleway would merge on to Catherine-de-Barnes Lane, adjacent to the northbound carriageway from the old road, the verge width would be reduced to 1m on the nearside and a 0.5m separation between the carriageway and the 3m wide new pedestrian footway and cycleway;

d. at 40m north of the Catherine-de-Barnes South overbridge, the road intersects with Shadowbrook Lane which would be modified slightly to allow a safer connection with Catherine-de-Barnes Lane;

e. between the south overbridge and 135m north of the intersection with Shadowbrook Lane, Catherine-de-Barnes Lane would largely be located on its existing alignment. At 135m north of Shadowbrook Lane the road would run off-line to the east of the old road to enable a safe approach to Bickenhill Roundabout. The existing Catherine-de-Barnes Lane within this section would be removed including the existing pedestrian footway and cycleway; and

f. approximately 260m north of the intersection, the road would connect with Bickenhill Roundabout.

3.5.80 Catherine-de-Barnes Lane would continue running north off the Bickenhill Roundabout for approximately 475m up to the intersection with St Peters Lane, north of Bickenhill Village. The carriageway width would be reduced to 6m (two 3m lane widths). A 2.5m wide verge would be provided adjacent to the northbound carriageway and a 0.5m wide verge plus a 2m wide pedestrian footway would be provided adjacent to the southbound carriageway. St Peters Lane to the north of Bickenhill would be modified slightly to allow an adequate connection between the two local road networks. A 3.5m wide access to the drainage attenuation and treatments systems would be provided off St Peters Lane north-east of the intersection with Catherine-de-Barnes Lane.

3.5.81 At the intersection with St Peters Lane, Catherine-de-Barnes Lane would run west crossing over the mainline link road via the Catherine-de-Barnes Lane north overbridge. The carriageway width would remain as 6m wide and the footway would run adjacent to the westbound carriageway. After crossing the mainline link road, Catherine-de-Barnes Lane would run to the north on a tight radius to avoid affecting The Haven Caravan Park adjacent. The Catherine-de-Barnes Lane would connect with the existing Catherine-de-Barnes road approximately 350m south-east of Clock Interchange.

Barber's Coppice roundabout

3.5.82 The proposed Barber's Coppice roundabout to the east of Birmingham Dogs Home would provide access to the northbound carriageway of the mainline link road, nearby properties and the WGAA sports facility.

3.5.83 The roundabout would consist of a 10m wide two lane carriageway (5m wide lanes) located on a 3.5m high embankment. A two lane access road to Birmingham Dogs Home would be provided off the eastern arm off the roundabout. This access road would also provide a spur off to access Four Winds, located north west of the roundabout and a drainage attenuation treatment system consisting of an underground storage tank located between the access road to Four Winds and Catherine-de-Barnes Lane.

3.5.84 The western arm of the roundabout would provide a 420m long merge slip road to the northbound carriageway of the mainline link road. The merge slip would be gradually lowered from an embankment to a cutting to connect with the mainline link road. The slip road would exit the roundabout with two 3.65m wide lanes which would merge into one 3.65m lane with a 3.3m nearside hard shoulder and a 1m offside hard strip. The verge width would be a minimum 2.5m which would widen to 15m to accommodate forward visibility as the slip road runs round a tight radius to safely merge with the mainline link road.

Bickenhill roundabout

3.5.85 A new roundabout (Bickenhill Roundabout) located to the west of Bickenhill village would connect Catherine-de-Barnes Lane to St Peters Lane, and the mainline link road southbound diverge slip.

3.5.86 The roundabout would consist of a 12m wide two lane carriageway (6m wide lanes) located largely at-grade. The eastern arm of the roundabout would provide an access to Bickenhill Village via St Peters Lane which would be slightly modified to accommodate an adequate connection with the roundabout. The northern and southern arms would continue the Catherine-de-Barnes Lane between north and south. The western arm would provide access to Bickenhill Roundabout off the mainline link road via a 510m long two lane slip road (comprising two 3.65m wide lanes plus 1m hard strips on the offside and nearside carriageway). The verge width would be a minimum of 2.5m wide which would widen to 24m to accommodate forward visibility as the slip road approaches the Bickenhill Roundabout.

Modifications to the WGAA sports facility

3.5.87 The mainline link road would sever the existing access to the WGAA sports facility from Catherine-de-Barnes Lane, and would require land currently used for sports pitches.

3.5.88 A 4m wide private means of access would be provided with 1m verges on both side of the carriageway beyond the cut slope running parallel to the northbound carriageway of the mainline link road, The private means off access would connect access and egress for the WGAA sports facility with the realigned Catherine-de-Barnes Lane at the north and south bridges.

3.5.89 Modifications are proposed to reconfigure the access and the layout of the affected pitches using adjacent land to the south of the facility, in order to secure its continued operation and viability.

3.5.90 Five illustrative designs for the reconfiguration options have been developed and considered as part of design-development and EIA processes, and are presented on **Figures 3.5 Options 1 to 5** [**TR010027/APP/6.2**].

3.5.91 Further information on the development of reconfiguration options for the WGAA is included in Chapter 4 Scheme history and alternatives.

Drainage

Overview of the drainage design

3.5.92 The drainage design has primarily been developed in accordance with Highways England's design standards. The requirements of the National Policy Statement for National Networks [REF 3-4] and the National Planning Policy Framework [REF 3-5] have also been considered in the design process, alongside advice from environmental practitioners responsible for undertaking water related assessments reported in Chapter 14 Road drainage and the water environment, with regards to minimising:

a. effects on water quality, through the use of natural storage, treatment and discharge solutions where appropriate to manage drainage during the construction and operational phases of the Scheme;

b. changes to watercourse and ditch alignments, by incorporating solutions into the design of the Scheme that would not result in changes to hydromorphology; and

c. landtake within areas identified as being at risk of flooding, by directing development away from such areas where possible.

3.5.93 As road drainage for the Scheme would discharge into networks maintained separately by Highways England and SMBC, the drainage design has accordingly been split into two networks:

a. local road drainage would be adopted by SMBC; and

b. drainage of the mainline link road, M42 Junction 5A and the M42 Junction 6 free flow links would be operated and maintained by Highways England.

3.5.94 Strategies for collecting, separating and treating road runoff have been developed and incorporated into the Scheme design to achieve the desired discharge rates, with infrastructure designed and sized to accommodate future increases in volume associated with climate change.

3.5.95 The approach to surface water collection across the Scheme varies depending upon the location and form of the carriageway. Where sections of carriageway are kerbed, gullies would be installed to capture surface water. Combined kerb drainage systems would be implemented only where a kerb and gully system is not appropriate. Filter drains would be used on sections that are not kerbed, such as the mainline link road, with sub-surface drainage used to convey any water from the carriageway sub-base or capping layers to join the surface water network.

3.5.96 A combination of underground and above ground solutions have been incorporated into the Scheme design to store, treat and discharge surface water runoff. The siting and design of this infrastructure has been influenced by the relationship of the Scheme to the higher risk areas of Birmingham Airport's safeguarding zone, the objective being to avoid introducing new standing water features that could attract migrating birds and increase the risk of aircraft bird strike.

Clock Interchange, M42 Junction 5A and the mainline link road

3.5.97 To the north of the mainline link road, adjacent to Clock Interchange, carriageway runoff would be attenuated underground prior to being discharged via a pump station to a swale which connects to an existing ditch running parallel to A45. The drainage system would include filters and material to treat dissolved metals.

3.5.98 South of the mainline link road, surface water runoff would be attenuated underground in a storage tank system with additional filtration prior to being pumped to a reed bed system, for subsequent discharge into an existing ditch.

3.5.99 An underground storage system with sustainable drainage system features would be located south of Clock Interchange to capture surface water runoff from the local road network.

3.5.100 A comparable drainage system would be installed to handle carriageway runoff to the north west of M42 Junction 5A. This would also attenuate underground, but would pump to a reed bed system prior to discharge into Shadow Brook. The reed bed would initially be netted until the reed growth achieves a height and density sufficient to discourage birds from landing on the water.

3.5.101 Existing drainage infrastructure south east of M42 Junction 5A would be upgraded. New underground storage incorporating a reed bed system and swales would be provided to capture, treat and discharge runoff into a local drain.

M42 Junction 6

3.5.102 North east of M42 Junction 6, runoff would be captured and directed into the existing drainage network. A reed bed system would be introduced through which runoff would pass and be treated, prior to discharging into Hollywell Brook.

Other drainage networks

3.5.103 A number of small surface water drainage networks would be upgraded to incorporate separators for sediment treatment. Additional drainage ditches would be installed in localised areas to carry discharge between existing features, and some existing ditches would be modified or realigned to accommodate the Scheme.

Culverts

3.5.104 One existing culvert at Hollywell Brook would be extended due to additional lanes being added on the road network.

Bickenhill Meadows Site of Special Scientific Interest (SSSI)

3.5.105 A pumped mitigation solution has been developed to mitigate for the loss of surface water catchment at Shadowbrook Meadows SE unit. The design principles of the pumped solution consist of a collection drain on the western slope of the mainline link road cutting to intercept surface water flows that would otherwise have drained towards the SSSI. The collection drain would discharge to a sealed collection sump, from where water would be pumped and/or captured from an alternative water source(s) to an appropriate reed bed/ditch feature in the vicinity of Shadowbrook Meadows SE unit. This feature would act as a recharge trench, from which water would drain through to the sand, gravel and clay

deposits in the upper layers of the substrata within the SSSI. The above design principle has been developed in consultation with and agreed in principle with Natural England.

3.5.106 Highways England will continue to refine the mitigation solution using: data obtained from the ongoing dipwell monitoring; and information gathered from further analysis of the local topography and existing water sources. These refinements will seek to identify a sustainable drainage mechanism to mitigate the effects of the Scheme on Bickenhill Meadows SSSI. Highways England will seek to agree any refinements to the mitigation approach with Natural England prior to commencement of the Scheme.

3.5.107 Further details regarding the mitigation solution for Bickenhill Meadows SSSI is presented within Appendix 14.2 [**TR010027/APP/6.3**].

Earthworks

3.5.108 To minimise visual impacts on communities and users of the local road and PRoW networks, and to preserve the openness of the Meriden Gap Green Belt, the mainline link road has been designed to be positioned below ground level in an earthwork cutting for the whole length with the exception of the northern and southern extents which would be positioned on an embankment to connect with Clock Interchange and M42 Junction 5A. Earthwork slopes along the mainline link road have been designed to a gradient of 1V to 3H to achieve the required earthwork stability, and to soften their appearance in the local landscape.

3.5.109 Similar gradients would be constructed across other parts of the Scheme where earthworks are proposed, except for the earthwork side slopes at M42 Junction 5A and the new Solihull Road overbridge earthwork which are proposed to be of a 1V to 2.5H gradient to minimise permanent landtake within Aspbury's Copse ancient woodland.

3.5.110 North of Bickenhill Roundabout, a 70 degree strengthened earthwork slope would be provided between the mainline link road and the realigned Catherine-de-Barnes Lane.

3.5.111 In order to retain a vegetated bank on the A45 eastbound to M42 northbound free flow link road, a strengthened earthwork with a 45 degree finished profile would be constructed to mitigate the impact on the adjacent environmental bund located between the highway boundary and the NEC facilities.

Road pavement and surfacing

3.5.112 New sections of road would be constructed using different types and layers of asphalt materials.

3.5.113 All sections of road within the Scheme extents would be constructed of fully flexible or a flexible composite pavement construction. The depth of the pavement layers on each section of road would vary based on the volumes of traffic that would use the road.

3.5.114 The use of pavement foundation class 2 and 3 has been assumed for all sections of road within the Scheme. Both foundation classes consist of a type 1 granular subbase layer which could be laid on a granular capping layer if required.

3.5.115 M42 Junction 5A including slip roads and the mainline link road would be constructed with a thin surface course system. The north facing slip roads and free flow links at Junction 6 would also be constructed with a thin surface course system.

3.5.116 The surface treatments for local roads would be agreed with SMBC as the highway authority.

3.5.117 Where existing roads would be modified to connect with new sections of road, or where improvements to accommodate future traffic growth are required, a surface treatment of either thin surface course system, hot rolled asphalt or stone mastic asphalt would be agreed with Highways England and/or SMBC that reflects the existing surface.

3.5.118 Where existing roads are modified to accommodate traffic management arrangements, localised repairs would be undertaken to reinstate the existing carriageway to its original condition upon completion of the works.

Kerbing

3.5.119 Kerbs would not be used on the mainline M42, all slip roads and the mainline link road.

3.5.120 Kerbs would be provided at roundabouts and on side roads. Combined kerb and drainage systems would be installed on bridges where required.

3.5.121 At roundabouts and local roads full battered (splayed) kerbs would be provided. Where a footway/cycleway is located behind the kerb, half battered kerbs would be provided. Where required, combined kerb and drainage systems would be installed to convey surface water off the carriageway to nearby drainage systems.

Vehicle restraint systems

3.5.122 Vehicle restraint systems have been incorporated into the Scheme for road safety, developed in accordance with relevant safety standards.

3.5.123 Steel barriers would be used on slip roads, junctions and sections of carriageway where restraint is required. Parapets would be used on new bridge decks as part of the bridge design.

3.5.124 Concrete barriers would be installed along the length of the central reserve within the mainline link road, to separate traffic travelling in opposite directions.

Fencing and boundary treatments

3.5.125 New and improved sections of road would be fenced with a wooden post and rail fencing. Additional measures, such as guide fencing to direct badgers to the locations of mammal tunnels beneath the mainline link road, would also be installed as part of the ecological mitigation measures incorporated into the design of the Scheme (see Chapter 9 Biodiversity).

3.5.126 Fencing would be installed along existing and new boundary lines to separate the road from adjacent land, and would incorporate a narrow strip of land between the fencing and the outer edge of cutting or embankment slopes for maintenance access.

3.5.127 Access to off-carriageway assets such as landscaping and drainage infrastructure would be provided via a gated access points.

Signage and road markings

3.5.128 New road signage and markings would be installed across the Scheme to ensure route legibility for road users travelling on new and improved sections of the road network.

3.5.129 As the Scheme would involve modifications to both the strategic and local road network, the static road signage strategy has been agreed with SMBC's highways department and other stakeholders to ensure continuity is achieved along the M42, A45 and other route corridors.

3.5.130 Where existing signs do not conform to the new Scheme layout, these would be removed and replaced with new signage containing updated information.

3.5.131 New and modified sections of road would be permanently marked using a combination of road markings and road studs to improve drivers understanding of the new road layout.

Lighting

3.5.132 Road lighting incorporated into the design of the Scheme reflects the level of safety required for road users and restrictions imposed by Birmingham Airport in relation to tall structures within their safeguarding zone.

3.5.133 The requirements for road lighting have been determined on the basis of increasing safety for all road users, following a review to determine the optimum locations for its installation.

3.5.134 Lighting would be implemented in following locations across the Scheme:

a. on the northbound merge and diverge slips of M42 Junction 6;

b. on M42 Junction 5A and its slip roads;

c. on Clock Interchange and its approach and departure roads; and

d. on Barber's Coppice Roundabout.

3.5.135 To avoid visual intrusion into existing views from Bickenhill village, road lighting would not be provided at Bickenhill Roundabout.

3.5.136 No lighting would be provided on the mainline link road beneath the Birmingham Airport safeguarding zone. Lighting would be provided on the mainline link road only at the approach to the western roundabout at Junction 5A and Clock Interchange. **Table 3.1** summarises the extents of street lighting infrastructure that would be provided on the mainline link road and adjacent slip roads.

Table 3.1: Summary of road lighting provision on the mainline link road

Road element	Start (chainage)	End (chainage)	Lighting
Mainline link road	0.00	150.00	Lighting infrastructure located in the central reserve
	2150.00	2320.00	
Northbound merge slip from Barber's Coppice Roundabout	0.00	200.00	Lighting infrastructure located in nearside verge (chainage 0.00 starts at Barber's Coppice Roundabout)

3.5.137 Consideration has also been given in the lighting design to minimise the potential for lighting to intrude into existing night time views.

Gantries and emergency refuge areas

3.5.138 The construction of M42 Junction 5A and the realigning of the northbound merge and southbound diverge slip roads at M42 Junction 6 would affect existing infrastructure on the M42 motorway.

3.5.139 Works to existing motorway infrastructure would include removal of gantry structures and ERAs, and those that are required to be removed and relocated with new infrastructure to ensure the safe and continuous implementation of the current operational regime.

3.5.140 All motorway infrastructure works would be implemented within the Order Limits of the Scheme.

Motorway technology equipment

3.5.141 The design has sought to retain existing motorway technology infrastructure and equipment where practicable.

3.5.142 The Scheme would provide the following new equipment:

a. message signs and signals: to direct traffic flow optimally and give correct and timely information to drivers;

b. Motorway Incident Detection and Automatic Signalling detectors: comprising inductive loops to inform motorway control centres of the current average traffic flow speed and the setting of advisory speed limits;

c. Pan Tilt Zoom closed circuit television cameras: positioned at locations for surveillance of the network;

d. emergency roadside telephones: provided within the new ERAs;

e. gantry power cabinets;

f. Distribution Network Operator supply exit points; and

g. Digital Enforcement Camera System: to monitor traffic and speed compliance through radar.

3.5.143 The placement of new technology infrastructure has taken into account future maintenance requirements and as such, would be installed in a manner that allows for off-site access wherever practicable.

Structures

3.5.144 Structures comprising overbridges, retaining walls, drainage culvert extensions and motorways gantries are included within the Scheme to accommodate the existing road network, and to connect the Scheme into the existing road network.

3.5.145 M42 Junction 5A would include a new bridge crossing the M42 motorway immediately north of the existing Solihull Road overbridge, which would be replaced to accommodate the junction's south facing slip roads.

3.5.146 Two bridges on the mainline link road (referred to as Catherine-de-Barnes north and Catherine-de-Barnes south) are proposed to carry the realigned Catherine-de-Barnes Lane, in order to retain connectivity between the villages of Catherine-de-Barnes and Bickenhill, and Clock Lane.

3.5.147 An underpass would be provided on the new A45 eastbound to M42 northbound free flow link, to enable traffic to flow beneath the existing South Way access road to the NEC from M42 Junction 6.

3.5.148 A shared NMU and accommodation track overbridge is proposed to the west of Shadowbrook Lane and east of Catherine-de-Barnes Lane, and two NMU structures would be provided near Clock Interchange; these features are described as part of the NMU facilities below.

Non-motorised user facilities and accommodation works

3.5.149 A number of closures and diversions to the existing PRoW network at locations directly affected by the Scheme would be required. These have been agreed with SMBC and designed in consultation with the local ramblers groups and associations.

3.5.150 Provisions have been included in the design to replace and, where feasible and appropriate, enhance existing routes used by pedestrians and cyclists to ensure connectivity for NMUs between communities and their facilities.

3.5.151 A new footway/cycleway overbridge would be installed across A45 between Clock Interchange and M42 Junction 6, which would allow NMUs to safely cross the road as part of journeys made between Bickenhill village and facilities to the north.

3.5.152 A pedestrian underpass would be constructed beneath the new free flow link to Airport Way to segregate NMUs and traffic, and allow the continued movement of users along the southern side of the A45 past Clock Interchange.

3.5.153 A section of the Green Man Trail immediately south of Clock Interchange would be severed by the mainline link road and would require closure. In order to maintain route connectivity, the footpath would be redirected west on Church Lane up to St Peters Lane, and then Catherine-de-Barnes Lane, before connecting with a new cycleway/footway and tying into the existing cycleway/footway on Airport Way. The route would reconnect with the Green Man Trail at the roundabout between Airport Way and Bickenhill Lane.

3.5.154 All pedestrian and cycleway access to Clock Interchange would be closed and users would be diverted to either the pedestrian/cycleway overbridge west of Clock Interchange or the new pedestrian/cycleway underpass beneath the free flow link to Airport Way and north towards Airport Way.

3.5.155 A section of footpath running along the A45 westbound diverge slip to M42 Junction 6 roundabout would be upgraded to form a 3m wide combined footway and cycleway.

3.5.156 Construction of the free flow link between M42 Junction 6 southbound to A45 eastbound would require the closure of the footpath at this location. NMUs would be diverted west on the southern edge of the A45 up to the East Way underpass, and beneath the M42 motorway to maintain access to Middle Bickenhill Lane.

3.5.157 A new accommodation bridge across the mainline link road, south of Shadowbrook Lane and east of Catherine-de-Barnes Lane, would enable NMUs to cross the road as part of journeys made on the PRoW network in this area. This bridge would also provide a means of access for farm vehicles to reach agricultural land severed by the road.

3.5.158 The realigned Catherine-de-Barnes Lane would incorporate a 2m wide footway adjacent to the road, between the intersection with St Peters Lane and Bickenhill Roundabout. A new cycleway/footway would also be constructed adjacent to the southbound carriageway between Bickenhill Roundabout to south of the Catherine-de-Barnes Lane south bridge, where the cycleway/footway ties into the existing Catherine-de-Barnes Lane.

3.5.159 A short section of footway would be incorporated into the modified junction of Shadowbrook Lane and Catherine-de-Barnes Lane.

3.5.160 Improvements to existing footways and cycleways to the south of Clock Interchange would also be implemented as part of the Scheme.

Statutory utilities diversions

3.5.161 A number of existing utility infrastructure assets within the area would be affected by the Scheme. The following protection or diversion works of the affected utilities would be required. These works have been provisionally agreed but are subject to further detailed design by the individual utility companies.

Western Power Distribution

3.5.162 Western Power Distribution is responsible for a range of assets in the area that would be affected by the Scheme, from 11kV through to 132kV overhead and underground assets.

3.5.163 Works to low voltage 11kV and 33kV assets include:

a. lowering of the existing high voltage (HV) buried cable under proposed Catherine-de-Barnes Lane adjacent to Birmingham Dogs Home;

b. disconnecting the existing low voltage (LV) overhead cable at Shadowbrook Lane and installing a new LV underground cable in the Shadowbrook Lane footpath to pick up supply to Oak Tree Lodge;

c. disconnection of LV overhead cables at the corner of The Haven Caravan Park, removing two poles on overhead line;

d. diverting HV cables running between substations Bickenhill (N), Farm Cott. Bickenhill and Bickenhill CH;

e. removing all overhead lines and install new underground section of circuit at a depth to suit the mainline link in cutting;

f. lowering the LV main running under the Airport Way connector road where the free flow Link from the mainline link joins the Airport Way connector road;

g. diverting the LV main running along the A45 Coventry Road to be moved to new verge and across the A45 Coventry Road; and

h. diverting the LV main currently in the verge of the M42 slip road to new verge.

3.5.164 The Scheme would impact on two separate 132kV high voltage overhead cable networks on the north west quadrant of M42 Junction 6, requiring the following works.

3.5.165 The first network affected by the Scheme would require the construction of a new pylon tower on the western overhead cable network which run north–south, adjacent to NEC carparks, and across the A45 into fields south west of Junction 6. The new pylon tower would replace an existing tower required to be removed as part of the construction of the new A45 eastbound to M42 northbound free flow link. The new pylon tower would be approximately 20m north of the existing tower.

3.5.166 The second overhead network affected by the Scheme is a pylon tower just east of the western overhead network described above. This network splits into separate networks that form a diamond arrangement in order to avoid National Grid 400kV overhead cables. This network is required to be diverted as the footprint of the pylon adjacent to the A45 conflicts with the proposed A45 eastbound to M42 northbound free flow link.

3.5.167 It has been identified that Western Power Distribution assets upstream of these affected pylons will also be impacted by HS2's proposals. Outages on Western Power Distribution networks in this area have already been programmed in for 2019 in order to undertake diversion works on the 132kV assets, to enable the construction of a proposed people mover link between the HS2 Interchange Station and other commercial and transport hubs in this area.

3.5.168 Coordination between HS2 and Highways England is ongoing in order to investigate how both schemes could combine their required diversion/protection works in order to minimise disruption to road users and local businesses.

3.5.169 The diversion works to the 132kV high voltage overhead cable networks are illustrated on **Figure 3.6** [**TR010027/APP/6.2**].

National Grid

3.5.170 National Grid maintains high voltage 400kV assets in close proximity to the proposed A45 eastbound to M42 northbound free flow link. A construction approach and methodology has been proposed that would avoid the need for diversion of this asset. The free flow link underpass structure can be constructed using height restricted construction equipment; however, this may require the asset to be turned off to protect the construction workforce.

3.5.171 Highways England is continuing to liaise with National Grid.

Severn Trent Water potable water supply

3.5.172 As a result of the Scheme the following potable water assets are identified as requiring diversion:

a. underground water main assets within the existing Solihull Road overbridge would require diversion onto either the new Junction 5A overbridge or the new Solihull Road overbridge. These works would need to be undertaken before the demolition of the existing Solihull Road overbridge and may require the construction of a temporary service crossing of the M42 motorway;

b. underground water main assets on the existing Catherine-de-Barnes Lane are required to be diverted onto the proposed realigned Catherine-de-Barnes Lane. This would include the need for diversions through the proposed Catherine-de-Barnes North and South overbridges; and

c. underground water main assets on Shadowbrook Lane and St Peters Lane would be locally diverted.

Severn Trent Water aqueduct

3.5.173 In addition to potable water supplies, the mainline link road would impact on major aqueduct distribution mains (comprising 900 – 1050m long ductile iron mains) that form part of the main water distribution network to the Birmingham conurbation, at the following locations:

a. where the mainline link road west of Junction 5A intersects with the aqueduct (where the link would be 5m in cutting). This would require the Severn Trent Water asset to be being locally diverted underneath the new vertical alignment and the asset ducted for ease of future maintenance; and

b. as the mainline link road approaches to Clock Interchange, an existing Severn Trent Water aqueduct would be affected by the Airport Way connector road being constructed on embankment and subsequently increasing the loading on the asset. Protection works in the form of ducting would be required to dissipate the loading.

3.5.174 The diversion works to the Severn Trent Water aqueducts are illustrated on **Figure 3.7** [**TR010027/APP/6.2**].

Cadent Gas

3.5.175 Cadent Gas is the provider of low, medium and high pressure gas supplies to the local area and assets that serve on a wider strategic link basis. A number of low and high pressure gas mains would be impacted by the Scheme, as follows:

a. a high pressure gas main (classified as the Shrewley to Catherine-de-Barnes line by Cadent) crossing perpendicular to the existing M42 alignment shall require protection works due to the introduction of the new south facing slip roads at Junction 5A;

b. a high pressure gas main (classified as the Coleshill to Copt Heath line by Cadent) would need to be diverted due to the mainline link construction in close proximity to the asset which would be constructed in 7.5m deep cutting;

c. a high pressure gas main (classified as the Bickenhill pipeline by Cadent) would need to be protected due to the construction of the A45 eastbound to M42 northbound free flow link construction; and

d. a Local Gas Governor (classified as the Bickenhill Pressure Release System) may be decommissioned (as indicated by Cadent Gas) due to its current position being in the position of the A45 eastbound to M42 northbound free flow link construction.

3.5.176 Following consultation with Cadent, it was established that for the high pressure gas mains, material lead in times and any associated design studies would result in diversion works not being possible prior to 2020. This constraint has been recognised in the construction programme.

3.5.177 The diversion works to the Cadent Gas high pressure gas main are illustrated on **Figure 3.8** [**TR010027/APP/6.2**].

BT/Openreach

3.5.178 BT/Openreach are providers of cable, wired and fibre optic communication networks to deliver telephone, internet, data and TV services to households and businesses.

3.5.179 As a result of the Scheme the following assets would require diversion:

a. existing BT/Openreach assets would need to be diverted from the existing Solihull Road overbridge onto the new structure;

b. assets on the existing alignment of Catherine-de-Barnes Lane would need to be diverted onto the new road alignment and cross through Catherine-de-Barnes South overbridge;

c. between Catherine-de-Barnes North and South overbridges, BT/Openreach assets shall be diverted onto the realigned Catherine-de-Barnes Lane;

d. assets running adjacent to the A45 Coventry Road shall be diverted to suit the introduction of the new A45 eastbound to M42 northbound free flow link construction; and

e. assets running adjacent to the A45 Coventry Road shall be diverted to suit the introduction of the new M42 southbound to A45 eastbound free flow link construction.

Zayo

3.5.180 Zayo Group is a provider of communications infrastructure.

3.5.181 Works required to Zayo's assets as a result of the Scheme would comprise the realignment of duct routes to suit the new alignment of Catherine-de-Barnes Lane, with ducting to be routed across Catherine-de-Barnes North and South overbridges.

Esso

3.5.182 The Scheme would require protection works to be undertaken on an existing Esso fuel pipeline on the realigned Catherine-de-Barnes Lane, south west of Barber's Coppice Roundabout.

3.5.183 These protection measures are in the form of a protective cover slab which would be installed above the fuel pipeline.

Limits of deviation

3.5.184 Limits of deviation have been incorporated within the Order Limits to allow minor modifications to be made to the design of the Scheme during the detailed design and construction stages.

3.5.185 The limits of deviation have been determined based on the design, construction and billability factors, and have been taken into consideration as part of the EIA.

3.5.186 The limits of deviation have been defined using lateral limits of deviation for all infrastructure elements within the Scheme, and vertical limits of deviation for all the road elements.

3.5.187 The extents of the lateral limits of deviation have been used to identify the amount of land to be acquired permanently as part of the Scheme, and are indicated on the Works Plans [**TR010027/APP/2.3**]. Any deviation from the lines or situations shown on the Works Plans [**TR010027/APP/2.3**] are to the extent of the limits of deviation shown on those plans.

3.5.188 The vertical limits of deviation are referenced against the vertical profile levels indicated on the Engineering Drawings and Sections [**TR010027/APP/2.8**] and are permitted to deviate by a maximum of 0.5m upwards or downwards, with the exception of Solihull Road overbridge (Work No. 3) which has a limit of deviation of a maximum of 1.5m upwards or downwards to retain flexibility in construction sequencing.

Speed limits

3.5.189 A speed limit has been allocated to each section of road modified by, and included within, the Scheme.

3.5.190 The mainline link road would operate under the national speed limit.

3.5.191 All motorway sections of the Scheme, including slip roads, would operate with variable speed limits under a dynamic hard shoulder running operational regime.

3.5.192 The majority of the A45 within the Order Limits currently operates under a 50mph speed limit, which would be retained. Clock Interchange and associate approach roads and slip roads would retain the existing 40mph speed limit.

3.5.193 All side roads have been designed to retain the speed limits currently in place on the existing road network. Where changes to the existing speed limits are proposed, these have been agreed following consultation with SMBC.

3.5.194 The proposed speed limits for each section of road are presented in the Traffic Regulation Measures Plans [**TR010027/APP/2.6**].

Landtake

3.5.195 Although Highways England would endeavour to acquire land by agreement, the rights to acquire the land required to deliver the Scheme are being sought by Highways England through the DCO application.

3.5.196 The Scheme's temporary and permanent landtake requirements have been identified through the preliminary design, consultation and through engagement with landowners that would be affected by its progression. These are defined by the Order Limits within the DCO application, and are illustrated on the Land Plans [**TR010027/APP/2.2**]

3.5.197 All areas of land within the Order Limits are located within the administrative boundary of SMBC.

3.5.198 The Order Limits include land which would be taken permanently to accommodate the engineering, drainage and environmental components of the Scheme.

3.5.199 Land has also been identified within the Order Limits that would be acquired temporarily to facilitate construction of the Scheme. This land would be required for construction site compounds, vehicular access, temporary highway diversions, working areas and the temporary storage of materials such as soil and aggregates.

3.5.200 In addition to the permanent land acquisition, permanent rights in land are being sought within the DCO application to enable utility diversions, and for future maintenance access.

Environmental Masterplan and securing mitigation

Overview

3.5.201 **Figure 8.8** [**TR010027/APP/6.2**] presents the Environmental Masterplan developed for the Scheme. This illustrates the locations, functions and objectives of the mitigation, compensation and enhancement measures relating to landscape, biodiversity and drainage considered within the assessments undertaken as part of the EIA.

3.5.202 The objectives and functions of these measures are presented on the Environmental Masterplan, and are described in the Register of Environmental Actions and Commitments in Appendix 3.1 [**TR010027/APP/6.3**]. These measures would be secured by requirements in the DCO, which would ensure that the Scheme is implemented in accordance with the following:

a. the Scheme design (illustrated on General Arrangement Plans [**TR010027/APP/2.4**]);

b. the Outline Environmental Management Plan (OEMP) [**TR010027/APP/6.11**] which contains details of all standard mitigation measures that would be implemented during construction of the Scheme.

c. the Register of Environmental Actions and Commitments in Appendix 3.1 [**TR010027/APP/6.3**], contains details of all mitigation, compensation and enhancement measures, and cross-references the standard measures in the OEMP [**TR010027/APP/6.11**]; and

d. other specific mitigation obligations relating to key topic areas such as archaeology, landscaping and drainage.

Landscaping measures

3.5.203 Landscaping measures have been incorporated into the design of the Scheme with the objectives of:

a. mitigating impacts on landscape character;

b. mitigating visual impacts;

c. providing visual interest for road users; and

d. mitigating for the loss of vegetation.

3.5.204 To assist in integrating the appearance of the Scheme into the receiving landscape pattern and provide visual screening of earthworks and other visually conspicuous components, a combination of woodland and woodland edge planting would be established in the following locations:

a. surrounding the two roundabouts of M42 Junction 5A – to soften the appearance of Solihull Road overbridge and the junction earthworks in views from properties on Solihull Road, and more distant views from Hampton in Arden;

b. on the western edge of Barber's Coppice Roundabout – to visually screen the new junction in views from Catherine-de-Barnes Lane; and

c. at the junction of Shadowbrook Lane and Catherine-de-Barnes Lane – to visually screen and integrate the modified junction.

3.5.205 Addition landscape integration and screening would be achieved through the use of native hedgerow planting in the following locations:

a. along the eastern edge of the M42 motorway and around the relocated East Way roundabout, north of M42 Junction 6;

b. along the entire length of the eastern boundary of the mainline link road;

c. along the length of the western boundary of the mainline link road, between M42 Junction 5A and Clock Lane;

d. around Barber's Coppice Roundabout;

e. along sections of the modified Catherine-de-Barnes Lane between Shadowbrook Lane and St Peters Lane; and

f. along the free flow diverge slip from the northbound carriageway of the mainline link road to the A45.

3.5.206 Shrubs with intermittent trees would be established at the following locations to assist with landscape integration and provide visual screening:

a. along the free flow diverge slip from the northbound carriageway of the mainline link road, immediately south west of Clock Interchange;

b. to the west of the mainline link road, in the area of the proposed underpass to the south west of Clock Interchange;

c. along the embankment slopes of the relocated East Way roundabout and the southbound diverge slip from the M42 motorway; and

d. along the eastern boundary of Bickenhill Roundabout.

3.5.207 Smaller pockets of shrubs with intermittent trees would also be established around the junction of St Peters Lane and opposite The Haven Caravan Park.

3.5.208 Scrub planting would be established along the cutting slopes of the mainline link road between St Peters Lane and Shadowbrook Lane, and on the cutting slopes between Shadowbrook Lane and west of M42 Junction 5A, to provide landscape integration and visual interest to road users.

3.5.209 Shrub planting would be established on land located between the merge and diverge slips of M42 Junction 5A and the M42 motorway to visually screen the form of the junction.

3.5.210 Grassland comprising species-rich and verge mixes would be established on earthwork slopes, cutting slopes and highway verges throughout the Scheme.

Biodiversity measures

3.5.211 In addition to the landscaping measures, biodiversity measures have been incorporated into the design of the Scheme with the objectives of:

a. mitigating and compensating for the loss of habitats;

b. retaining existing habitats (where possible);

c. providing badgers with a means of safely passing under the mainline link road;

d. translocating species and habitats prior to construction; and

e. providing ecological enhancement for habitats and species.

3.5.212 Woodland and grassland habitats have been retained within the design of the Scheme at the following locations:

a. within the roundabout of Clock Interchange (woodland);

b. between Barber's Coppice Roundabout and the mainline link road (woodland);

c. adjacent to Bickenhill Roundabout, between Catherine-de-Barnes Lane and the mainline link road (grassland); and

d. surrounding a proposed reed bed immediately north west of M42 Junction 5A.

3.5.213 Grassland and scrub would be established at the following locations to mitigate for the loss of existing habitats:

a. between the relocated East Way roundabout and the M42 southbound to A45 eastbound diverge slip;

b. within the roundabout of Clock Interchange;

c. between Clock Lane and the free flow diverge slip from the northbound carriageway of the mainline link road to the A45;

d. along the eastern boundary of the mainline link road, between St Peters Lane and Clock Interchange; and

e. between Barber's Coppice Roundabout and the mainline link road.

3.5.214 An area of land between Bickenhill Meadows SSSI and the mainline link road has been identified for habitat translocation.

3.5.215 An area of land immediately south of Aspbury's Copse ancient woodland, adjacent to the eastern boundary of the M42 motorway, has been identified for new woodland planting (to compensate for the loss of ancient woodland resource), and for the translocation of ancient woodland soils and habitat.

3.5.216 Bat boxes to mitigate for the loss of existing roosts would be provided on land to the north west and south west of M42 Junction 5A, and in proximity to the junction of Shadowbrook Lane and Catherine-de-Barnes Lane.

3.5.217 Habitats to mitigate impacts on great crested newts would be provided to the east of M42 Junction 5A on Solihull Road, north of Bickenhill village.

3.5.218 Additional bat boxes for ecological enhancement purposes would be provided within retained woodland in proximity to Bickenhill Meadows SSSI, and within retained woodland located between Barber's Coppice Roundabout and the mainline link road.

3.5.219 Mammal tunnels for the safe passage of badgers beneath the mainline link road have been incorporated into the design of the Scheme immediately north west of M42 Junction 5A, and immediately south of Clock Interchange. Guide fencing to direct badgers to these mammal tunnels would also be installed along the highway boundary of the mainline link road between St Peters Lane and Clock Interchange, and along the boundary of the mainline link road north west of M42 Junction 5A.

Drainage measures

3.5.220 The following locations incorporate reed beds and swales as part of the drainage infrastructure of the Scheme, and have been designed to mitigate impacts on aquatic species:

a. south of Aspbury's Copse ancient woodland, adjacent to the eastern boundary of the M42 motorway;

b. immediately north west of M42 Junction 5A; and

c. north of the relocated East Way junction.

3.6 Construction, operation and long term management

Construction programme

3.6.1 Subject to the successful completion of the statutory process and granting of the DCO application by the Secretary of State for Transport, construction of the Scheme would commence in spring 2020 and would continue until spring 2024.

3.6.2 The works would be undertaken in phases across different areas of the Scheme, in order to reduce the level of disruption to residents, local businesses, statutory undertakers and road users.

3.6.3 Notwithstanding this, some overlapping of activities within the phases would be necessary during the construction period. The Scheme would open for traffic in Autumn 2023 before full completion of the works in Spring 2024.

3.6.4 The key construction programme dates are provided in **Table 3.2**.

Table 3.2: Key construction programme dates

Key programme element	Date
DCO application granted by the Secretary of State for Transport	Spring 2020
Notice to proceed (construction begins)	Spring 2020
Scheme open to traffic	Autumn 2023
M42 Junction 6 works complete	Spring 2024
Defects correction period (1 year)	Autumn 2024
Landscape maintenance period ends (up to 5 years)	Spring 2029

3.6.5 A high level programme detailing the phased delivery of the Scheme is provided in **Table 3.3**.

Table 3.3: Construction programme works phasing

Phase of work	Dates and durations
Phase 1: Junction 5A, mainline link road and Clock Interchange works	
Enabling works including site clearance, fencing, site compound construction and utility diversion works	March 2020
Construct temporary alignments for Catherine-de-Barnes Lane	March 2020 to June 2020
M42 Junction 5A bridges and slip roads, including temporary alignments for Solihull Road.	April 2020 – February 2022
Reconfigure GAA sports facility	April 2020 – September 2020
Construct mainline link road and local roads, and works to A45 and Clock Interchange	June 2020 – November 2021
Works to M42 motorway gantries and ERAs	April 2020 – April 2021

Phase of work	Dates and durations
Open M42 Junction 5A to traffic	March 2022
Phase 2: works at M42 Junction 6	
M42 Junction 6 free flow link roads enabling works	March 2022 – May 2022
Phased underpass and retaining wall construction	June 2022 – August 2023
Excavation and slip road construction	October 2023 – March 2024
M42 Junction 6 works complete	March 2024

3.6.6 The strategy is to construct the mainline link road, M42 Junction 5A and improve Clock Interchange, and open these elements of the Scheme to traffic prior to commencing works on the A45 and new A45 to M42 free flow links.

3.6.7 This strategy has been developed to minimise the impact on the travelling public, as the majority of the works in the first phase is off-line, and once completed would reduce the traffic flows around M42 Junction 6 during the second phase of construction of the A45 eastbound to M42 northbound free flow links.

3.6.8 This strategy has been developed to minimise the impact on the travelling public, as the majority of the works in the first phase are off-line, and once completed should reduce the traffic flows around M42 Junction 6 during the second phase of construction of the A45 eastbound to M42 northbound free flow link. The construction strategy in phase 1 of the works makes use of a number of temporary road alignments to maintain access along Catherine-de-Barnes Lane and Solihull Road.

3.6.9 It has been announced that Birmingham will hold the Commonwealth Games in 2022.The games are expected to take place between 27 July and 7 August 2022 and venues will include the NEC. Highways England will liaise with the Commonwealth Games organisers to understand potential construction constraints and restrictions during the period of the Games. However, Phase 1 of the construction works is anticipated to be complete prior to the start of the Games.

3.6.10 The different phases of Scheme construction are illustrated on **Figure 3.4** [**TR010027/APP/6.2**].

Advanced works

3.6.11 Advanced works would be required ahead of the main construction operations. These include:

a. site clearance activities would need to be undertaken prior to the main construction works commencing. This would involve the removal of existing trees, hedgerows and vegetation. Start of works is currently programmed for early spring 2020, which would coincide with the bird nesting session (March to August inclusive).Where possible land entry would be negotiated, by agreement, to undertake pruning or advance vegetation removal works to prevent nesting birds causing delay to the earthwork operations (see Chapter 9 Biodiversity);

b. land entry would be made under agreement with the land owner to undertake advance archaeological trial trenching, as per the requirements of the Written Scheme of Investigation (see Chapter 7 Cultural heritage);

c. ecological mitigation works including surveys, installation of barrier fencing and trapping would be undertaken as per the requirements of the specific species licence agreements with Natural England (see Chapter 9 Biodiversity);

d. non-intrusive and intrusive surveys would be undertaken to confirm the location and level of existing utility assets. The methodology of intrusive trail holes would be agreed with the utility owner prior to work commencing; and

e. topographic surveys would be undertaken at key pinch points on the Scheme, including tie-in locations, utility service crossings and drainage outfalls.

Construction activities

3.6.12 The first phase of construction would involve undertaking enabling works, prior to the commencement of the main construction activities. These would be undertaken over a period of three months, from start of works.

Formation of the main construction compound

3.6.13 The main construction compound would be formed as part of the enabling works on a parcel of land positioned between the A45 and Church Lane, north east of Bickenhill.

Statutory undertaker works and the diversion of utilities

3.6.14 As described in Section 3.5, construction of the Scheme would require some existing services and utilities to be protected and/or diverted through the following types of works:

a. protection works: using an exclusion zone or a structural solution, such as a bridging slab, constructed to protect an asset during Scheme construction;

b. pre-earthworks diversions: undertaken either in advance of, or early in, the construction phase to allow the earthworks and drainage operations to commence; and

c. multiple phased diversions: where services require diversion onto a temporary alignment during construction, with subsequent diversion into the verge of the new highway.

3.6.15 These works would typically involve the following activities:

a. excavating trial holes to determine the exact alignment and depth of existing utilities and the desired connection points;

b. excavating trenches for new service alignments or to install assets using trenchless techniques, such as pipe jacking or directional drilling;

c. installation of towers or poles for overhead line equipment;

d. installation of new assets (pipes, ducts or cables) and connections to existing services;

e. undertaking survey of new asset for records;

f. testing and commissioning new assets; and

g. decommissioning and removal of redundant equipment.

Demolition

3.6.16 A small number of existing buildings and structures would be demolished or removed to enable construction of the Scheme to proceed.

3.6.17 Heath End House, comprising a detached dwelling and smaller building within the property curtilage located on Catherine-de-Barnes Lane, would be demolished as they are located within an area of land required to construct the mainline link road. This would be preceded by a demolition survey undertaken to identify whether any hazardous materials such as asbestos are present.

3.6.18 A building located on land opposite Bracey's Nurseries and Garden Centre, on the west side of Catherine-de-Barnes Lane, would be demolished to enable the construction of localised improvements to this road.

3.6.19 A pre-fabricated building located adjacent to the WGAA's north eastern pitch would need to be moved, dismantled or demolished to facilitate construction of the mainline link road.

3.6.20 A memorial positioned on the south east corner of the WGAA sports facility would need to be relocated to a location agreeable to the WGAA.

3.6.21 The existing Solihull Road overbridge would need to be demolished, in order to facilitate the construction of M42 Junction 5A and the construction of a larger overbridge at this location.

3.6.22 A number of existing gantries on the M42 motorway and the A45 would have to be demolished or moved, as defined in Schedule 1 of the draft DCO [**TR010027/APP/3.1**].

Construction of M42 Junction 5A

3.6.23 Preliminary works would involve the formation of satellite compounds located north of the Solihull Road overbridge, on either side of the M42 motorway, to facilitate works to the overbridge and to construct M42 Junction 5A.

3.6.24 Access to the compound would be via works access roads within the M42 junction 6 traffic management. Temporary diverge slip would be constructed along the verge of the M42 junction 6 to provide access for works vehicles onto the hard shoulder of the M42.Works vehicles from the main site compound would use Catherine-de-Barnes Lane and Solihull Road to access the compounds. Temporary signage would be installed along the Solihull Road for the duration of the construction period prohibiting work vehicles from traveling through Hampton in Arden.

3.6.25 Works to construct the M42 Junction 5A would involve the construction of an overbridge across the M42 motorway, which would connect two new roundabouts to form a new dumb-bell junction.

3.6.26 Construction of the two roundabouts would be undertaken in parallel to the overbridge, and would involve activities such as topsoil stripping, earthworks, the installation of drainage, and formation of the two sections of carriageway.

3.6.27 Demolition of the existing Solihull Road overbridge and construction of a new overbridge with a longer span bridge at the same location would then be carried out. During the demolition of the existing Solihull Road bridge, a temporary access road would be formed, utilising the new M42 Junction 5A overbridge, to enable continued movements along Solihull Road during construction works. There would be no access to the motorway during these works.

3.6.28 Following the completion of the new Solihull Road overbridge, construction of the slip roads between Junction 5A and the M42 motorway would be undertaken. These works would be preceded by any works required to protect the buried gas pipeline in the existing verge.

Mainline link road from M42 Junction 5A to Birmingham Airport

3.6.29 Works to form the mainline link road between M42 Junction 5A and Clock Interchange would commence with a number of preparation activities within the working corridor. These would include site clearance to remove vegetation, the erection of boundary fencing to demarcate the working area, the formation of an internal haul road for vehicles to access the working corridor, the stripping and storage of topsoil and subsoil, and the diversion of utilities.

3.6.30 Temporary road alignments for Catherine-de-Barnes Lane, Church Lane and Shadowbrook Lane would be constructed to divert traffic around the bridge and mainline link road work area, providing continuous vehicular access during the construction period. Following the switch of traffic onto the temporary alignments, works would commence on the bridge construction activities. Night time road closures would be required on the local roads to complete the pavement tie-in works to both the temporary and permanent road alignments.

3.6.31 Works would be undertaken to reconfigure the WGAA sports facility, in advance of the construction of the link road adjacent to the existing WGAA sports facility. Works would also be undertaken to form the private means of access along the western boundary of the Scheme, so as to maintain access to agricultural fields adjacent and the WGAA sports facility.

3.6.32 Approximately 900,000m^3 of material would need to be excavated to construct the main sections of the mainline link road. Earthworks operations to form the cuttings and embankments would be undertaken in phases along different sections of the works corridor.

3.6.33 Following completion of the earthworks, road drainage would be installed. The carriageway subbase would then be laid with surface water channels installed to collect and direct road runoff. The final stages of the works would involve construction of the carriageway pavement and the installation of safety barriers.

3.6.34 Bridge works would commence with preliminary works to form satellite construction compounds, platforms for cranes and piling operations, and to construct temporary retaining walls and haul routes. These would be followed by the main bridge construction works and would involve the formation of reinforced earth walls and abutments and the installation of bridge piers, beams and decking. Final finishing works would then follow, including the removal of any temporary earthworks used during construction.

3.6.35 The accommodation bridge would be constructed south of Shadowbrook Lane to take NMUs across the mainline link road. Works would be comparable to those associated with the other bridge structures on the mainline link road, and would be undertaken from two small satellite construction compounds formed on either side of the mainline link road.

3.6.36 A number of areas of land adjacent to Catherine-de-Barnes Lane and the mainline link road would be used temporarily for materials stockpiling and storage.

3.6.37 The temporary road alignments would be removed following completion of the realignment works to Catherine-de-Barnes Lane, including all bridge works and accommodation works.

Clock Interchange construction works

3.6.38 Works to Clock Interchange would be undertaken in parallel with the works to the mainline link road, with operations undertaken along the following sections of road.

a. A45 westbound link to Bickenhill Lane;

b. Bickenhill Lane realignment and widening;

c. Clock Interchange widening to incorporate a third lane; and

d. merge and diverge slips to Clock Interchange.

3.6.39 The type of construction works on each section of road would be similar and would be undertaken sequentially. Initial operations would involve the setting up of traffic management measures and undertaking site clearance activities to clear working areas, in preparation for the road widening and realignment works.

3.6.40 Localised works to realign and/or widen the existing sections of highway would be undertaken, followed by the installation of safety barriers, lighting and road signs and markings.

3.6.41 The mainline link to Airport Way connector road would be constructed in phases to maintain the existing traffic movements between Catherine-de-Barnes Lane and Clock Interchange. This would involve the installation of a new pedestrian underpass and embankment to the north of Catherine-de-Barnes. Following construction of the mainline link road, traffic would be switched onto the new northbound carriageway. Earthworks and highway construction over the redundant Catherine-de-Barnes Lane would then be completed and the new slip road opened to traffic.

M42 Junction 6 works

3.6.42 Construction of the A45 eastbound to M42 northbound free flow link underpass would involve a number of construction phases and temporary traffic management solutions.

3.6.43 Underpass construction would commence after the opening M42 Junction 5A and the mainline link road, to reduce the flow of traffic at M42 Junction 6 and minimise disruption from traffic management.

3.6.44 Construction of the M42 to A45 southbound free flow link would be undertaken using the traffic management in place for the M42 Junction 5A and M42 motorway works.

M42 southbound to East Way link

3.6.45 Works to construct the southbound link from the M42 motorway to East Way would commence with the formation of satellite construction compound and the setting out of traffic management on the road network to form narrow lanes.

3.6.46 Preliminary activities would also involve the clearance of working areas and the erection of fencing around working areas. Materials stockpiles would also be formed and demarcated.

3.6.47 Topsoil would be stripped prior to undertaking earthworks, installing drainage infrastructure and the formation of attenuation ponds adjacent to the carriageway. Further works would involve the laying of the carriageway subbase and installation of surface water channels and road kerbs. Works to extend the existing Hollywell Brook culvert beneath the M42 motorway would also be undertaken.

3.6.48 Operations would be completed following the formation of the carriageway pavement and installation of safety barriers.

A45 eastbound to M42 northbound free flow link

3.6.49 The 132kV overhead cables and pylons would be diverted in 2020/2021 in advance of the construction works to the mainline link road and structure. The diversion route and programme would be undertaken in consultation with HS2.

3.6.50 Construction works along this section of the network would be sequentially phased to minimise disruption to road users and the NEC. These works would be completed in six stages:

a. Stage 1: Enabling works in the first phase of operations would involve the formation of a satellite construction compound on land adjacent to the north west quadrant of M42 Junction 6, and the diversion of local utilities. These works would be planned in conjunction with the proposed HS2 works in this area;

b. Stage 2: Would involve the clearance of road verges and islands along this section of the network, and the diversion of local services. A temporary access road to the NEC would also be formed, along with a platform to undertake piling operations;

c. Stages 3 – 5: Works would be undertaken in three phases, each commencing with the deployment of traffic management measures to control vehicular movements associated with the NEC. Activities during each phase would involve the installation of sheet piles, structure abutments, beams, structure decks and retaining walls in different combinations, followed by final finishing works; and

d. Stage 6: Works would commence with the excavation of areas in preparation for the free flow link, and works to finish the underside of the bridge and clad its outer faces. Following a period of works to construct the free flow link, all traffic management would be removed and the road would be open for use.

3.6.51 In parallel with the latter phases of work, operations would be undertaken on the western side of the motorway underneath East Way bridge. Construction activities would be similar to those carried out as part of the free flow link, with the main works involving the soil nailing of the west abutment retaining wall, piling operations, the installation of a concrete capping beam, levelling works and cladding. This would enable the motorway to be widened to accommodate the new slip road merge arrangement.

A45 footbridge works

3.6.52 Works to construct the A45 footbridge would commence in parallel with the works to the mainline link road in the summer of 2020. The new bridge and footpath would be opened to the public in advance of the works to Clock Interchange starting so as to provide pedestrian access across the A45.

3.6.53 Preliminary works would involve the setting up of traffic management measures on the A45, and the clearance of vegetation to enable the formation of a satellite construction compound. Works would also involve the removal of an existing overhead gantry structure and the diversion of services. A night time closure of the A45 eastbound carriageway would be required to facilitate the removal of the existing gantry.

3.6.54 Construction works would commence in the central reserve, requiring the clearance of vegetation and the formation of a piling platform. Steel columns and central supports would be erected alongside piling operations in the first phase of works, followed by reinstatement of the central reserve.

3.6.55 Works to existing verges would commence in the next phase. Traffic management measures would be used to manage vehicle flows adjacent to the working areas. Operations would involve piling and foundation works, and the formation of bridge abutments prior to the erection of the footbridge abutments, staircases and ramps.

3.6.56 The next phase would involve the installation of the bridge deck, and the footbridge steel ramps and staircases. Closures of the A45 would be required to facilitate the installation of the bridge deck.

3.6.57 Works to the footbridge would be finalised following completion of any reinstatement works and removal of traffic management measures on the A45.

M42 motorway north and south of Junction 6 works

3.6.58 Construction works along the M42 motorway corridor would include the:

a. demolition of existing gantry structures;

b. installation of retaining structures for gantry foundations and ERAs;

c. installation of new drainage and ducts within the verge;

d. construction of foundations for new gantries;

e. installation of street lighting and signage; and

f. installation and commissioning of new motorway technology systems.

3.6.59 The installation of the permanent signage would be undertaken prior to the opening of Junction 5A. The permanent signage would be covered until the mainline link road had been opened to traffic

3.6.60 These works would take place at the same time as the construction of M42 Junction 5A.

3.6.61 Temporary traffic management would be installed to provide a safe working area along the hard shoulder of the M42 motorway northbound and southbound carriageways, with lane restrictions and reduced speed limits put in place. During the construction period the existing dynamic motorway system in operation on this section of the motorway would be immobilised.

3.6.62 Site clearance operations would commence following the installation of traffic management, and would involve the removal of vegetation at the proposed gantry and ERA sites. Redundant lighting columns, road restraint systems, signs and motorway technology assets would also be removed, as well as any existing gantries using cranes during night time carriageway closures.

3.6.63 Subject to the surveying of existing assets, any new drainage assets required would be installed.

3.6.64 Retaining structures consisting of soil nails, sheet piles and gravity walls would be installed to form the widened areas for the new ERAs and gantry sites.

3.6.65 Trenches would be excavated along the verge for the installation of new communication and lighting ducting. Existing ducts across the carriageway would be surveyed to establish their potential for reuse, with any new or replacement ducts installed using direction drilling techniques.

3.6.66 Piles would be installed for the new sign and signal gantries, with gantry structures lifted into position during night time carriageway closures.

3.6.67 Foundations would be excavated for new signage posts, and road restraint systems would be installed along the highway verges.

Catherine-de-Barnes roundabout

3.6.68 Existing road signage at Catherine-de-Barnes roundabout would be changed to reflect the road modifications introduced by the Scheme, with works undertaken under local traffic management.

Construction compounds

Main site compound

3.6.69 An area of land to the south of A45 and east of Clock Interchange has been identified for the main site compound. This would provide the office and welfare facilities for the staff and workforce, and include material lay down areas.

3.6.70 Compound facilities would include office units, car parking, welfare units (for washing and changing), a roadworks recovery area, areas for waste segregation, materials testing units, fuel storage, and wash out facilities.

3.6.71 Areas would be provided within the main site compound for the storage of soils and materials, secure containers, fabrication and processing areas, and for construction plant, equipment and materials laydown and storage.

3.6.72 A new access point to the main site compound would be constructed off Catherine-de-Barnes Lane. Parts of this access would utilise the construction of the new embankment for the mainline link road at the tie-in with Clock Interchange.

3.6.73 A secondary access on to Catherine-de-Barnes Lane would be constructed adjacent to the Church Lane junction to provide continued access during the construction of the tie-in works at Clock interchange, and during construction of the A45 eastbound to M42 northbound slip road.

3.6.74 A haul road would be constructed between the main site compound and the A45 NMU bridge to the east.

3.6.75 The principal route for material deliveries would be via the A45 and Clock Interchange, and deliveries would take place between normal working hours.

3.6.76 The main site compound would be occupied at all times either by designated store personnel or security teams. Personnel working on the Scheme and visitors would be encouraged to use green travel plans such as car share or public transport. As the area is well serviced by public transport, it is envisaged that a mini bus service would be provided to facilitate more sustainable modes of transport.

Temporary satellite compounds

3.6.77 In addition to the main site compound a number of smaller temporary satellite compounds would be formed to facilitate Scheme construction, the details of which are summarised in **Table 3.4**.

Table 3.4: Temporary satellite construction compounds

Satellite compound reference	Function	Location
Airport Way compound	Office unit for engineering and supervision of underpass. Local welfare and material storage. Temporary works platform for crane for construction of underpass	Located in southern end of field between Catherine-de-Barnes Lane and Clock Lane to the south of the proposed new pedestrian underpass. Access from Clock Lane and Catherine-de-Barnes Lane.
Catherine-de-Barnes north	Office unit for engineering and supervision of bridge structure. Local welfare and material storage facilities Beam unloading and fabrication area	Located in north east corner of the bridge structure. Access from Catherine-de-Barnes Lane.

Satellite compound reference	Function	Location
Catherine-de-Barnes south	Office unit for engineering and supervision of bridge structure and adjacent highway works. Local welfare and material storage facilities	Located to east of bridge structure. Access from Catherine-de-Barnes Lane.
Accommodation bridge satellite compound	Office unit for engineering and supervision of bridge structure. Local welfare and material storage facilities	Located adjacent to bridge structure. Access from internal site haul road.
M42 Junction 5A west satellite compound	Office unit for engineering and supervision of bridge structure and M42 northbound works. Local welfare and material storage facilities Temporary stockpile for demolition arisings Welfare facilities for roadwork recovery teams.	Located to the north of the M42 Junction 5A bridge. Access from within traffic management on the M42. Secondary access from Solihull Road using Catherine-de-Barnes Lane from Clock Interchange. No construction vehicles would be permitted through Hampton in Arden.
M42 Junction 5A east satellite compound	Office unit for engineering and supervision of bridge structure and M42 southbound works. Local welfare and material storage facilities. Temporary works platform for beam fabrication and lifting operations. Topsoil storage. Temporary stockpile for demolition arisings. Welfare facilities for roadwork recovery teams.	Located to the north of the M42 Junction 5A bridge. Access from within traffic management on the M42. Secondary access from Solihull Road using Catherine-de-Barnes Lane from Clock Interchange. No construction vehicles would be permitted through Hampton in Arden.
A45 NMU bridge north	Office unit for engineering and supervision of bridge structure. Local welfare and material storage facilities. Storage of topsoil and subsoil. Area for unloading and storage.	Located in land to the east of Arden Hotel. Works access from the A45 eastbound carriageway.

Satellite compound reference	Function	Location
A45 NMU bridge south	Office unit for engineering and supervision of bridge structure. Local welfare and material storage facilities. Storage of topsoil and subsoil. Beam fabrication area.	Located in land to the west of Church Lane. Works access from the A45 westbound carriageway. Internal site access from the main site compound.
East Way compound	Office unit for engineering and supervision of highway works at junction 6 slip roads. Topsoil storage. Welfare facilities for roadwork recovery teams.	Located in land to the south of East Way in the north east quadrant of M42 Junction 6. Works access from M42 southbound slip road and from the A45 via East Way.
NEC compound	Office units for engineering and supervision of bridge structure. Welfare and material storage facilities. Fabrication area for reinforcement cages and precast elements.	Located in car park to the north west of M42 Junction 6. Access via South Way from M42 Junction 6.
Satellite compound for WGAA reconfiguration	Local welfare facilities and office unit for supervisor. Hard standing area for parking, plant storage and material storage.	Located in the field adjacent to the north side of the access road to the Birmingham Dogs Home Access via existing gate access into field on north side of access road to Birmingham Dogs Home.

Construction plant, equipment and machinery

3.6.78 Construction activities undertaken across the Scheme would involve the use of a range of plant, equipment and machinery depending on the location and nature of the works.

3.6.79 Tracked excavators, dozers, breakers, dumper trucks, planers, piling rigs, concrete pumps and rollers would be used to dig, move, lay and compact material as part of earthworks and foundation operations.

3.6.80 Road wagons, tipper wagons, telehandlers, low loaders and cranes would be used to transport materials and equipment to and from construction working areas.

3.6.81 Hand tools including hammer drills, vibrators, saws, plate compactors and sprays would be used for specific activities and where access does not permit the use of larger equipment.

3.6.82 Petrol and diesel powered generators would be used in working areas to provide a power source for some plant and equipment. Solar powered equipment such as lighting towers would be utilised where applicable.

3.6.83 Ancillary equipment such as pumps would be installed during construction to dewater the excavations and working area, and lighting towers would be erected to provide illumination for safe working outside of daylight hours.

3.6.84 Equipment comprising office and canteen cabin units, drying rooms, stores, changing rooms, showers and a sewage treatment plant would be set up within the main construction compound and in some satellite compounds for staff welfare. A mobile welfare unit would be used during works in areas more remote from the compounds.

3.6.85 Minibuses, pick up vehicles, road sweepers, recovery trucks and lorry mounted cranes would be used across all working areas to support other construction activities, and for the transportation of people and vehicles from the main construction compound.

Construction haul routes

3.6.86 Construction vehicles would not be permitted to travel through the local villages.

3.6.87 Mini buses would travel on Solihull Road to collect and drop off personnel at Hampton in Arden railway station and Birmingham International Railway Station, to enable site personnel to use public transport.

3.6.88 Internal site haul roads would be constructed along the north-south alignment of the mainline link road adjacent to the toe of embankment or top of cutting. These would be typically 10m wide with a bund or windrow alongside them, formed using the excavated material from the haul road.

3.6.89 Haul roads would be constructed from either site-won processed arisings or imported granular material placed on a geotextile membrane.

3.6.90 Internal cut to fill movements would be undertaken using articulated dumper trucks. Surplus material would be transported to a suitable deposition location via road wagons using the site access/exits on to the M42 motorway and the A45 via Catherine-de-Barnes Lane.

3.6.91 Two road crossings for construction equipment would be provided at the Catherine-de-Barnes north and south bridges to facilitate the movement of cut material to its required deposition location. These crossings would be installed with traffic signals to control the movement of vehicles across the carriageway. Wheel washing facilities would be installed to reduce the risk of construction material being taken onto the road network.

3.6.92 Temporary traffic lights would be installed over Solihull Road overbridge to facilitate the movement of the fill material from the east to the west side of M42 Junction 5A.

Construction workforce

3.6.93 The following worker numbers and types are estimated to be required during construction of the Scheme:

a. Highways England: six people. These individuals would be project managers within the overseeing organisation;

b. technical assurance: two people. These individuals would function in site supervisor roles;

c. delivery integrated partner: 110 people. These workers would undertake managerial, engineering and administrative roles relating to health and safety, quality and commercial management, site inspections, works planning and operations co-ordination, foremen and environmental management; and

d. subcontractor: 260 people. These workers would undertake works and roles such as driving vehicles, environmental supervision, traffic marshalling and management, drainage installation, earthworks, concrete formwork, bridge fabrication and general logistical support.

Construction working hours

3.6.94 Construction work would take place between the hours of 07.00 and 18.00 on weekdays, and between the hours of 07.30 to 13.00 on Saturdays.

3.6.95 Exceptions to these hours may be required to accommodate elements such as oversize deliveries, tie-in works for the new slip roads and junctions, demolition of Solihull Road overbridge, bridge beam lifting operations, and bridge deck concrete pours over carriageways. Requirement 4 of the draft DCO [**TR010027/APP/3.1**] sets out the exceptions for the Scheme.

Construction materials

3.6.96 **Table 3.5** summarises the expected quantities of materials to be generated during construction of the Scheme, and the quantities of materials that would need to be imported during the works.

Table 3.5: Construction materials quantities

Material description	Unit	Quantity
Excavated material		
Excavated topsoil	m^3	181,207
Excavated material, clay and unacceptable	m^3	986,540
Hard arisings	m^3	43,016
Re-soil for verges, batters and re-instatement works	m^3	125,013
Fill for earthworks embankments	m^3	259,711
Excavated material exported from site-including clay, unacceptable material, top soil and surplus hard arisings	m^3	793,722

Material description	Unit	Quantity
Imported material		
Structural granular fill for backfill and reinforced earth wall construction	m^3	26,000
6F classified material for road foundation	m^3	11,000
Pavement construction (base, binder and surface course)	T	88,200
Drainage filter material	m^3	22,500

Temporary road closures and diversions

3.6.97 Traffic management measures would be put in place to ensure that traffic flows on both the strategic and local road networks are maintained, whilst allowing safe working at the interface between the existing road network and the Scheme.

3.6.98 **Table 3.6** summarises the temporary closures that are likely to be required during Scheme construction, the final timings of which (along with any associated diversion works) would be agreed with Highways England's maintenance operatives and SMBC.

Table 3.6: Temporary road closures

Construction Activity	Carriageway	Closure details
Junction 5A bridge – beam installation	M42 northbound and southbound	4 successive overnight closures between 21:00 and 05:00.
Solihull Road bridge demolition	M42 northbound and southbound	Full weekend closure from 00:00 Saturday to 05:00 Monday.
Solihull Road Bridge – beam installation	M42 northbound and southbound	3 successive overnight closures between 21:00 and 05:00.
	M42 southbound	3 successive overnight closures between 21:00 and 05:00.
Gantry demolition	M42 northbound and southbound	8 overnight closures between 21:00 and 05:00.
Gantry boom installation	M42 northbound and southbound	4 overnight closures between 21:00 and 05:00.
Traffic management installation and removal	M42 northbound	4 overnight closures between 21:00 and 05:00.
	M42 southbound	4 overnight closures between 21:00 and 05:00.

Construction Activity	Carriageway	Closure details
A45 NMU bridge deck installation	A45 eastbound carriageway	2 overnight closures between 21:00 and 05:00.
A45 gantry demolition	A45 eastbound carriageway	Overnight closure between 21:00 and 05:00.

Landscape aftercare period

3.6.99 The appointed contractor would be responsible for undertaking landscape management within the contract period, after which the longer term maintenance and management responsibilities would transfer to Highways England.

3.6.100 The appointed contractor would also be responsible for the preparation of a Handover Environmental Management Plan (HEMP) during the contract period.

3.6.101 The purpose of the HEMP is to provide information relating to existing and future environmental commitments and monitoring that would need to be delivered by those responsible for the future management and operation of the Scheme. The HEMP would include specific requirements concerning the long term maintenance and management of all landscaping incorporated into the Scheme.

Long term maintenance of the Scheme

3.6.102 The Scheme has been designed in a way that minimises the frequency of future interventions through the incorporation of low maintenance equipment and features that reduce the amount of repairs required. Examples include the use of cast-in road studs over other stick-on alternatives, and the co-location of equipment to facilitate access for routine inspections. Accordingly, no significant maintenance activities are likely to be required within the first five years of the Scheme being operational.

3.6.103 The maintenance responsibility for the mainline link road, associated slip roads and M42 improvements, as shown as trunk roads in the Classification of Roads Plans [**TR010027/APP/2.7**] and Schedule 3 of the draft DCO [**TR010027/APP/3.1**], would rest with Highways England.

3.6.104 The maintenance responsibility for the new local road, improvements to Clock Interchange, the new NMU bridge over the A45 and other unclassified roads, as shown in the Classification of Roads Plans [**TR010027/APP/2.7**] and Schedule 3 of the draft DCO [**TR010027/APP/3.1**], would rest with SMBC.

3.6.105 Short term maintenance and repair activities are likely to comprise inspections on the new works and installed assets, and any unplanned, emergency repair works due to damage following events such as road traffic incidents.

3.6.106 The following assets within the Scheme would be subject to the routine maintenance operations, similar to those being undertaken elsewhere on the existing strategic and local road networks. These maintenance activities would, wherever feasible, be programmed in a way that enables their combination with other planned operations to reduce disruption to road users associated with lane closures and diversions.

3.6.107 Traffic management deployed during such operations would comprise a combination of temporary speed restrictions, lane closures and reduced running lane widths to enable continued access for traffic.

Highway verge equipment

3.6.108 Assets that would be located within the highway verge comprise safety barriers, parapets, drainage infrastructure, structures, technology, lighting, and environmental barriers.

3.6.109 Repair works to safety barriers and parapets would generally be undertaken following events such as road traffic accidents, and drainage infrastructure comprising features such as attenuation tanks, pumps, oil separators, gullies, filter drains and chambers would be subject to periodic inspection and cleaning to ensure their continued operation.

3.6.110 Structures comprising overbridges, underbridges and accommodation bridges would be inspected during scheduled maintenance events. Gantries would require minor maintenance (painting) after 12 years and major maintenance after 20 years, with minor inspections undertaken when required. Periodic inspections of lighting, environmental barriers and signage would also be undertaken after the first five years of operation.

Overhead mounted equipment

3.6.111 Equipment attached to overhead gantries such as signage, cabling and other ancillary apparatus would require maintenance and replacement should such equipment become faulty. The structural condition of much of the overhead equipment fitted to the gantries would be inspected every two years, with digital enforcement cameras maintained every three to six months.

Central reserve

3.6.112 Equipment located within central reserves would be inspected and managed in a similar way to the equipment located within the highway verge.

Landscaping

3.6.113 Landscaping would be inspected and maintained in accordance with the HEMP developed to the long term management of the soft estate, including any periodic litter picking. Maintenance would be more intensive during the first three to five years after opening to ensure the successful establishment of any planting, with management operations reducing to a three to six month cycle after this period.

Drainage features

3.6.114 The maintenance regime associated with the sustainable drainage features of the Scheme would typically comprise:

a. swales would be inspected bi-annually to check for erosion, build-up of silt deposits and waterlogging. Areas of poor vegetation growth and bare patches should be reseeded. During the growing season grassed swales would be mown regularly. Compaction of the ground in the base of the swale would be avoided, in order to maintain infiltration;

b. attenuation ponds would be inspected bi-annually and eroded or damaged areas should be repaired. Inlet and outlet zones should be cleared of debris or built up material. Sediment build up would be removed when necessary typically every five to ten years. The maintenance requirements of landscaping, grassland and other ground cover would be dependent on the type of vegetation;

c. reed beds would be inspected on an annual basis. Inlet and outlet zones should be cleared of debris or built up material and should be checked for clogging roots. Reeds would be cut back annually after the second years growth to promote new growth. During the initial period of establishment, up to 24 months, netting would be placed over the pond to avoid attracting birds. This is an important part of the bird management strategy required as part of Birmingham Airport safeguarding, therefore the netting would be inspected regularly to ensure it remains in place; and

d. pumps used to transfer water from the underground storage tanks into the swales and reed beds would be inspected at a frequency recommended within the manufacturer's guidelines. Maintenance activities would involve the visual inspection of the pumps (for example to detect any blockages), the greasing and lubricating of components, and switching on and off of the pump to confirm it functions correctly.

Other works

3.6.115 Maintenance and renewal of the road surfacing, markings, road studs and buried technology would be undertaken when they reach the end of their design life.

3.6.116 Attenuation features such as buried tanks and ponds would be accessed periodically for maintenance and inspection, typically annually.

3.7 Decommissioning

3.7.1 It is highly unlikely that the Scheme would be demolished after its design life, as the improvements would have become an integral part of the strategic and local road networks.

3.7.2 In the unlikely event of the Scheme needing to be demolished, this would conform to the statutory process in place at that time, including any requirements for EIA as appropriate.

3.7.3 Demolition of the Scheme has therefore not been considered further in this Environmental Statement; however, appropriate consideration has been given, where relevant, to its future maintenance in relation to activities such as periodic inspections and the renewal of components once they reach the end of their design life, where significant effects are likely to occur.

3.8 References

REF 3-1	Road Investment Strategy: for the 2015/16 – 2020/21 Road Period. Department for Transport (2015). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf
REF 3-2	Planning application PL/2015/51409/PPOL. Extra MSA Group. Available at: https://publicaccess.solihull.gov.uk/online-applications/simpleSearchResults.do?action=firstPage (accessed November 2018).
REF 3-3	Highways England Environment Strategy 2017 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/605063/Environment_Strategy__21___.pdf
REF 3-4	National Policy Statement for National Networks. HMSO (2014).
REF 3-5	National Planning Policy Framework. Department for Communities and Local Government (2018).