M5 Junction 10 Improvements Scheme

Environmental Statement

Chapter 2 - The Scheme

TR010063 - APP 6.2

Regulation 5(2)(a)

Planning Act 2008

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

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

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

6.2 Environmental Statement: Chapter 2 - The Scheme

(Tracked Change Version)

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2. The Scheme

2.1. Scheme overview and the need for the Scheme

2.1.1. The infrastructure works under consideration in this Environmental Statement (ES) comprise the following elements which are, or are related to, changes to the Strategic Road Network (SRN) and together make up the Scheme:

- An all-movements junction at M5 Junction 10 (Scheme element 1)[1].
- A new West Cheltenham Link Road east of Junction 10 from the A4019 to the B4634 (Scheme element 2)[2].
- Widening of the A4019 to the east of Junction 10, including a bus lane on the A4019 eastbound carriageway from the West Cheltenham Fire Station to the Gallagher Junction (Scheme element 3)[3].

2.1.2. An overview of the proposed infrastructure improvement elements that make up the Scheme are illustrated in Figure 2-1 (provided in Appendix 1.3 (application document TR010063/APP/6.15)). More detailed figures showing the Scheme are provided in the General Arrangement Plans (application document TR010063/APP/2.9). The location of the Scheme relative to the nearest urban areas of Cheltenham and Gloucester is shown in Figure 2-2. Locations of the Joint Core Strategy (JCS) strategic allocated sites (two sites) and the safeguarded land (two areas) are shown in Figure 2-3.

2.1.3. The need for the Scheme has been developed from the limitations of the existing M5 Junction 10, and the identification in the JCS of land for development adjacent to the existing junction.

- The existing M5 Junction 10 only provides access and egress to and from the north, with no connectivity to M5 south; this causes existing traffic to cross Cheltenham through various routes to access and leave the M5 from the south using other M5 junctions. This contributes significantly to existing traffic flows across Cheltenham, with significant congestion at peak times.
- Upgrading M5 Junction 10 to an all movements junction has been identified[4] as a key infrastructure requirement to enable the housing and economic development allocated in the JCS and proposed by the Gloucestershire Local Enterprise Partnership's (GFirst LEP) Strategic Economic Plan. The Scheme is also central to the transport network sought by Gloucestershire County Council (GCC) (Host Authority) in the adopted Gloucestershire Local Transport Plan. The provision of the Link Road will further ease congestion in the town.

2.1.4. Further detail on the need for the Scheme is set out as part of the Scheme Background section (Section 1.1) of Chapter 1 – Introduction (application document TR010063 – APP 6.2).

2.2. Scheme objectives

2.2.1. The objectives for the Scheme are to:

1. Support economic growth and facilitate growth in jobs and housing by providing improved transport network connections in west and north-west Cheltenham.
2. Enhance the transport network in the west and north-west of Cheltenham area with the resilience to meet current and future needs.

[1] Work No. 2(a) to 2(i). This excludes the slip road and elements deemed to be motorway, plus drainage, which are covered under Work No. 1(a) to 1(o).
[2] Work No. 5(a) to 5(n).
[3] Work No. 3(a) to 3(d) for the A4019 to the west of J10, and Work No. 4(a) to 4(y) for the A4019 to the east of J10.
[4] The Transport Strategy for the adopted JCS (2017) identifies the need for all movements M5 Junction 10 (alongside a range of other transport improvements) to mitigate the cumulative impacts on the transport network of all development proposed by the JCS.

3. Improve the connectivity between the SRN and the local transport network in west and north-west Cheltenham.
4. Deliver a package of measures which is in keeping with the local environment, establishes biodiversity net gain and meets climate change requirements.
5. Provide safe access to services for the local community and including for users of sustainable transport modes within and to west and north-west Cheltenham.

2.3. Existing environment

2.3.1. This section provides a summary of the existing environment within the Order limits for the Scheme (the “Scheme area"); and the areas outside of the Order limits which are relevant to the environmental assessments presented in Chapters 5-15 of this ES, for example areas designated for ecological, landscape or heritage value. Noting that the M5 motorway, Junction 10 and the A4019 are existing infrastructure within this environment.

2.3.2. The landscape within which the Scheme is located is predominantly rural in nature, with the land use being a combination of arable and areas of grazing pasture (of Grade 3a (good) to Grade 3b (moderate) agricultural value). Traditional orchards are widespread, and the area also contains important areas of lowland meadow and floodplain grazing marsh. The Cotswolds Area of Outstanding Natural Beauty (AONB) is located 6 km to the east of M5 Junction 10, with the Cotswold scarp rising from the broad Severn Vale immediately to the east of Cheltenham.

2.3.3. Multiple watercourses cross the Scheme area, notably the River Chelt, Leigh Brook, and River Swilgate. The River Chelt and Leigh Brook flow from east to west across the Scheme area, forming tributaries to the River Severn, which they join at least 7.5 km downstream of where these watercourses leave the Order limits. The River Swilgate flows north-westwards to its confluence with the River Avon at Tewkesbury (which then joins the River Severn). The estuary of the River Severn is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI), reflecting its international biodiversity value and protecting it as an estuarine habitat supporting a wide range of important habitats and birds. From where the River Chelt joins the River Severn (>7.5 km downstream of the point that the River Chelt leaves the Order limits), the Severn Estuary designations are a further 40 km downstream.

2.3.4. The area to the north of the A4019 and east of the M5 is affected by surface water and river flooding. Land just south of the A4019 and extending either side of the existing M5 Junction 10 contains the floodplain for the River Chelt and falls within Flood Zones 2 and 3, where medium and high probability of flooding is recognised. To the immediate north of the A4019 is the floodplain of the Leigh Brook, an ordinary watercourse. This is not included in Flood Zone 3 but is known to flood. There is also land in Flood Zone 3 near Stoke Orchard, to the north-east of M5 Junction 10, associated with the River Swilgate and its tributary Dean Brook.

2.3.5. There are two groundwater bodies (designated under the Water Framework Directive) within the Scheme area, namely the Severn Vale - Secondary Combined, and the Warwickshire Avon - Secondary Mudrocks. Further details on both of these is presented in Chapter 8 – Road Drainage and the Water Environment (application document TR010063 – APP 6.6), with locations presented in Figure 8-3.

2.3.6. The dominant arable and grassland habitats are interspersed with pockets of other terrestrial habitats, notably broadleaved and mixed plantation woodland, traditional orchards, and unimproved and semi-improved neutral grassland. Along with the watercourses, these areas provide the sites of greater nature conservation value within the Scheme area. There are two SPAs within the National Character Area (Severn Estuary SPA and Walmore Common SPA (17.5 km south-west of the Order limits)), designated for their internationally important populations of wintering wildfowl, including Bewick’s swan and shelduck.

2.3.7. The Wye Valley and Forest of Dean SAC, located 21 km south-west of the Order limits is designated for bats, and Cotswold Beechwoods SAC is 7.4 km south of the Order limits

and designated for its deciduous woodland. Coombe Hill Canal SSSI is a disused canal designated for its groups of nationally rare and scarce invertebrates and nationally scarce ~~plants, and~~plants and is located 1.9 km north-west of the Order limits. At least five species of bat have been recorded within the Order limits. Preliminary studies have identified bat roosting sites in buildings and trees within the Order limits.

2.3.8. There is one area of known historic landfill within the Order limits, at Colmans Farm, located to the north of the M5 Junction 10 adjacent to the motorway.

2.3.9. There is one statutory designated air quality management area (AQMA) close to the Scheme, located in Cheltenham Town Centre; and areas designated as noise important areas (NIAs) along the A4019 and the M5 within the Order limits.

2.3.10. There are 31 designated heritage assets within 1km of the Order limits as well as 65 non-designated heritage assets. The most notable of these in terms of being potentially impacted by the Scheme are the Moat House, a moated site close to the A4019 in Uckington which is a Scheduled Monument, two Grade II listed buildings to the north of the A4019 (also in Uckington), and three Grade II listed buildings at Withy Bridge (on Withybridge Lane halfway between the A4019 and the B4634). Previous investigations have identified the likelihood of buried archaeology across the Scheme area.

2.3.11. The greatest concentrations of private residential properties and community facilities relative to the Scheme are found in the larger settlement of Cheltenham (overlapping with the eastern end of the Scheme area), and the villages Staverton and Boddington to the west, Hayden and Staverton to the south, and Elmstone Hardwick to the north. With the exception of the north-west edge of Cheltenham, all of these settlements are outside the Order limits. The only settlement fully within the Order limits is Uckington, which is spread either side of the A4019 approximately halfway between Cheltenham and the M5. In addition to Uckington there are several clusters of properties within the Order limits, notably the clusters of properties at Withybridge Gardens and Stanboro Lane (also known as Piffs Elm Lane), adjacent to the south-east and north-west of the existing M5 Junction 10 respectively.

2.3.12. An area of land is currently occupied by travellers, adjacent to the southbound carriageway of the M5, approximately 400 m north of Junction 10, and just outside of the Order limits. For ease of reference, throughout this ES this area of land has been termed ‘informal Traveller site’. For the purposes of this ES it has been assumed that this informal Traveller site, which is deemed by Tewkesbury Borough Council (TBC) be an illegally occupied site, will be occupied during the construction and operation of the Scheme.

2.3.13. There are a number of public rights of way (PRoW) that intersect with the Order limits. The M5 and A4019 currently act as barriers, limiting or funnelling movement for walkers, cyclists and horse riders (WCH). Access across these transport corridors is therefore interrupted and the position of existing crossing infrastructure, which includes footbridges and subways, is likely to have shaped the preferred routes of WCH for recreation and commuting within the Scheme area. There is little public green space due to the predominance of agricultural activity in the rural parts of the wider area in which the Scheme is located. Much of the land is designated as Green Belt.

2.3.14. The climate of the wider area in which the Scheme is located is typified by relatively mild winters and warm summers with higher than UK average mean and maximum monthly temperatures. The long-term average monthly rainfall is lower than the UK average (based on 1981 – 2010 data), as are the average number of days in which heavy rainfall was experienced. In the future it is projected that, on average, this area is likely to experience hotter, drier summers and warmer, wetter winters. Alongside these changes in the average conditions, it is likely that climate change will increase the frequency and severity of extreme weather events such as heavy rainfall, storms and heatwaves.

Environmental constraints and opportunities

2.3.15. An overview of the key environmental constraints, and opportunities is provided below. Further information is presented in the relevant topic chapters of the ES.

- Noise - whilst the Scheme area is predominantly rural there are clusters of residential properties throughout. Many of these lie within designated NIAs which have been established due to traffic on the A4019.
- Air quality - there is one statutory designated AQMA close to the Scheme, but outside of the Order limits. The Scheme will result in changes to traffic flows through west Cheltenham and may have the potential to alter the air quality impacts, and also the noise impacts associated with the resultant changes in traffic flows on the road network. Air quality and noise modelling has been undertaken to understand the potential impacts. Further details are presented in Chapter 5 – Air Quality (application document TR010063/APP/6.3) and Chapter 6 – Noise and Vibration (application document TR010063/APP/6.4) of this ES.
- Biodiversity - there is confirmed evidence and records for the presence of protected and notable species within the Scheme area, including bats, badgers, dormice, otter, great crested newts, terrestrial invertebrates and 31 species of birds. There are opportunities available therefore to enhance the value of land within the Scheme area for biodiversity. An extensive programme of field surveys has been undertaken to understand the presence (or absence) of protected species and habitats within the Scheme area. Further details are presented in Chapter 7 - Biodiversity (application document TR010063/APP/6.5) and its supporting appendices. An assessment of the ability of the Scheme area to provide a net gain in biodiversity has also been undertaken (against the Defra 3.0 metric). Further details are provided in Section 2.7 and Appendix 7.18 (application document TR010063/APP/6.15).
- Flooding - the low lying nature of the Scheme area and the presence of multiple watercourses means that much of the area is floodplain and subject to numerous flooding issues. All parts of the Scheme are likely to have an element of exacerbated flooding and have required appropriate mitigation in the design. Detailed modelling and assessment has been undertaken to understand the baseline flood environment for the Scheme and the potential change in flooding and flood risk. Further details are presented in Chapter 8 – Road Drainage and the Water Environment (application document TR010063/APP/6.6), and the flood risk assessment in Appendix 8.1 (application document TR010063/APP/6.15).
- Historic environment - there are known above ground structures of historic importance within the Scheme area, and the potential for buried archaeology. Opportunities are available as a result of the Scheme to improve current understanding of the buried archaeology within the Scheme area as a consequence of the further investigation work (comprising geophysical investigation and archaeological evaluation) that will be conducted in advance of construction works. Further details are presented in Chapter 11 – Cultural Heritage (application document TR010063/APP/6.9).
- Access – there are public rights of way (PRoWs) crossing and intersecting with the Scheme area. Access to fields to the north and south of the A4019 is currently from the A4019 and Withybridge Lane. Some of these accesses will be impacted by the widening of the A4019 and the construction of the Link Road.

2.4. Scheme location

2.4.1. The M5 links the Midlands with the South West, running from Junction 8 of the M6 at West Bromwich near Birmingham to Exeter in Devon, and linking with the M4 north of Bristol. Junction 10 (of the M5) is located 76 km to the south of Birmingham, 64 km to the north of Bristol, 8 km to the south of Tewkesbury, 6.5 km to the north-west of Cheltenham, and 12 km to the north-east of Gloucester.

2.4.2. The junction is in a strategically important location for the region, particularly as northern and western Cheltenham are the sites of a number of large retail parks and employment

areas, and the location of planned future housing and nationally significant business development.

2.4.3. The location of M5 Junction 10 is shown in Figure 2-2.

Figure 2-1 - The permanent footprint of the Scheme

Figure provided in Appendix 1.3 (application document TR010063/APP/6.15).

Figure 2-2 - Location of the Scheme

2.4.4. The locations of the proposed infrastructure improvements that make up the Scheme, the JCS site allocations (the North West Cheltenham Development Area, and the West Cheltenham Development Area) and the safeguarded land to the north-west and west of Cheltenham are illustrated in Figure 2-3.

2.4.5. The JCS site allocations (the North West Cheltenham Development Area and the West Cheltenham Development Area) are referred by their respective developers as the Elms Park and the Golden Valley ~~developments :~~developments:

- Elms Park (North West Cheltenham) – to the north of the A4019: mixed use development of up to 4,285 new homes, business park, retail and community facilities, transport hub and public transport interchange, schools and new areas of green infrastructure. An outline planning application for the development was submitted to Tewkesbury Borough Council (TBC) in 2016 (ref. 16/02000/OUT).
- Golden Valley (West Cheltenham) – to the south of the B4634: mixed use development for 2,371 homes and 45 ha. of employment land, including community facilities, a primary school, green infrastructure, formal and informal public open space, and sports pitch provision. An outline planning application for the development was submitted to Cheltenham Borough Council (CBC) in 2022 (ref. 22/01817/OUT).

The Order limits for the Scheme overlap with these areas as follows:

- Where access points are included as part of the Scheme, there is overlap with: the southern edge of the North West Cheltenham Development Area and the north-western edge of the West Cheltenham Development Area.
- Where mitigation measures for the Scheme have been developed, which also fit

with the built development proposal for the areas, there is overlap with: the southern edges of the North West Cheltenham Development Area, and the safeguarded land to the north-west of Cheltenham.

The Scheme does not overlap with the safeguarded land to the west of Cheltenham.

Figure 2-3 - Location of the Scheme elements (M5 Junction 10 Improvements, A4019 Widening, and the Link Road to West Cheltenham), the allocated land at West and North-west Cheltenham (light blue areas on the figure), and the safeguarded land areas at north-west and west Cheltenham (dark blue areas on the figure). (Safeguarded land is land which has been identified for development in the future and is protected from conflicting development).*

2.5. Scheme description

2.5.1. The elements that make up the Scheme are illustrated in Figure 2-1 (provided in Appendix 1.3 (application document TR010063/APP/6.15). A description of the three key elements, namely M5 Junction 10, the Link Road, and the A4019 Widening is presented below. More detailed figures showing the preliminary design (DF3) of the Scheme (including the highway alignment extents) are provided in the General Arrangement Plans (application document TR010063/APP/2.9). The boundary of the works has been drawn with reference to the development consent order (DCO) limits of deviation (LoD) (as shown in the Works Plans (application document TR010063/APP/2.4) and draft DCO (application

document TR010063/APP/3.1) and applied the 'Rochdale Envelope' to allow for any further design refinement and development during the detailed design of the Scheme (further detail provided in Chapter 4 on this). In summary, a vertical LoD of +0.5m and -1m has been applied for the development shown on the General Arrangement Plans (application document TR010063/APP/2.9), except for the flood storage area where a vertical LoD of -2m and any distance upwards to ground level has been applied. The environmental mitigations that apply to the height of the River Chelt bridge above the river (2.8m between the underside of the bridge and the top of the riverbank, to allow for the passage of floodwater and bats), and the Withybridge underpass (minimum internal cross section of 5m wide by 4m high, to allow for the passage of bats, and the use of the underpass by equestrians), mean that no negative vertical deviation can be applied to these two structures. The lateral LoD for the development is as shown on the Works Plans (application document TR010063 – APP 2.4).

2.5.2. In addition to the three key elements of the Scheme described below, the General Arrangement Plans (application document TR010063 – APP 2.9) show the proposed locations of the Scheme's drainage features, lighting, fencing and signage, as well as details of bus stops and crossing points for pedestrians and cyclists. The design strategy for these items is the same across all three key elements for the Scheme. A summary of the design strategy for these Scheme wide items is presented below.

Scheme wide items

Drainage

2.5.3. The surface water drainage strategy for the Scheme seeks to replicate the existing hydrology within the Scheme area through sustainable urban drainage systems (SuDS) principles. The drainage design for the upgraded and new carriageway sections consists of gravity drainage networks, which convey flows to suitable outfalls via new attenuation basins. Full details of the drainage strategy are presented in Appendix 2.1 of this report and Appendix 2.2 (figures) (application documents TR010063 - APP 6.15).

2.5.4. The proposed collection system for rainwater runoff from the M5 motorway carriageway is offset gullies which connect to carrier drains. For other sections along the A4019, top entry gullies are provided. For the Link Road, swales and filter drains serve as the collection systems. For the B4634, a combination of both swales and top entry gullies are provided. Pre-earthworks ditches and filter drains would be provided to serve highway earthworks slopes.

2.5.5. The locations of the attenuation basins (and the access tracks to them) are provided in the General Arrangement Plans (application document TR010063 - APP 2.9).

Lighting

2.5.6. The lighting design for the Scheme will use directional full cut-off Light Emitting Diode (LED) luminaires at a 12m mounting height to illuminate the carriageway to standard and minimise light spill on the surrounding areas. The proposed LED luminaires have a warm white appearance for environmental reasons and will have an option to be dimmed using GCC's Central Management System. Details of the lighting extents within each element of the Scheme are described in the respective sections below.

Fencing

2.5.7. The outer extents of the highway corridor will be fenced, typically with post and rail fencing, although the final detail at each location will be dependent on the functional requirements and its context (e.g. agricultural area accommodation works fencing may need to be stock proof).

2.5.8. Badger resistant fencing will be provided along much of the Link Road section of the Scheme, with short sections of otter specific fencing to funnel otters towards safe crossing points beneath the River Chelt overbridge. Stock proof fencing will be provided at badger crossing points to prevent access to crossing points by agricultural livestock (particularly

lambs). The specification for badger fencing proposed is as shown in National Highway's Design Manual for Roads and Bridges (DMRB). Otter fencing will generally be as badger fencing with the addition of an overhanging crank on the outer face of the fencing where specific otter mitigation is required.

2.5.9. Where a badger or otter fence demarcates the highway boundary, a maintenance strip will be acquired for the highway authority to maintain the fence from the landowner side.

Signage

2.5.10. New road signage and markings will be installed across the Scheme to ensure route legibility for road users travelling on new and improved sections of the road network. As the Scheme will involve modifications to both the strategic and local road network, the road signage strategy has been agreed with GCC (Applicant) and other stakeholders to ensure continuity is achieved along the M5 and other route corridors. Where existing signs do not conform to the new Scheme layout, these will be removed and replaced with new signage containing updated information.

2.5.11. Advance direction signs will be provided at appropriate distances ahead of junctions to provide drivers with information about road layout ahead. These will be supplemented with direction signs placed at the junctions.

2.5.12. Clearway signs will be placed along the A4019 from the western extent of the Scheme through to the Kingsditch roundabout (north-west Cheltenham). No U-turn signs will be placed along the A4019 from its junction with Withybridge Lane to the Kingsditch roundabout, which will represent an extension to the existing no U-turn restrictions.

2.5.13. New and modified sections of road will be permanently marked using a combination of road markings and road studs to improve driver understanding of the new road layout.

2.5.14. Details for signage are shown in the General Arrangement Plans (application document TR010063 – APP 2.9). However, it is noted that the exact locations for the signs will be determined at detailed design and can be moved from the positions shown in the preliminary design to allow for specific environmental constraints, such as trees.

Crossing points for pedestrians and cyclists

2.5.15. The new signalised junctions on the A4019 and the Link Road, and on the new gyratory roundabout at M5 Junction 10 will include dedicated crossing points for pedestrians and cyclists.

2.5.16. Advanced stop lines for cyclists have not been included at the new junctions on the A4019 as part of the Scheme. LTN 1/20[5] recommends against advanced stop lines when the traffic flows, number of lanes and proportion of green time expected are similar to those that will be found on most parts of this Scheme.

Bus stops

2.5.17. The locations of the existing bus stops along the A4019 were reviewed with the following changes made as a result of the Scheme:

- Stanboro lane bus stops (west of Junction 10) will not be re-provided due to the limited number of properties at that location and the proximity of the Gloucester Old Spot bus stops to the west, which will be retained.
- Withybridge Lane bus stops will not be re-provided due to the removal of all existing properties at that location.
- Cooks Lane bus stops were proposed to be re-provided to the east of their current location so that they combine with the Uckington bus stops approximately mid-way between the two existing sets of bus stops. However, a further review following the

[5] LTN 1/20 Cycle infrastructure design. Guidance for local authorities on designing high-quality, safe cycle infrastructure. Department for Transport, July 2020.

statutory consultation stage concluded that these bus stops would be better located closer to Uckington and the proposed signalised crossing facilities. The preliminary design has them (the eastbound and westbound stops) located as in lane stops just to the east of the junction of The Green and the A4019 in Uckington. Pedestrian access is provided to both from the signalised junction in Uckington.

- Bus stops adjacent to the Elms Park development are to be re-provided and will be located between Site Access A and Site Access B. Pedestrian access is provided to both from the signalised junction at Site Access A. Pedestrian access will also be possible to the westbound stop from the adjacent access road, through a gap in the noise barrier.
- The existing bus stops at the eastern extents of the Scheme (to the east of the Gallagher Junction) will be re-provided. These bus stops would be adjacent to the Sainsburys store. The bus stopping points will be in lane stops with canopied shelters. The shared use path running along both sides of the A4019 (between the Gallagher Junction and the eastern extent of the Scheme), will pass to the rear (non-road side) of these bus stops.

2.5.18. The proposed bus stops adjacent to the Elms Park development are considered the most likely to have high usage due to the suitability of this location to serve the Elms Park development. The bus stop on the westbound A4019 will be a lay-by type bus stop, whereas the one on the eastbound A4019 will be an in lane bus stop (in the bus lane).

Scheme key elements

M5 Junction 10 (Work No. 2(a) to 2(i))

2.5.19. The proposed improvements to M5 Junction 10 are to increase the capacity of the junction, and to upgrade the current restricted movements junction to an all-movements junction. To enable travel both south and north on the M5, the two existing Junction 10 sliproads will be removed, and four new slip roads will be constructed to provide access and egress to the M5 in all directions.

2.5.20. Two new overbridges (Piffs Elm Interchange Bridge North and Piffs Elm Interchange Bridge South) will be constructed over the M5, centred either side of the existing Piffs Elm Interchange Bridge (carrying the A4019 over the M5), which will then be demolished. The new overbridges will create a new elongated roundabout junction over the M5. Both bridges will be a single span steel composite multi girder bridge construction with a diaphragm connected to sleeved column foundations, and with reinforced earth wingwalls. The single span avoids a requirement for a support pillar in the central reservation.

- Piffs Elm Interchange Bridge North - a clear span of 38.5m (between the front faces of the abutments) across the M5. Bridge deck will be 24m wide, and incorporates the cycleway and footway along the north side of the bridge.
- Piffs Elm Interchange Bridge South - a clear span of 38.6m (between the front faces of the abutments) across the M5. Bridge deck will be 18m wide. The south bridge is narrower as it does not have the cycleway and footway that is included as part of the north bridge.

2.5.21. The A4019 will be realigned to provide an appropriate entry grade and angle to the new roundabout. A dedicated route for cyclists and pedestrians will be provided at grade through the junction (see the section below on the A4019 Widening). As a result of the new slip roads, the Piffs Elm culvert and the Leigh Brook culvert (also referred to as the Barn Farm culvert), that pass under the M5, will be extended by 100.2m and 16.4m respectively. The alignment of the new southbound on and northbound off slip roads means that an extension of the River Chelt culvert under the M5 will not be required. The speed limit along the A4019 across the new roundabout will be 50mph. The national speed limit for motorways will apply on the new slip roads. The new roundabout, and the approaches to it (from the motorway and the A4019) will be lit.

2.5.22. The creation of new north facing slip roads means that the existing 53.5m long culvert for the Leigh Brook underneath the M5 to the north of Junction 10 will be extended at either end, to a total of 69.9m in length. The riverbanks 200m downstream of the culvert will be

reprofiled and planted with appropriate vegetation to improve hydromorphological and ecological diversity. The new south facing slip roads will not extend far enough south to require an extension of the River Chelt culvert, although the river banks 100m upstream and downstream of the culvert will be reprofiled and planted to improve hydromorphological and ecological diversity of this section of the River Chelt.

2.5.23. The existing retaining wall to the south side of the A4019, immediately to the east of the M5, will be demolished. The section of the existing northbound onslip that is outside of the footprint of the new embankments for the A4019, roundabout and the northbound offslip, will not be removed. Holes will be created in the pavement surface, with the pavement and sub-base left in-situ.

2.5.24. Highway drainage from the new slip roads and roundabout will be to two new attenuation basins located to west of the M5, to the north and south of the junction (and shown on Figure 2-1, as provided in Appendix 1.3 (application document TR010063 – APP 6.15).

2.5.25. The embankment to the north of the A4019, and west of the M5 will be steepened to enable an area of priority habitat along the north side of a section of Stanboro Lane to be retained. The existing crib wall retaining wall in this location will be demolished.

2.5.26. A new access track will be created to the northeast of the M5 Junction 10, as a replacement for the existing access points to the field areas and the informal Traveller site, that have been lost as a result of the new southbound off-slip. This is also shown in Figure 2-1 (provided in Appendix 1.3 (application document TR010063 – APP 6.15).

2.5.27. Public footpath ABO14, that is located to the west of the M5 and south of the A4019, will be rerouted via the access track from the attenuation basin number 3 to intersect with the A4019 at a point just west of the junction of Stanboro Lane and the A4019.

2.5.28. The public footpath through the River Chelt culvert (ref. ABO16 part 2) will be retained as part of the completed Scheme.

2.5.29. To the southeast of the M5 Junction 10, an area of land will be reprofiled by the excavation of material. This area will provide flood storage for the Scheme, and compensation for the loss of flood storage from construction of the Scheme. The land adjacent to (and surrounding) the excavated area will be landscaped to provide a mix of habitats to support biodiversity enhancements within the Scheme. Collectively the excavated area and the landscaped area are referred to as the 'flood storage area' (Work No. 7). The preliminary design for the flood storage area is provided in the Environmental Masterplan (application document TR010063 – APP 2.13). Note that two other areas are included in the design for flood compensation (and described in the section reviewing the West Cheltenham Link Road).

2.5.30. Whilst the final layout for the flood storage area will be determined at detailed design stage, the layout selected will provide the following design parameters:

- Excavation to no deeper than the Piffs Elm culvert, with capacity to store 190,298m^3 of floodwater.
- To provide a sufficient level of flood storage within the parameters of a 1 in 100 year flood event with a 53% climate change allowance.
- The outfall from the attenuation basin adjacent to the flood storage area (attenuation basin number 4) will provide a regular supply of water into the excavated area (from highway drainage that has been treated through the attenuation basin). This will supply a permanent body of water located between the outfall from the attenuation basin and the Piffs Elm culvert, which will be created by excavating to a greater depth than Piffs Elm culvert. This permanent body of water will not affect the flood storage capacity of the excavated area.

2.5.31. A structure for roosting bats has been included within the flood storage area, to provide mitigation for the loss of roosting sites within the Scheme area.

2.5.32. An underpass (the 'Withybridge (A4019) underpass') will be constructed under the A4019 immediately to the east of Junction 10 to provide a traffic free route for bats to cross under the A4019, as well as pedestrians, cyclists and equestrians. The underpass will be constructed from two precast concrete U-sections to provide a clear opening of 4m height and 5m width, and with wingwalls and a headwall at either end, and a total length of 55m. Physical measures will be in place to prevent vehicular access through the underpass. The underpass will be lit during the day, with the lights switched off between sunset and sunrise. Bridleway ref. AUC1 will be extended through this underpass from its current end point to the north of the A4019, to the south side of the A4019 at Withybridge Lane.

2.5.33. Works to install signage and technology equipment will be undertaken along the M5 to the north and south of Junction 10. The exact locations of these works will be determined at detailed design and will be limited to works at discrete locations in the existing highway verge (for the installation of new signage for example) or the installation of cabling along the edge of the existing motorway. The specific locations of the signage and cabling works is not fixed at this stage and will be determined at detailed design stage, subject to ecological investigations to ensure that specific impacts (to badgers for example) are avoided.

West Cheltenham Link Road (Work No. 5(a) to 5(n))

2.5.34. The Link Road element of the Scheme comprises a new single carriageway 1.4km in length, between the B4634 to the A4019, designed to provide greater connectivity between the reconfigured M5 Junction 10 and the West Cheltenham Development Area (shown in Figure 2-3). The Link Road has a segregated cycleway (3m in width) and footway (2m in width) all the way along its west side. The speed limit on the Link Road will be 50mph, reducing to 40mph at the junction with the B4634.

2.5.35. The Link Road crosses predominantly agricultural land. The design of the Link Road includes flood mitigation structures across the floodplain to the north of the River Chelt, and a single span bridge over the River Chelt. The bridge construction will be a single span precast beam bridge with integral full height reinforced concrete abutments, resting on a piled foundation (comprising 1m diameter bored concrete pile). The bridge will cross the River Chelt at an angle, with the bridge abutments set back from the riverbanks by a minimum of 4m on each side of the river. As the abutments will also be on an angle to the riverbank, then at some points the abutments will be greater than 4m from the riverbank.

2.5.36. The bridge will have a clear span of 24m between the front faces of the abutments (equivalent to a 24.9m skew span), and the bridge deck will be 20.8m wide. The clearance underneath the bridge (between the underside of the bridge and the top of the riverbank) will be 2.8m. This clearance provides sufficient space for floodwater to pass underneath the bridge in the 1% annual exceedance probability event (1 in 100-year return period) including an allowance for climate change (+53% in flow) with a minimum of 600mm freeboard to soffit.

2.5.37. The clearance underneath the bridge, and the space between the riverbank and bridge abutments will also allow access for small vehicles and livestock along either riverbank at this point, as well as the PRoWs described below.

2.5.38. In order to ensure that access under the River Chelt bridge is maintained, a short section of hard bank protection, such as rip-rap or non-biodegradable geotextile, will be installed along both banks of the River Chelt underneath the River Chelt bridge.

2.5.39. Flood mitigation structures will be provided underneath the Link Road at two locations between the River Chelt and the A4019. These are to ensure that the Link Road does not impede the natural movement of floodwater from the River Chelt north-westerly from a point upstream of the proposed River Chelt bridge. The flood mitigation structures will comprise two groups of precast concrete box culverts, laid on top of 1m of imported granular fill material:

- Group 1: eighteen 3m span x 1.25m clearance box culverts; with one 6m span x

2m clearance box culvert to accommodate a field drain. All culverts will be 31.85m in length and laid perpendicular to the carriageway, with the total group being 63.9m in length parallel to the carriageway.

- Group 2: eighteen 3m span x 1.25m clearance box culverts. The culverts will be 37.4m in length perpendicular to the carriageway, with the total group being 70.9m in length parallel to the carriageway. Group 2 will be located approximately 70.5m south of Group 1.

2.5.40. Two areas for flood compensation are included as part of the design:

- Immediately to the east of the Link Road, and to the north of the River Chelt (Work No. 5(n)).
- To the west of the Link Road, between Withybridge Lane and the Link Road, and to the south of the River Chelt (Work No. 6(d)).

2.5.41. There are two existing PRoWs running east/west across the line of the Link Road:

- The line of the PRoW (ref. ABO24) that runs to the south of the River Chelt will not be affected by the Scheme, with the PRoW crossing underneath the River Chelt bridge along the south side (left bank) of the river.
- The PRoW (ref. AUC11) running to the north of the River Chelt will be realigned at the point where its alignment crosses the Link Road, so that it crosses under the River Chelt bridge along the north side (right bank) of the river.

2.5.42. Two new junctions will connect the Link Road with the existing A4019 (to the north) and the B4634 (to the south):

- A4019 - a four-arm signalised junction with the northern arm ultimately providing access to the proposed developments to the north of the A4019, as safeguarded in the JCS (referred to in this ES as the safeguarded land to the north-west of Cheltenham). Within the design of the Scheme, the northern arm provides for field access and the informal Traveller site only. The design of this northern arm to enable access into the safeguarded land will be undertaken by the relevant developer. Pedestrian and cycle access over this junction will be incorporated into the signal phasing for this junction.
- B4634 - a new four arm signalised junction on the B4634 to connect the proposed West Cheltenham Development Area to the M5 Junction 10 via the Link Road and the A4019. This junction will be located close to Hayden Hill Farm on the B4634, and approximately 300m east of the junction for Withybridge Lane. The existing culvert underneath the B4634 adjacent to this junction will be modified as a result of the widening of the B4634 in the approach to the junction, and to address potential flooding to the south of the B4634. The existing box culvert will be removed and replaced by three longer 0.8m diameter box culverts (2.1m in length).

2.5.43. Street lighting along the Link Road will be limited to the two new junctions and the sections of the Link Road adjacent to the junctions.

2.5.44. Highway drainage from the Link Road will outfall via two new attenuation basins located at the northern and southern end of the Link Road (and shown on Figure 2-1) provided in Appendix 1.3 (application document TR010063 – APP 6.15). The attenuation basin at the northern end of the Link Road also receives highway drainage from the A4019.

2.5.45. New field access routes off the Link Road will be included in the Scheme as replacements for the existing access points that have been lost as a result of the creation of the Link Road. These are also shown in in Figure 2-1, provided in Appendix 1.3 (application document TR010063 – APP 6.15).

2.5.46. At the southern end of Link Road, the Scheme extends east and west along the B4634 either side of the new junction (with the Link Road). The speed limit on the section of the B4634 within the Scheme will be 40mph.

- To the west of the junction, the Scheme will provide a parallel cycle and pedestrian

crossing of the B4634, incorporated into the signalised junction, to allow the future continuation of the proposed cycling and pedestrian route into the West Cheltenham Development Area.

- The B4634 will be widened to the south of its existing alignment to allow for the provision of a 2m wide shared use path along the northern verge through to the junction of the B4634 and Withybridge Lane. This will provide a connection between the walking and cycling provision on the Link Road and Withybridge Lane.
- From the new signalised junction with the Link Road, the B4634 will continue westwards as a 7.3m wide single carriageway and tie into the existing B4634 at its junction with Withybridge Lane.
- To the east of the new signalised junction, the B4634 will also be widened to the south of the existing road before continuing to its tie in as a 7.3m wide single carriageway, just to the east of the access with Hayden Hill Fruit Farm.

A4019 widening (Work No. 3(a) to 3(d) for west of J10, and Work No. 4(a) to 4(y) for east of J10)

2.5.47. The A4019 links the M5 Junction 10 to north-west Cheltenham. Currently, the A4019 is a dual carriageway over the M5 Junction, returning to single carriageway east of the junction to serve the turning into Withybridge Lane. The A4019 continues eastwards to Cheltenham as a single carriageway, where it ties into an existing dual carriageway at the Gallagher Retail Park.

2.5.48. The section of the A4019 covered by the Scheme runs from just west of the M5 Junction 10 (at the junction of Stoke Road and the A4019) eastwards through to the existing dual carriageway at the Gallagher Retail Park (finishing just east of the junction of the B4634 and A4019).

2.5.49. As part of the highway improvements incorporated into the Scheme, the A4019 will be widened to a two-lane dual carriageway from Withybridge Lane, eastwards through to the Gallagher Retail Park, where the Scheme will tie into the existing dual carriageway. Widening of the A4019 through Uckington will be predominantly to the southern side of the A4019. Widening to the east and the west of Uckington will be to the northern side of the A4019. To the west of Junction 10 the existing section of two-lane dual carriageway will be replaced with single lanes.

2.5.50. The elevation of the A4019, in the vicinity of the Withybridge Lane junction, will be raised to remove an existing low point that experiences surface water flooding currently. Existing culverts under the A4019 in this location will be removed.

2.5.51. The following changes will be made to the existing junctions on the A4019, alongside the creation of three new junctions. For residents and businesses whose current access is directly onto the A4019 (for example those in Uckington, and along the southern side of the A4019 in north-west Cheltenham), short sections of new access roads will be created alongside the widened A4019 to facilitate ease of access both westbound and eastbound and will join the A4019 at signalised junctions. Details are shown on the General Arrangement Plans (application document TR010063 – APP 2.9).

- Stoke Road – no change made to the existing junction.
- Stanboro Lane – existing junction location retained, with minor changes made to the mouth of the junction. Left and right turning from the junction retained.
- Withybridge Lane – existing junction location retained, but access changed to left turn into Withybridge Lane, and left turn only out onto the A4019.
- Cooks Lane – existing junction closed, with access from Cooks Lane to the A4019 diverted through to the Link Road via a new access road.
- The Green and Moat Lane – modified to form a single signalised crossroads.
- West Cheltenham Fire Station – access for emergency vehicles retained with left and right turning onto the A4019. Access for non-emergency vehicles diverted onto a new access road and joining the A4019 at a new junction (referred to as Site

Access B).

- Homecroft Drive and Sandpiper Drive - existing junctions closed, with access to the A4019 diverted through to the Site Access B junction via a new access road.
- Civil Service Sports Ground – existing junction location retained but changed to a signalised crossroads (the Site Access B junction). For traffic westbound on the A4019, the right turn at this junction will be for buses only.
- B4634 (Hayden Road) – the Gallagher Junction. Existing junction location retained, but with the layout changed. This will become the Site Access C junction into the proposed North-west Cheltenham Development site.

2.5.52. Three new junctions will be created to provide access into the proposed North-west Cheltenham Development site:

- A slip lane – opposite the West Cheltenham Fire Station for eastbound traffic on the A4019 into the North-west Cheltenham Development site.
- Site Access A – a signalised T-junction opposite Homecroft Drive.
- Site Access B – a signalised crossroads incorporating the existing access from the Civil Service Sports Ground. The new access road from the West Cheltenham Fire Station, Homecroft Drive and Sandpiper Drive will feed into the southern arm of this junction.

2.5.53. Street lighting will extend for most of the length of the A4019 within the Scheme boundary. The exceptions will be a section to the east and the west of Uckington where there will be no street lighting so as to provide mitigation for bats.

2.5.54. A speed limit along the A4019 of 50mph is proposed from the western extent of the Scheme through to a point west of Uckington between the junction with the new Link Road and Cooks Lane, where the speed limit will be reduced to 40mph through to the Gallagher junction.

2.5.55. The Scheme will include a segregated cycleway (3m width) and footway (2m width) on the northern side of the A4019, which with the exception of a short section of shared use path through Uckington will extend from the junction of the A4019 with Stanboro Lane in the west through to the Gallagher junction at the eastern end of the Scheme. This active travel corridor will provide connectivity for pedestrians and cyclists between north-west Cheltenham and the junction of the A4019 and Stanboro Lane (west of M5 Junction 10). It will tie into an existing shared use path at the eastern end of the Scheme, and an existing footway at the western end. The layout and design of these facilities for pedestrians and cyclists is shown in the General Arrangement Plans (application document TR010063 – APP 2.9).

2.5.56. Bus gates have been included in the preliminary design at the Site Access A and Site Access B junctions eastbound from the A4019. In addition, a bus lane and a bus gate have been included on the A4019 eastbound, between Site Access A and the Gallagher junction, and eastbound into the Gallagher junction, respectively. Taxis and cycles will also be able to use the bus lane.

2.5.57. Highway drainage from the A4019 will be to three new attenuation basins located:

- At the western end of the A4019 (off Stanboro Lane).
- Adjacent to the Cheltenham West Community Fire Station (on the A4019).
- At the northern end of Withybridge Lane. This attenuation basin will also receive highway drainage from the northern section of the Link Road.

2.5.58. These attenuation basins are shown in the General Arrangement Plans (application document TR010063 – APP 2.9).

2.5.59. Enhancements to existing hedgerows and the creation of new hedgerows will be made in several locations to the north of the A4019 to provide mitigation for dormice found to be present in this area. A new structure will be constructed within the highway boundary to

the north of the A4019 and east of Uckington, for roosting bats, to provide mitigation for the loss of existing roosts.

Land take

2.5.60. The DCO Order limits (also known as the 'red line boundary') are shown on the General Arrangement Plans (application document TR010063 – APP 2.9). This includes the land required for all of the works proposed, comprising the land for the permanent footprint of the Scheme, and the land for the temporary footprint of the Scheme which includes the areas required for construction. These areas of permanent and temporary land take are shown on the Land Plans (application document TR010063 – APP 2.2).

2.5.61. The Scheme will require the acquisition of land outside of the Applicant's existing land ownership boundary to enable it to be built, operated and maintained. Land acquisition is split into three categories, with details shown in the Land Plans (application document TR010063 – APP 2.2):

- Land to be acquired permanently - Outright acquisition where the land taken will be retained in the ownership of the Applicant after the works are complete. Approximately 54.1 ha of land will be taken permanently to build and operate the Scheme (i.e., the areas outside the existing highway boundary but within the proposed highway boundary).
- Land to be used temporarily - The land will be used to build the Scheme and returned to its original owners after construction is complete. Approximately 39.1 ha of land will fall into this category.
- Land to be used temporarily and rights to be acquired permanently - Acquisition of rights where the land will be used to build the Scheme and returned to its original owners after construction is complete, but where rights of access will remain over it for future maintenance operations, or other permanent rights or restrictions will remain. Approximately 41.7 ha of land will fall into this category.

2.5.62. The Applicant is also seeking powers to use land temporarily, pending or in the absence of a need to acquire it permanently. This comprises the areas categorised as 'Temporary land to be re-instated and returned' and 'Temporary land to be modified and returned'. The Order limits covering the sections of the M5 to the north and south of the junction where there are no changes made to the slip roads, embankments and pavement, are for the provision of signage (including electronic displays). These are the areas within the Order limits to the north and south of the blue dashed lines (to the north and south of Junction 10 respectively) in Figure 2-4 below. Within these areas, minor works will be required at discrete locations to create the foundations for the signage and to trim vegetation to provide the required visibility for the signs.

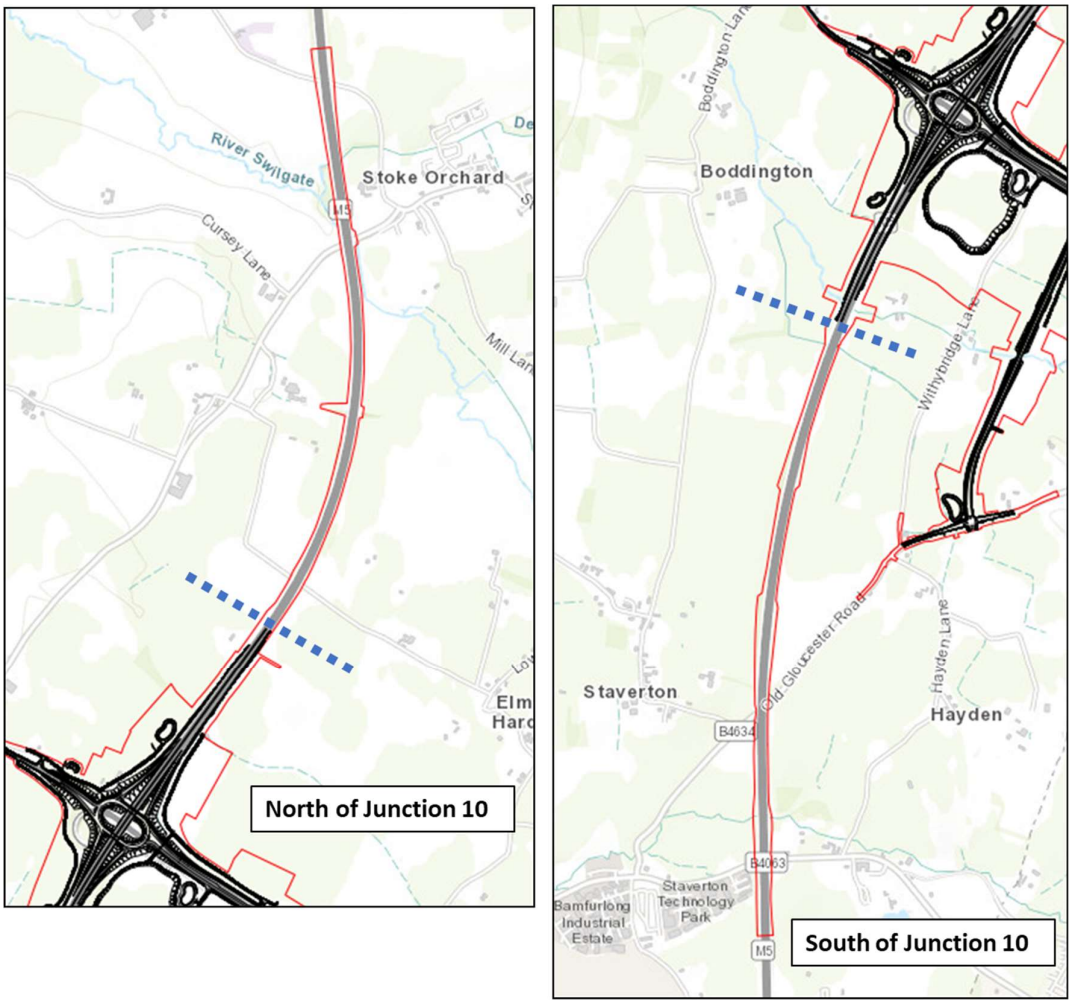


Figure 2-4 - Showing the sections of the M5 that are within the Order limits to the north and south of Junction 10, but do not include any highway alignment works. Scheme works within these areas are limited to the installation of new signage. The blue dashed lines denote the limits of the works on the slip roads, embankments and pavement.

2.5.63. The Order limits covering fields to the west and east of the Link Road, and downstream of Piffs Elm culvert, are required for the following reasons:

- East of the Link Road (to the north of the River Chelt) (Work No. 5(n)) – to provide for an area of flood compensation. Subsoil will be removed and the topsoil replaced, to leave a lower area.
- West of the Link Road (to the south of the River Chelt) (Work No. 6(d)) – to provide for an area of flood compensation. No physical works are planned for the creation of this flood compensation area.
- East and west of the Link Road - to encompass the land predicted to incur minor changes in the pattern of flooding that occurs currently.
- Downstream of Piffs Elm culvert – to encompass the land predicted to incur a slightly longer duration of flooding.

2.5.64. The acquisition of the land required for the Scheme will also result in the demolition of the following buildings:

- Three residential properties, and the Sheldon Nurseries business, on Stanboro Lane to the north of the A4019 and west of the M5.
- All fourteen of the residential properties at Withybridge Gardens, plus associated garages and garden outbuildings.

- Two residential properties at Withy Bridge, to the north of the A4019 near Withybridge Lane, plus associated garages and garden outbuildings.
- Three residential properties at Uckington, to the south of the A4019, as well as three farm buildings.
- Ten residential properties (comprising five semi-detached buildings, of which only two are occupied currently) to the north of the A4019, to the east of the West Cheltenham Fire Station, plus three farm buildings near to the Gallagher junction.

2.5.65. Although the Applicant is endeavouring to acquire land by agreement, the rights to acquire the land required to deliver the Scheme are being sought by the Applicant through the DCO application, to ensure that the Scheme can be delivered. The Statement of Reasons (application document TR010063 - APP 4.1) provides details of the steps taken by the Applicant to date to acquire land by agreement.

2.6. Preliminary environmental design

2.6.1. The environmental design for the Scheme has been developed by a multidisciplinary team to identify and manage the engineering and environmental constraints within the Scheme area. The iterative process includes developing, testing and refining the design and includes consideration of feedback received through the consultation process. The aim of the process has been to avoid key environmental features as far as possible so that impacts to them are avoided or minimised. This process will continue during the Scheme's detailed design development to ensure that any additional design opportunities are identified to avoid residual environmental impacts on key environmental features that are currently the result of the preliminary design.

2.6.2. Figures showing the preliminary environmental design for the Scheme are presented in Environmental Masterplan (application document TR010063 - APP 2.13). These show the mitigation and enhancement measures that have been embedded within the preliminary design of the Scheme to mitigate impacts to the environment.

2.6.3. The environmental mitigation details included in the Scheme design are considered sufficient at this stage to enable a robust EIA to be undertaken and reported in this ES, supporting the DCO application with sufficient information for the decision makers. Some of the measures will be developed further during the detailed design stage, such as the bases of the attenuation basins and the flood storage area, and the design of the noise barriers.

2.6.4. The mitigation and enhancement measures embedded in the design to minimise impacts to environmental receptors encompass both Scheme wide measures, and those specific to each of the three key elements of the Scheme (M5 Junction 10, the Link Road and A4019 widening). These are summarised below.

2.6.5. In addition to these measures, mitigation for the Scheme will also be implemented through the application of best practice at construction stage, and the measures set out in the Environmental Management Plan (EMP) (1st iteration) (application document TR010063 – APP 7.3). The EMP covers the measures to be implemented at the construction stage to manage impacts to the environment at this stage, as well as those measures that are relevant to the future operation and maintenance of the Scheme. The EMP will be updated in advance of construction (to produce the 2nd iteration of the EMP), and again towards the end of construction (3rd iteration of the EMP). Whilst the EMP will be updated at these points to produce the next iteration of the document, the EMP is a live document and will therefore be subject to regular update within each iteration to reflect the ongoing management of the mitigation measures identified.

2.6.6. Beyond the summary presented below, full details of the mitigation measures proposed for the Scheme are also outlined in the relevant ES chapters (Chapters 5 to 14), the EMP (1st iteration) (application document TR010063 – APP 7.3) and the Register of Environmental Actions and Commitments (REAC) (application document TR010063 – APP 7.4).

Scheme wide measures

2.6.7. Aspects of the environmental design features covering landscape, drainage, lighting and active travel apply at a Scheme wide level, rather than just for the specific elements of the Scheme. These Scheme wide features are described below.

Landscape design

2.6.8. The landscape design for the Scheme has been developed from the following principles:

- Replace any habitat losses as a minimum to ensure no net loss of biodiversity, and to provide biodiversity enhancements where possible.
- Retain the natural character through planting local native species.
- Replace the linear woodland along the M5 and around the new junction.
- Planting along the Link Road to include blocks of trees/woodland particularly around the River Chelt bridge to reflect the local character of roads and provide some screening for visual receptors, whilst creating an attractive route for users.
- Embankments and verges to be planted with species rich grasses, supplemented with bulb planting in some areas.
- Planting within the attenuation basins to use wetland grass species.
- Replacement planting to be provided (as appropriate) along the A4019 to help embed the widened route back into the landscape as well as ensure visual amenity for receptor. Typically this may include roadside hedgerows and trees to central reserves and verges.
- Sensitive design of noise barriers to ensure they provide visual as well as noise amenity.
- Earth contouring and appropriate planting in the flood storage area.

2.6.9. The application of these principles has sought to produce a landscape design that contributes to the landscape character of the area and provides visual amenity and screening, with the aim of embedding the Junction 10, the widened A4019 and the Link Road into the landscape.

Drainage design

2.6.10. The drainage system for the Scheme has been designed to enhance the water quality of the surface water runoff (when discharged to the environment) and limit the peak rate and overall volume of discharge.

2.6.11. The drainage design uses swales and ditches where possible, rather than pipework. The highway drainage that arises in the areas where the area of impermeable surfacing has increased (compared to existing) will be routed to attenuation basins before discharge into surface watercourses. The swales, ditches and attenuation basins will provide improved mitigation of impacts to water quality, by trapping pollutants before discharge to the River Chelt and Leigh Brook. These features will also provide opportunities for biodiversity and the creation of green corridors through the Scheme. Currently runoff from the highway drains directly to the adjacent surface watercourses (River Chelt and Leigh Brook) with no attenuation of the pollutants present.

2.6.12. The attenuation basins will be designed to sit naturally in the landscape.

Lighting design

2.6.13. The lighting design will minimise light spill, with zero upward lighting from the G4 luminaires used across most of the Scheme. There are 4no. columns with G3 luminaires used at Junction 10 which emit a small amount of upward light. However, the use of the G3 luminaires in this location avoids positioning lighting columns on the overbridges. All lighting will be a warm white colour temperature to minimise disturbance to bats. The Link Road will not be lit, apart from a short section at the junctions at the northern and southern ends. Two sections of the A4019 to the east and west of Uckington comprising a 92m section to the east between Uckington and the West Cheltenham Fire Station, and a 150m

section between Uckington and Cooks Lane, will also not be lit to provide mitigation for bats to be able to forage across the A4019.

Active travel corridor

2.6.14. The Scheme design includes an active travel corridor along the length of the Link Road and the A4019 (within the extents of the Scheme). This will provide traffic free space for cyclists and pedestrians with the objective of reducing car journeys through the Scheme and thereby reducing noise and air quality impacts, as well as providing exercise opportunities for people.

Scheme key element specific measures

M5 Junction 10 (Work No. 2(a) to 2(i))

2.6.15. This section summarises the mitigation measures embedded in the design of the M5 Junction 10 element of the Scheme, to reduce impacts to the environment:

- Embankment for the A4019 designed to enable the retention of an existing area of lowland meadow priority habitat along Stanboro Lane, along with the existing section of Stanboro Lane between the lowland meadow habitat and the embankment. This will also enable the retention of Sheldon Cottages.
- A flood storage area excavated to the southeast of the junction with sufficient capacity to store 190,298m^3 of floodwater from the River Chelt. The design of the excavated area and the strip of land surrounding it will provide a range of ecological habitats. The outfall from the attenuation basin at the northern end of the Link Road will drain into the excavated area, and thereby provide a permanent area of standing water within the flood storage area. This will not affect the storage capacity of the area for floodwater. A structure for roosting bats will be constructed within the surrounding landscaped area, which will provide mitigation for the loss of existing roosting sites for bats in the vicinity of Junction 10. The flood storage area will not be accessible to the public.
- The Withybridge (A4019) underpass (5m wide and 4m high, and 55m in length) underneath the A4019 east of Junction 10. This will provide mitigation for bats that cross the existing A4019 to the east of the M5. The changes to the abutments for the new overbridges for the A4019 (which removes the existing large space between the bridge abutments and the motorway) and the raising and widening of the A4019 in the Scheme are assessed to result in a greater barrier for bats. The underpass will provide a traffic free route for the bats across the A4019.
    - The underpass will also provide traffic free access for pedestrians and equestrians across the A4019, with bridleway AUC1 extended from the north of the A4019 through the underpass and connecting to Withybridge Lane to the south of the A4019. Lighting will be provided through the underpass, with the lights switched off between sunset and sunrise.
    - Bollards (or similar) will prevent vehicular traffic through the underpass.
- The embankments at the motorway ends of the southbound on-slip and the northbound off-slip have been designed to ensure that the existing culvert for the River Chelt which passes under the M5 at this point does not require to be lengthened.
    - An otter ledge is included in the design to provide access for otters through the culvert during periods of high water.
    - Planting of appropriate vegetation and reprofiling of the river banks 100m upstream and downstream of the culvert are included in the design to improve hydromorphological and ecological diversity. A similar measure will be applied to the Leigh Brook for the section 200m downstream of the Leigh Brook culvert. An indicative design is presented in the figure ‘Proposed Indicative River Chelt Link Road River Cross-Sections’ in Environmental Masterplan (application document TR010063 – APP 2.13). Full details are provided in Chapter 8 – Road Drainage and the Water Environment (application document TR010063 – APP 6.6).

    - PRoW ABO16 will be retained through the culvert, although minor diversions of the current alignment may be required to accommodate the river bank reprofiling.
- Extensions to the Piffs Elm and Leigh Brook culverts will use the same size and slope as the existing culverts, with buried inverts.
- Badger mitigation to be fully developed at the detailed design stage. Further details provided in Appendix 7.5 (application document TR010063 - APP 6.15).
- Noise barriers on either side of the M5 immediately to the north of the Junction 10 to provide noise mitigation to people at Barn Farm (to the west of the motorway) and at the informal Traveller site (to the east of the motorway). The proposed noise barriers will be 130m and 150m long (alongside the northbound and southbound carriageways of the motorway respectively) and 2m high. Indicative designs for all of the noise barriers included in the DF3 design are provided in the Typical Details plans (application document TR010063 - APP 2.10). The specific design for these noise barriers will be determined at detailed design stage.
- The siting of the attenuation basin to the south of Barn Farm in a location away from the farm buildings so as to reduce land take adjacent to the farm.
- Re-routing of PRoW (ref. ABO14) that is located to the west of the M5 and south of the A4019. Currently this footpath intersects with the A4019 just west of the Junction 10. In the preliminary design for the Scheme, this footpath is rerouted via the access track from the attenuation basin to intersect with the A4019 at a point just west of the junction of Stanboro Lane and the A4019, so as to provide better connectivity into Stanboro Lane and the surrounding PRoW network.

West Cheltenham Link Road (Work No. 5(a) to 5(n))

2.6.16. This section summarises the mitigation measures embedded in the design of the Link Road element of the Scheme, to reduce impacts to the environment:

- The alignment design of the Link Road so that is outside the floodplain of the River Chelt as far as possible, so as to reduce impacts of flooding. Minor changes to the alignment of the road have then been made to ensure that the Link Road will transect the existing hedgerows in the area at a right angle, rather than along a longer length of hedgerow, so as to minimise loss of hedgerow.
- A clear span bridge to cross the River Chelt, with the bridge abutments set >4m back from the riverbanks. This will avoid direct impacts to the river channel by the bridge.
    - The bridge will convey the 1% annual exceedance probability event (1 in 100-year return period) including an allowance for climate change (+53% in flow) with a minimum of 600mm freeboard to soffit.
    - There will be sufficient clearance under the bridge (2.8m headroom) to enable access for light vehicles and livestock along either riverbank, as well as for pedestrians using the PRoWs. Both of the PRoW footpaths ref. AUC11 and ref. ABO24 will be retained.
    - PRoW footpath ref AUC11 that currently runs east/west to the north of the River Chelt will be rerouted under the River Chelt bridge along the right bank of the river. The line of PRoW ref. ABO24 will be subject to very minor rerouting and will pass under the Link Road along the left bank of the river.
- Reprofiling of the river banks and the planting of appropriate vegetation either side of the River Chelt bridge, 100m upstream and downstream of the bridge to improve hydromorphological and ecological diversity. An indicative design is presented in the figure 'Proposed Indicative River Chelt Link Road River Cross-Sections' in the Environmental Masterplan (application document TR010063 – APP 2.13). Full details are provided in Chapter 8 – Road Drainage and the Water Environment (application document TR010063 – APP 6.6).
- Provision of hard bank protection, such as rip-rap or non-biodegradable geotextile along both banks of the River Chelt underneath the River Chelt bridge. This will ensure the river banks are stable and do not retreat, potentially encroaching on the

adjacent access tracks and bridge abutments. The identification of existing active bank erosion, combined with potential high stream powers mean that there is a likely need for bank protection, along all or part of the river banks through the structure. Specific details have not been identified at this preliminary design stage, and this mitigation measure has been included as a worst case. At detailed design stage, further assessment and consultation with the Environment Agency will determine the most pragmatic solution and confirm the need for bank protection, specify the materials and general arrangement which will endeavour to minimise and, where possible, exclude hard bank protection.

- A series of flood mitigation structures underneath the Link Road, to the north of the River Chelt to allow the existing periodic westward movement of floodwater from the River Chelt to occur without flooding the Link Road or being impeded by it. The flood storage area (adjacent to the M5 Junction 10) has been located at the point to receive this floodwater.
- A flood compensation area to be created to the east of the Link Road (to the north of the River Chelt) (Work No. 5(n)), to mitigate for the construction of parts of the Link Road within the floodplain (providing level for level replacement), and thereby avoid adverse effects of flooding downstream.
- The inclusion of underpasses to the north and the south of the River Chelt bridge to enable mammals to cross the Link Road avoiding impacts with traffic. Mammal proof fencing will be constructed either side of the underpasses to direct the mammals into the underpasses and prevent them from crossing via the road.
- New access points created off the Link Road to provide farm access to land parcels to the east of the road which were accessed previously from Withybridge Lane.
- Increased capacity of the culverts underneath the B4634 at the southern end of the Link Road to reduce the risk of flooding in this area.
- A flood compensation area to be created between the Link Road and Withybridge Lane, to the south of the River Chelt. This flood compensation area (Work No. 6d) is to mitigate for the changes made to the flooding along Drain 15 (also referred to as Staverton stream) downstream of the B4634 following the changes made by the Scheme to the culverts under the B4634 at the junction of this road and the Link Road.
- The PRoW footpath ref. ABO26 is located to the south of the B4634. This footpath is only impacted by the Scheme where it intersects with the B4634, close to the junction with the Link Road. A connection has been included in the preliminary design to continue the alignment of this footpath through the new highway boundary to the highway verge.

A4019 widening (Work No. 3(a) to 3(d) for west of J10, and Work No. 4(a) to 4(y) for east of J10)

2.6.17. This section summarises the mitigation measures embedded in the design of the widening of the A4019 element of the Scheme, to reduce impacts to the environment:

- Widening of the A4019 to minimise direct impacts to existing buildings along either side of the road where possible. Therefore, the widening to the west of Uckington will be to the north of the existing alignment, and then to the south of existing embankment through Uckington, and then to the north again to the east of Uckington.
- Retention of the existing alignment and access point for Stanboro Lane (to the west of the Junction 10) to improve the amount of existing vegetation that can be conserved in this area.
- Raising the vertical alignment of a short section of the A4019 just to the east of the Withybridge Lane junction to remove an existing low point which is prone to surface water flooding.
- Raising the vertical alignment of a short section of the verge to the south of the A4019 near to the junction of this road and Stoke Road. This is to remove a low point in the verge which allowed surface water flooding onto the road from the fields

to the south.

- New access points created off the A4019 to provide farm access to land parcels to the north of the road which were accessed previously directly off the road. This will include access to the existing informal Traveller site adjacent to the M5.
- Noise barriers to provide noise mitigation at three locations along the A4019. All of the noise barriers will be 2m high, with the specific design determined at detailed design stage:
    - A noise barrier 160m in length along the westbound carriageway near to Cooks Lane.
    - Two noise barriers alongside the eastbound carriageway in Uckington, to the west (95m long barrier) and east (150m long barrier) of the junction of the A4019 with The Green.
    - A noise barrier 350m in length alongside the westbound carriageway between the Civil Service Sports Ground and the West Cheltenham Fire Station.
- Realignment of the junction between Moat Lane and the A4019 (in Uckington). This results in the A4019 being no longer in a direct line of sight to the Moat House Scheduled Monument.
- The inclusion of local access roads linked to the signalised junctions to enable local residents to retain an ease of access onto the A4019, particularly for turning right.
- Bus stop provision along the A4019 has been retained, and a new bus lane provided along part of the A4019, as detailed in the Scheme wide review above.
- A structure for roosting bats to be constructed to the north of the A4019 (east of Uckington) to mitigate for the loss of existing roosts in this area.
- Sections of the A4019 to the east and the west of Uckington will not be lit so as to provide mitigation for bats to be able to forage across the road. The unlit section to the east of Uckington will align with the dark corridor proposed as part of the Elms Park development.
- The PRoW footpath ref. AUC8 is located to the east of Uckington and to the north of the A4019. This footpath is only impacted by the Scheme where it intersects with the A4019. A connection has been included in the preliminary design to continue the alignment of this footpath through the new highway boundary to the active travel corridor to the north of the A4019.
- The PRoWs that intersect with the A4019 via Cooks Lane and Moat Lane are not impacted by the Scheme. As these PRoWs are not affected, and PRoW AUC8 will retain a connection through the A4019, then the section of the Cheltenham Circular Path that crosses the Scheme area at Uckington will also be retained on completion of construction. Equestrian users crossing the A4019 at Uckington will have an equestrian phase and a push button at the junction of the A4019, The Green and Moat Lane.
- Improvements to some of the hedgerows to the north of the A4019, comprising additional planting to fill in existing gaps, and the creation of a new hedgerow along an existing fenceline, to provide mitigation for dormice.
- Inclusion of tall planting (tall plant stock) within the landscape design at points along the A4019 to encourage bats to cross the road at a greater height, and thereby reduce potential collisions with vehicles.

2.7. Biodiversity net gain

2.7.1. Biodiversity net gain (BNG) is an approach which aims to leave the natural environment in a measurably better state than beforehand. At the time of submission of this DCO it is not a legal requirement for NSIPs to achieve a BNG, as the relevant parts of the Environment Act 2021 are not yet in force. However, a BNG assessment has nonetheless been undertaken to inform the Scheme design.

2.7.2. The Natural England Biodiversity Metric 3.0 (hereafter referred to as 'the metric') has been used to measure the biodiversity losses and gains resulting from the Scheme at

preliminary design stage, against the existing environment (pre-construction) as the baseline. BNG calculations are used as a tool for iterative design development to ensure that habitat design fully addresses the potential impact on existing habitats.

2.7.3. As per the methodology set out by Natural England for the assessment of BNG[6], separate assessments have been made for the three habitat typologies present within the Order limits, namely rivers, streams and ditches, terrestrial habitats (habitats) and hedgerows. The assessment of the preliminary design of the Scheme (DF3) has calculated a net gain in biodiversity of >10% for each of the three habitat typologies. Full details are presented in Appendix 7.18 – Biodiversity Net Gain (application document TR010063 – APP 6.15).

2.7.4. The BNG achieved for the Scheme has been delivered through a consideration of the BNG Good Practice Principles for Development (CIEEM, 2016)[7] in the development of the Scheme's environment design, and the trading rules for terrestrial habitats, rivers, streams and ditches. Local and national biodiversity strategies have been reviewed and habitat creation has been focused on helping deliver these targets, where appropriate.

2.7.5. Areas of existing habitats have been retained wherever possible, and all areas of habitat enhancement and creation are within the Order limits of the Scheme and no off-site habitat creation or enhancement is proposed.

2.8. Construction

2.8.1. The arrangements for the construction of the Scheme have been developed by the buildability contractor to a level of detail sufficient to provide certainty on the land take required to build the Scheme and defining key construction methods and equipment to inform the environmental assessment. Potential locations of construction compounds, topsoil storage areas and construction working areas for the contractor have been identified and are included within the temporary land take for the Scheme, and are shown on the Works Plans (application document TR010063 – APP 2.4). The assessments of construction effects assume the implementation of best practice, based on industry guidance and professional experience. The construction of the Scheme is planned to commence in 2025, with the Scheme planned to be open for traffic in 2027.

2.8.2. This construction programme is based on the current preliminary design (DF3) of the Scheme and will be updated by the Principal Contractor ~~when appointed~~ during the detailed design stage.

2.8.3. The mitigation of potential impacts to the environment at the construction stage will be addressed through the implementation of the EMP (application document TR010063 – APP 7.3). The mitigation measures implemented will include the appointment of an Environmental Clerk of Works (EnCoW) to oversee the construction activities.

~~Early contractor involvement (ECI~~Construction activities and workforce~~)~~

2.8.4. A contractor has been appointed to develop the Scheme with the aim of streamlining delivery should the Scheme receive consent. This early contractor involvement (ECI)- has informed the assumptions made within the assessment regarding the construction workforce. At the peak of construction activities, the assumptions are as follows:

- The construction workforce would total 400, comprising 100 members of staff and 300 operatives.
- 75% of the construction staff would be engaged in daytime working.
- The main compound, accessed from the A4019, would form the base for 200 members of the construction workforce, comprising 100 members of staff and 100

[6] Panks, S., White, N., Newsome, A., Potter, J., Heydon, M., Mayhew, E., Alvarez, M., Russell, T., Scott, S.J., Heaver, M., Scott, S.H., Treweek, J., Butcher, B. and Stone, D. (2021). Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide. Natural England.
[7] https://cieem.net/wp-content/uploads/2019/02/Biodiversity-Net-Gain-Principles.pdf

operatives.

- Satellite compounds would form the base for the remaining 200 members of the construction workforce.
- As a base case for assessment, all members of the construction workforce would make their way to construction compounds in their own vehicles and unauthorised parking in public places will not be tolerated by the Principal Contractor.

Operatives within the construction workforce will be encouraged to share transport and information will be made available regarding access via footpaths and public transport throughout the construction phase. Such matters are amongst those that are ~~to be~~ set out in the Environmental Management Plan (EMP) Annex B.11 Traffic Management Plan (TMP) (application document TR010063/~~-~~APP/~~-7.3~~9.12) which also correlate to those contained in the REAC (application document TR010063 APP 7.4). The EMP and its Annexes are developed as 1st iteration documents at this stage, to be more fully developed at detailed design stage. Prior to commencement of any part of the authorised development, Requirement 3 of the DCO requires the EMP and its Annexes to be produced as 2nd iteration documents. This process is described in greater detail in Chapter 4 – Environmental Assessment Methodology (application document TR010063 APP 6.2) of this ES.

- There will be a requirement for deliveries using heavy duty vehicles (HDVs) and light duty vehicles (LDVs). For the purposes of the assessment an assumption that 200 HDV movements per day is not exceeded, has been applied. The volume and distribution of trips by these vehicles will be controlled by the TMP (EMP Annex B11- application document TR010063/~~–~~APP/~~–7.3~~9.12) such that it does not, cumulatively with the construction workforce movements, exceed thresholds that would trigger significant adverse effects on noise and air quality. This calculation is based on a technical assessment of available headroom within the existing transport network (see Chapter 5 – Air Quality (application document TR010063~~–~~/APP/~~-~~6.3) and Chapter 6 – Noise and Vibration (application document TR010063 ~~–~~/~~-~~APP/~~-~~6.4) of this ES).

Land required temporarily to build the Scheme

~~2.8.3.~~2.8.5. The contractor will require site compounds from which to operate the construction of the Scheme. This land will be taken temporarily and returned to its original owners after agreed restoration works have been carried out. The areas that will be affected by temporary works are shown on the Land Plans (application document TR010063 – APP 2.2).

Site compounds

~~2.8.4.~~2.8.6. The contractor will require site compounds to operate the construction activities from. These compounds will house site offices, welfare facilities and storage for plant and materials. There will be no planned overnight staff accommodation facilities. Details of these compounds are summarised in the bullet points below. The main site compound will be located to the north of the A4019 opposite the Link Road, and accessed from the A4019, and will operate for the duration of the construction works. This will occupy an area of land approximately 4.5ha which is currently agricultural land. The detailed internal layout of this compound and the other compound locations noted below will be developed during detailed design.

~~2.8.5.~~2.8.7. In addition to the main site compound, three satellite offices, two mobile welfare facilities, and one additional materials storage area are proposed. These are within the areas of temporary land take shown on the Land Plans (application document TR010063 – APP 2.2), and will operate for the period of the construction of the respective structure or Scheme element:

- Satellite office for the M5 Junction 10 element of the Scheme, providing site offices, welfare, and storage of materials and plant. Located on the south side of the A4019 near Withybridge Lane.
- Satellite office for the B4634 works and the southern end of the Link Road, providing site offices, welfare, and storage of materials and plant. Located at the southern end of the Link Road.

- Satellite office near to the proposed new bridge on the Link Road, providing site offices and welfare.
- Mobile welfare on the west side of the M5 for the Piffs Elm culvert extension works.
- Mobile welfare on either side of the motorway for the works on the Leigh Brook culvert.
- Material storage area adjacent to the Link Road (north of the River Chelt) for the culvert units.

Haul roads

~~2.8.6.~~2.8.8. A temporary haul road will be required along the length of the Link Road, so as to construct this element of the Scheme, and the associated flood mitigation structure and the River Chelt bridge. This will also include the construction of a temporary bridge across the River Chelt, adjacent to the proposed new bridge.

Topsoil storage

~~2.8.7.~~2.8.9. Locations proposed for topsoil storage are identified on the Works Plans (application document TR010063 – APP 2.4). The topsoil storage will be at a maximum height of 3m and the locations have been selected to avoid significant vegetation clearance.

Statutory undertakers works

~~2.8.8.~~2.8.10. Diversions of below ground utilities will be required as part of the construction stage. All diversions will be within the Order limits. There are two high pressure gas mains, one that crosses the Link Road and one that crosses the A4019 east of Moat Lane. It is assumed that no additional structures will be required for the maintenance of these gas mains.

- With regards to the process that has been followed to engage with affected undertakers and identify diversions, Atkins completed the C2 searches, and the subsequent C3 and C4 applications. Ongoing discussions through the C3 stage allowed certain omissions of utility companies to ensure only the specific, affected utilities were engaged at C4 stage. It is expected that the C4s will need to be completed again by the Principal Contractor to ensure the latest designs are reviewed by the Statutory Undertakers to scope additional diversionary/protection works, or de-scope surplus of these works as well as capturing rates changes enforced by the Statutory Undertakers.

~~2.8.9.~~2.8.11. For the 132Kva overhead lines that cross the line of the Link Road, near its junction with the B4634, NGED (National Grid Electricity Distribution) has confirmed that the Scheme is outside of the clearances for these lines.

Construction of the Scheme elements

~~2.8.10.~~2.8.12. An outline approach for the construction of the components of the Scheme is presented below.

Earthworks

~~2.8.11.~~2.8.13. The construction of the new Junction 10 slip road embankments, re-profiling of the A4019 approaches to the east and west and construction of the Link Road embankments require significant volumes of fill (approximately 660,000m^3). There is limited excavation within the footprint of the new roadworks. However, the construction of the new flood storage area will yield just under ~~200~~150,000m^3 of suitable fill. Ground investigation has confirmed that there is little superficial material, and the weathered Charmouth Mudstone is very stiff with stiffness increasing with depth. Provided the moisture content is adequately controlled then this material should be suitable for bulk fill in the embankments.

~~2.8.12.~~2.8.14. The approximate volumes are measured from the existing surface to new surface and therefore include the new pavement quantities. New embankments are assumed to have 1 in 3 side slopes.

~~2.8.13.~~2.8.15. Preliminary discussions with the major quarrying companies indicate that three companies have resources that could be used to supply the project. Haul distances are likely to exceed 30 miles and preliminary indications are that each supplier could deliver 1,000 tonnes per day to the Scheme.

Construction and demolition of structures

~~2.8.14.~~2.8.16. The Scheme will require the construction of a number of structures, and the demolition of the existing A4019 overbridge and the retaining wall to the south of the A4019 just east of the M5 Junction 10.

~~2.8.15.~~2.8.17. Details of the properties required to be demolished for the Scheme are provided in Section 2.5.

Demolition of the existing A4019 overbridge

~~2.8.16.~~2.8.18. The proposed design of the M5 Junction 10 element of the Scheme requires the demolition of the existing Piffs Elm bridge, and the construction of two new single span bridges.

~~2.8.17.~~2.8.19. The existing bridge is a 4-span reinforced in-situ concrete bridge with a post tensioned bridge deck. The proposed construction sequence for the Scheme shows that this bridge will be demolished at any time after the opening of the new Piffs Elm North overbridge at M5 Junction 10. Demolition earlier than this will result in long diversion routes impacting on local roads and will therefore be avoided.

~~2.8.18.~~2.8.20. Demolition using machine mounted concrete breakers is the proposed technique to be used for this bridge. This approach is a common demolition method adopted successfully for the removal of many highway bridges similar to the A4019 overbridge which have good access for plant and suitable access for rapid delivery and removal of materials. Demolition is to be undertaken overnight (one night), with a full closure of the M5.

Construction of the new overbridges for M5 Junction 10

~~2.8.19.~~2.8.21. The steel concrete composite bridge deck (for each bridge) will be constructed offline and then installed using self-propelled mobile transports (SPMTs). Each deck will be installed in a single (separate) 12-hour overnight closure of the M5.

Construction of the Link Road flood mitigation structure

~~2.8.20.~~2.8.22. The Link Road flood mitigation structure comprises two sets of culverts underneath the Link Road, to the north of the River Chelt bridge. These culverts will be constructed by abutting runs of standard precast concrete culvert units, laid on top of 1m of imported granular fill material.

Construction of the River Chelt bridge

~~2.8.21.~~2.8.23. The new River Chelt bridge will be constructed using precast concrete beams set on abutments offset from the top of the riverbank.

~~2.8.22.~~2.8.24. A temporary haul road and bridge across the River Chelt, along with a working area for cranage and beam delivery, will be required adjacent to the location of the new bridge. The haul road required will tie into the haul road constructed along the alignment of the Link Road (and described towards the start of this section). Sufficient space for these areas is included within the temporary land take shown on the Land Plans (application document TR010063 – APP 2.2).

Existing Piffs Elm Service culvert

~~2.8.23.~~2.8.25. The existing Piffs Elm Service culvert will be abandoned and backfilled. The existing services that are in the Piffs Elm Service Culvert will be diverted to a new location north of the M5 Junction 10 and installed in new sleeved crossings underneath the motorway. The new crossings will be constructed by directional drilling techniques.

Extension of the Piffs Elm culvert

~~2.8.24.~~2.8.26. The existing Piffs Elm culvert under the M5 will be extended at both ends to clear the earthworks required for the two new south facing slip roads at M5 Junction 10. Constructed using an over pumping approach with temporary stream diversion required at the upstream and downstream ends.

Extension of the Leigh Brook culvert

~~2.8.25.~~2.8.27. The existing Leigh Brook culvert will be extended at the downstream end. As the proposed extension to this culvert is relatively short (compared to that required for the Piffs Elm culvert) then the stream diversion will not be required, with over pumping used for the period of the Leigh Brook works.

Traffic management

~~2.8.26.~~2.8.28. Details of traffic management will be included in a traffic management plan to be produced by the Principal Contractor. Traffic management will be implemented to maintain traffic flows during construction of Junction 10 and the widened A4019. Traffic management is not expected to be required for the Link Road / B4634 junction as this is considered a straight forward junction construction with a single lane operating under temporary traffic lights.

~~2.8.27.~~2.8.29. The traffic management will be implemented using the following principles:

- The existing M5 Junction 10 traffic movements will be retained until such time as closure of the southbound off slip and northbound on slip are necessitated by the construction phasing of the interchange construction. Signed diversion routes will be implemented, supported by provisions to discourage HDV (Heavy Duty Vehicle) through movements along the local road network as appropriate. The diversion route for traffic seeking to join the M5 at Junction 10 and travel northbound, will be via the A38 and A46 to Junction 9. The diversion route for traffic southbound on the M5, and seeking to leave the M5 at Junction 10, will be to Junction 11, and then the A40 and A4013.
- Contraflow on the M5 is to be kept to the minimum duration consistent with safely and efficiently constructing the Scheme.
- On the A4019 a minimum of one eastbound and one westbound traffic lane will be maintained throughout the construction period except for essential overnight works lane closures where single lane working under traffic control is deployed.
- Withybridge Lane is to be retained as it provides access to several farms and farmland. Access will be maintained from the B4634 for the duration of the works. Access from the A4019 will be closed during phases 7 and 8 of the construction of the new Junction 10, while the new junction is constructed. Phases 7 and 8 are outlined in description of the construction sequence below.
- Access is to be maintained throughout construction to Cooks Lane, Moat Lane, and Green Lane, either directly from the A4019 or by local diversions.
- M5 and A4019 closures will be minimised as far as is practicable.
- Night-time working will be minimised where possible.
- Widening of the A4019 will require temporary closures of the side road junctions whilst they are tied into the new alignment. Property accesses will be maintained as part of the traffic management arrangements.

Road and other rights of way closures and diversions

~~2.8.28.~~2.8.30. As described above, the construction of the Scheme will require the periodic closures of the A4019 and M5 (slip roads and motorway carriageway). Closures of the A4019 and the M5 motorway carriageway will be kept to a minimum and will take place overnight where possible. Closure of the two slip roads at Junction 10 will be longer, 15 months for the northbound on slip and 9 months for the southbound off slip, with an overlap of 5 months when both slip roads are closed. Closure of the B4634 will not be required, and

access to Withybridge Lane (from the B4634) will be maintained for the duration of the works.

~~2.8.29.~~2.8.31. Access to the informal Traveller site will be maintained during the construction of the Scheme, while the site remains present.

~~2.8.30.~~2.8.32. With regard to the PRoWs that exist within the Order limits, the aim is keep these open during the construction programme, with temporary diversions and short term closures implemented during the construction of the respective Scheme elements. As a worst case:

- PRoWs ref. ABO24 and AUC11 will be closed during the construction of the Link Road.
- PRoW ref. ABO16 part 2, ABO16 part 3 and ABO13 part 1 will be closed during the works proposed on the River Chelt culvert.
- PRoW ref. ABO14 part 1 will be closed during the construction of the M5 Junction 10.
- PRoW ref. AUC8 will be closed during the construction of the A4019 widening to the east of Uckington.

~~2.8.31.~~2.8.33. The exception to the approach for only short term closures of PRoWs, is bridleway AUC1 which will be stopped for the duration of the construction programme, to the north of the A4019, on the basis of safety to avoid bringing horses through a construction working area and close to a construction compound.

Construction sequence

~~2.8.32.~~2.8.34. The main construction works comprise four interlinked and interdependent sections of work. At this stage it is anticipated that the construction programme will run from April 2025 to December 2027. Based on these dates, the construction of these four sections of work is proposed as follows:

- Construction of the new Junction 10 including the junction structures and slip roads (month 5 – month 30).
- Widening and realignment of the A4019 (month 5 – month 30).
- Construction of the Link Road and associated flood alleviation works (month 17 – month 26).
- New signalised junction between the Link Road and B4634 (month 6 – month 24).

~~2.8.33.~~2.8.35. The phasing within each of the four sections of work is outlined below, with the key stages shown in Table 2-1. The sequence presented is based on the following principles:

- The existing southbound off slip and northbound on slip roads to the M5 will be permanently closed to traffic when required by the phasing of the interchange construction.
- The contraflow on the M5 is to be kept to the minimum duration consistent with safely and efficiently constructing the Scheme.
- On the A4019, a minimum of one eastbound and one westbound traffic lane will be maintained throughout the construction period, except for essential overnight works lane closures where single lane working under traffic control is deployed.
- Access is to be maintained throughout construction to Cooks Lane, Moat Lane, Withybridge Lane and The Green. While access from the A4019 will generally be maintained, local diversions may be required while the new junctions are constructed.
- Withybridge Lane to have access at all times from either the A4019 or the B4634.
- The existing services currently crossing underneath the M5 within the Piffs Elm Service Culvert will be diverted into a new crossing underneath the M5 using directional drilling techniques.
- The erection method adopted for the bridge decks of the new overbridges at M5

Junction 10 will be full deck construction on site adjacent to the new bridge location and transport into position via SPMTs.

- M5 and A4019 closures will be minimised as far as is practicable.
- Demolition of the existing A4019 overbridge is delayed until the full opening of the new junction layout. This will permit traffic to bypass the junction by using the new slip roads to exit and re-enter the M5. This will remove the need for motorway traffic to use local roads during the closure.
- Traffic contraflow on the M5 is minimised consistent with safe, efficient construction of the new junction.
- The existing motorway communications building and associated infrastructure located in the M5 southbound verge to the north of the Junction 10 is to be retained.
- All utility diversions are within the Order limits.

~~2.8.34.~~2.8.36. Pre-phases including early works, site mobilisation and ecological mitigation and compensation works will also occur. The phases are not discrete and there will be some overlap between them. The schedule outlined below reflects the assumed construction sequence for the assessment of effects. These activities may be undertaken as DCO pre-commencement activities.

M5 Junction 10 and the western extent of the A4019 to the Link Road

Phase 1 – site clearance and preparatory work.

- Works to all four quadrants of the junction will commence with the objective of clearing the construction and temporary land areas to allow the construction works to proceed. The areas will be fenced with the permanent highway boundary fencing where there are no further interfaces with construction works, or temporary fencing erected where subsequent activities such as access to topsoil storage are required that will cross the highway boundary. Topsoil will be stripped and stockpiled for reuse and enabling works for utility diversions completed. Traffic management will be installed on the M5 to close the hard shoulder and safeguard the working areas.
- Traffic management on the M5 will commence with hard shoulder closures to allow the installation of speed cameras, CCTV and the diversion of National Roads Telecommunications Services (NRTS) cables. Works to construct the tie-ins for all four new slip roads could be done at this time to provide site access from, and egress to the M5. Lane 3 closures will follow to permit installation of cross overs at Scheme extents to enable contraflow running through the site when required. Central reserve barrier removed in locations between deck assembly areas and over-bridge locations to permit SPMT access to east side abutments and existing bridge demolition.
- Vehicle recovery areas will be established.

Phase 2 – access tracks, utility diversion and protection.

- With the completion of preliminary works for utility diversions in Phase 1 the medium pressure gas main and two water mains are diverted and commissioned in their new locations between the Link Road junction and the western extent of the Scheme. Motorway communications are diverted and protected as required to maintain access to the transmission station. To enable the bulk earthworks to commence in all sectors of M5 Junction 10 any temporary protection (slewing, lowering or slabs as required) to the existing communications systems is completed.

Phase 3 – earthworks and structures east.

- Having cleared the junction footprint of services the construction of the new works will commence. Construction of both new Piffs Elm overbridge end supports can commence in the north-east and south-east sectors with the M5 running in contraflow with three lanes northbound plus one lane southbound on the northbound carriageway. The southbound carriageway is reduced to two lanes. It will be usual to construct each end support by sequencing the construction activities to efficiently re-use resources. The order in which the supports are constructed will be selected by the contractor to suit their overall construction strategy.

- As there is a significant difference in level between the proposed A4019 vertical alignment and the existing A4019 alignment of approximately 2.5m, temporary carriageway widening is required to the east and west approaches to M5 Junction 10 in order to maintain one lane of traffic each way on the A4019 when the Piffs Elm North Overbridge opens.
- To the west of the junction the temporary carriageway can be constructed on the footprint of the westbound carriageway, west of the existing northbound on slip. The phase will complete when the diaphragm first stage construction of the east abutments to the overbridges and the Piffs Elm Culvert extensions are completed.

Phase 4 - A4019 Temporary Pavements, Comms Building Retaining Wall, Bulk Earthworks, A4019 Underpass, and Structures West.

- Having completed the end supports to the underside of main girders on the east side of the junction, the M5 contraflow will be switched to run three southbound lanes plus one northbound lane on the existing southbound carriageway with two northbound lanes retained on the northbound carriageway.
- The existing northbound on slip entry onto the M5 will be closed to create sufficient working space for the safe construction of the south bridge abutment. The sequencing of the structures will be decided by the contractor to suit their earthworks fill strategy.
- To account for the significant difference in level between the proposed A4019 vertical alignment and the existing A4019 alignment (approximately 2.5m), temporary carriageway widening is required to the east and west approaches to M5 Junction 10 in order to maintain one lane of traffic each way on the A4019 during construction.
- To the east of the junction the temporary carriageway can be constructed on the footprint of the new cycleway and footpath. It will be important during the detailed design phase to integrate this requirement into the design to maximise the retention of this temporary carriageway construction within the permanent works.
- A4019 underpass constructed in two phases as the eastbound and westbound carriageways of the A4019 and their supporting earthworks are constructed.

Phase 5 - Erect Junction 10 overbridge decks, complete earthworks on north facing slip roads and eastbound A4019 west.

- Having completed the first stage of the end support diaphragms, the decks can be transported from the assembly areas and positioned. This will enable the connection between the deck and the support diaphragm to be completed together with the wingwalls. A closure of the motorway will be required for deck positioning of approximately twelve hours for each structure. This can take place overnight and once the decks are positioned the motorway can be returned to three lanes on each carriageway with only hard shoulder closure. Once the decks are completed and wing walls are constructed to full height the earthworks can be completed.

Phase 6 - Complete North Facing Slip Roads and A4019 Alignments and Pavement over North Bridge.

- This phase of the works completes the necessary pavement north of existing A4019 to enable traffic to be moved onto the new Piffs Elm North Overbridge. Pavement works and finishes can be completed to both north facing slip roads.
- The phase will complete with the diversion of A4019 traffic on to the new Piffs Elm North Overbridge. East of the M5, traffic is diverted on to the temporary carriageway, and west of the M5 diversion is to the new east bound carriageway.

Phase 7 - Open Piffs Elm North Overbridge, Demolition and Earthworks to Construct New Westbound A4019 and Withybridge Lane Junction.

- A4019 through traffic is diverted on to the new Piffs Elm North Overbridge to enable closure of the existing A4019 from the Link Road junction to the west of the M5. This enables the existing A4019 Overbridge and carriageway east of the junction to be closed and demolitions and earthworks to be completed. Demolition of the existing A4019 overbridge is covered in Phase 11.

- The phase ends with the completion of earthworks to the new A4019 westbound, the southern portion of the gyratory and both south facing slip roads.

Phase 8 - Completion of Junction 10 roundabout, A4019 Westbound Pavement, New Slip Road Pavements.

- Completion of all earthworks to the east and west of the M5 will allow the new westbound pavements to be constructed.
- Phase 8 will end with the completion of the gyratory system to allow traffic to fully access the new northbound on slip and diversion of traffic in contraflow on to the new A4019 westbound east of the M5.

Phase 9 - Open North Facing Slips, Open Gyratory, Move A4019 Traffic onto Westbound Carriageway East of M5.

- Completion of the gyratory and diversion of traffic on to the northbound on slip allows the new southbound off slip to open. East of the M5, diversion of traffic in contraflow on to the new A4019 westbound carriageway enables the temporary carriageway to be closed and the new eastbound carriageway and adjacent footpath and cycleway to be constructed. The phase ends with opening of the new A4019 eastbound carriageway east of the M5.

Phase 10 - Completion of Cycleways and Footpath, Completion of A4019, Commission Traffic Lights.

- With the opening of the new eastbound A4019 carriageway east of the M5, all works to the A4019 can be completed using lane restrictions as required. Traffic lights controlling the footpath and cycleway crossings of the northbound on slip and southbound off slip are commissioned, and footpath and cycleway opened.

Phase 11 - A4019 and Junction 10 fully open, Existing A4019 structure demolition.

- Completion of the M5 Junction 10 and the opening of all slip roads will enable the closure of the M5 through the junction for the demolition of the existing A4019 overbridge. M5 traffic in both directions will exit on the off slip, cross the junction on the gyratory, and re-enter the M5 via the on slip. This will benefit through traffic by minimising the length of a diversion route and benefit local routes by removing the requirement for diversions. It also mitigates the impact of any over run on the possession and could permit a longer possession period for demolition.

A4019 widening

Phase 1 – Clearance and Preparatory Work.

- Works to the full length of the section will commence with the objective of clearing the construction and temporary land areas to allow works to proceed. The areas will be fenced with the permanent highway boundary fencing where there are no further interfaces with construction works, or temporary fencing erected where subsequent activities are required that will cross the highway boundary. Topsoil will be stripped and stockpiled for reuse and enabling works for utility diversions completed. Traffic management will be installed where required to maintain access to side roads such as Moat Lane.
- Traffic will continue to use the existing carriageways for the full length of the section.

Phase 2 – Diversion and Protection of Utilities.

- Statutory Undertaker's (SU) plant and equipment is moved from within existing carriageways and footpaths to the new footpath, protected, slewed or left undisturbed where required.

Phase 3 – Earthworks and Drainage to Offline Carriageway and Junctions.

- With the diversion and protection of existing services in areas of new carriageway, earthworks and carrier drainage works can now commence to all sections including the new access points to the development area to the north of the A4019. The interface to existing drainage will determine if any connections within existing carriageway are required, or whether these can be left until Phase 5 when the

existing carriageways are reconstructed.

- The phase will complete when the earthworks and drainage are complete, and roadworks can commence between chainage (ch) 1150 and ch 1600.

Phase 4 – Roadworks, Cycleway and Footpaths to Offline Carriageway and Junctions.

- The objective of this phase is to complete the new carriageway from ch 1050 to ch 1550 to allow the diversion of the existing carriageway on to the new alignment. Construction of the new eastbound roadworks, cycleway and footpath works will commence but may not be complete when the traffic switch occurs.
- New carriageway will be completed to include central reserve kerbing on the construction side. The central reserve will be completed when the adjacent existing carriageway is reconstructed.
- The phase concludes with the switch of traffic to the new westbound carriageway in contraflow with one lane in each direction.

Phase 5 – Complete New East Bound Carriageway, Reconstruct Existing Eastbound Carriageway ch 1050 to ch 1650.

- The object of this phase is to complete the new eastbound carriageway and tie ins at the B4634 junction to both the A4019 northside and the retail park. This may involve temporary ramps between the new and existing carriageways and adjustment to traffic light phasing on the junction.
- Work to connect south side properties at ch 650 to ch 850 to the Link Road to enable closure of current accesses from A4019 and provide access via the Link Road Junction.
- The phase completes with the opening of the new eastbound carriageway in contraflow enabling reconstruction of the existing westbound carriageway to be commenced.

Phase 6 – Reconstruct Existing Westbound Carriageway ch 550 to ch 1050 and ch 1650 to ch 2650

- With traffic running in contraflow on the eastbound carriageway the sections of the existing westbound carriageway can be constructed and the access road from ch 1850 constructed. Traffic management is coordinated with the Junction 10 phasing through the Link Road junction. Traffic west of the Link Road will use either the existing A4019 or the temporary carriageway depending on the contractor's final proposals for integrating the works on the A4019.
- Properties on the south side of the A4019 between ch 550 and ch 900 have access via the new link constructed in phase 5 and the Link Road junction.
- Access to the West Cheltenham Fire Station and Homecroft Drive is maintained across the works with temporary ramps which are moved as required to enable carriageway reconstruction, until the new access road is constructed.
- This phase completes with the opening of the new westbound carriageway.

Phase 7 – Complete Central Reservation Works.

- Traffic is moved to lane 1 on both eastbound and westbound carriageways to enable central reservation construction works to complete and all junction paving, islands to be installed.
- The phases completes when the central reserve is completed.

Phase 8 – Complete Verge Works

- Traffic is moved to lane 2 on both eastbound and westbound carriageways to enable verge construction works to complete and all junction side road footpath and cycleways, kerbing paving not completed due to TM requirements to be completed.
- The phases completes when the all verge works are completed.

The Link Road

~~2.8.35.~~2.8.37. The new embankment for the Link Road lies within the floodplain of the River Chelt and requires the construction of a significant flood mitigation structure between the River

Chelt and the A4019. It is envisaged that the culvert units and associated materials for this structure will be brought in via the A4019 and site haul road with the culverts constructed working north to south. Sufficient working area for cranage activities and material deliveries is required with safe unobstructed access past the bridge structure essential.

The construction sequence for the Link Road is as follows:

- Site clearance and boundary fencing
- Pre earthworks drainage
- Topsoil strip
- Install site access and haul roads and construction hardstanding's and River Chelt plant crossing
- SU Diversions where required
- Construct bulk earthworks and structures
- Highways drainage
- Highways formation and capping
- Pavement construction
- Vehicle restraint system installation
- Verge fill
- Verge topsoil
- Road markings

Link Road / B4634 junction

~~2.8.36.~~2.8.38. The B4634 Link Road junction is predominantly offline construction with tie in to the existing B4634 east and west of the new junction. The existing B4634 comprises two lanes (one eastbound and one westbound).

~~2.8.37.~~2.8.39. It is assumed that the junction is constructed under temporary traffic light control with a single lane used for alternate eastbound and westbound traffic.

Phase 1:

- Installation of traffic management including temporary traffic light control for single live lane operation on the existing eastbound carriageway.
- Site clearance and fencing. This may include the attenuation basin at the southern end of the Link Road which can provide fill for the work if required.
- Topsoil strip and stockpile.

Phase 2:

- Diversion of utilities into the south verge.

Phase 3:

- Excavation and filling to top of capping level.
- Excavation of the attenuation basin at the southern end of the Link Road will yield a quantity of general fill which can be utilised to minimise the requirement for imported fill.
- Construction of highway drainage and ducting for traffic signals.

Phase 4:

- Construction of new pavement to the southern area of the junction including sub-base, kerbing, surfacing and traffic signal bases.
- Construction of tie-ins to existing alignment at east and west end of the new alignment.
- Completion of all footpaths and cycle ways in southern half of junction.
- Switch of traffic to new westbound carriageway to release existing pavement for

reconstruction.

- Traffic light control of single carriageway will continue to operate.

Phase 5:

- Existing eastbound carriageway broken out and earthworks for new alignment.
- Construction of new pavement.
- Installation of permanent road markings.
- Installation and commissioning of traffic lights.
- Removal of traffic management and opening of realigned B4634.

Table 2-1 - Construction sequence

Location	Activity	Dates - based on a 30 month construction period
All	Construction starts	Month 1
M5	M5 Junction 10 works commence	Month 5
A4019	A4019 east of the Link Road works commence	Month 5
B4634	B4634 Link Road junction commence	Month 6
M5	SB off slip closed	Month 11
The Link Road	The Link Road works commence	Month 12
Flood storage area	Flood storage area works commence	Month 12
M5	NB on slip closed	Month 15
The Link Road	Flood alleviation culverts complete	Month 17
M5	North overbridge open	Month 19
M5	New SB off slip open	Month 20
B4634	B4634 Link Road junction complete	Month 24
Flood storage area	Flood storage works complete	Month 26
The Link Road	River Chelt bridge complete	Month 26
The Link Road	The Link Road works complete	Month 26
M5	New SB on slip open	Month 27
M5	South overbridge open	Month 28
M5	New NB off slip open	Month 29
M5	Existing overbridge demolished	Month 30
M5	New NB on slip open	Month 30
M5	M5 Junction 10 works complete	Month 30
A4019	A4019 east of the Link Road works complete	Month 30
All	Construction complete	Month 30

Operation and long-term management

~~2.8.38.~~2.8.40. Once completion of the commissioning activities has taken place the Scheme will be open to traffic (scheduled to be 2027). The Principal Contractor will be responsible for any construction defects that arise for a period of 12 months after opening.

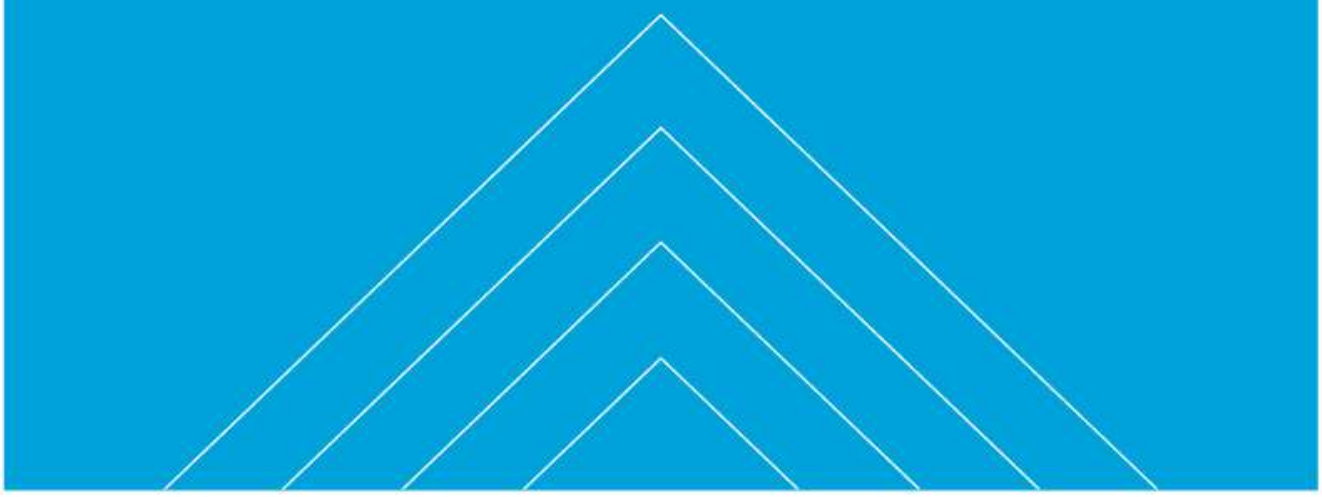
~~2.8.39.~~2.8.41. After this period the maintenance of the Scheme will be the responsibility of GCC (Applicant) or National Highways, depending on the highway authority boundaries and as may be agreed between them.

~~2.8.40.~~2.8.42. Environmental works will be maintained by GCC (Applicant) after completion of those works to ensure that they become appropriately established and maintained. These are outlined in the REAC (application document TR010063 – APP 7.4) and supported by the ecology and landscape maintenance and management operations set out as part of the EMP (1st iteration) (application document TR010063 – APP 7.3).

2.9. Decommissioning

2.9.1. In view of the indefinite life of the Scheme, it is not considered appropriate for this to form part of the environmental assessment. The focus of the Scheme will be upon seeking to minimise disruption and to re–use materials that will also form part of the materials assessment. Decommissioning of the Scheme has therefore not been included in this ES.

Appendices



Appendix 2.1 – Drainage Strategy

Appendix 2.1 – Drainage strategy for the Scheme is provided as a separate document (application document TR010063 – APP 6.15).

Appendix 2.2 – Drainage Strategy Figures

Appendix 2.2 – Drainage strategy figures are provided as a separate document (application document TR010063 – APP 6.15).

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