

M5 Junction 10 Improvements Scheme

Environmental Statement

Chapter 3 - Assessment of Alternatives

TR010063 - APP 6.2

Regulation 5(2)a

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6.2 Environmental Statement: Chapter 3 - Assessment of Alternatives

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Document accessibility

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3. Assessment of Alternatives

3.1. Introduction

- 3.1.1. This chapter presents a summary of the alternative options that have been considered and the justification for the chosen design, in line with the requirements of Regulation 14(2)(d) of the Environmental Impact Assessment (EIA) Regulations to include a description of the alternatives and an indication of the main reasons for the chosen option.
- 3.1.2. Proposals for the improvement of the M5 Junction 10 and the A4019, and the creation of the Link Road have been under consideration since 2012.
- 3.1.3. To support the developments allocated and reserved in the Joint Core Strategy (JCS) at West Cheltenham and North-west Cheltenham, including safeguarded land to the north-west of Cheltenham, a number of proposals for new and improved public transport services and walking and cycling schemes will be required in the area. However, the volume and dispersed origin and destinations of the trips anticipated to be generated by the developments will present significant challenges in terms of accommodating all new trips via public transport or active modes solutions. This, coupled with uncompetitive journey times offered by public transport options, means that there will be a large residual number of trips generated by the new developments that will need to be accommodated through highways based solutions.
- 3.1.4. Details of the options considered (in chronological order) for the highways based solutions are outlined below. The process of how these options were analysed, refined and sifted down to those presented at the non-statutory Public Consultation (October 2020), and ultimately a recommended Preferred Route is shown in the flowchart in Figure 3-1. Between 2015 and the adoption of the JCS in 2017, and alongside the identification of options (described in Section 3.2 below), a range of infrastructure scenarios were considered (as part of the development of the Business Case) in relation to the required housing numbers and whether these met the high-level social, economic and political goals expected of the JCS. These were tested using a traffic model to determine their efficacy.
- 3.1.5. The scenarios considered were:
- Do minimum - delivering only the committed network improvements to 2031. This scenario failed to support the required JCS housing growth.
 - DS1 (Do Something 1) - a low-cost transport solution, primarily schemes fully within existing highway boundaries. This scenario also failed to support the required housing delivery.
 - DS2 to DS6a - introduced increasing levels of investment alongside demand management interventions. DS6 introduced the 'all movements' Junction 10 which was shown to meet the needs of the JCS site allocations in West Cheltenham and North-west Cheltenham (i.e. those which are the subject of the Homes England Bid) but not to meet the wider demands.
 - DS7 - incorporating Junction 10 improvements, plus additional works. This scenario was developed further to support housing delivery requirements, as set out in the identification of options below.
- 3.1.6. Only the DS7 scenario was determined to enable the delivery of 5,212 homes up to 2031 incorporating the West and North-west Cheltenham Strategic Allocation sites. Note that this did not incorporate the housing and employment on the additional 'safeguarded' land which was identified in the JCS but not formally allocated for development. At the time of

securing funding for the Scheme in October 2020 the core scenario had evolved to include for 8,914 homes up to 2041 and revised modelling indicated higher traffic volumes than previously used to inform option development. This further enhanced the rationale for deselecting scheme options where traffic capacity was perceived to be a potential issue.

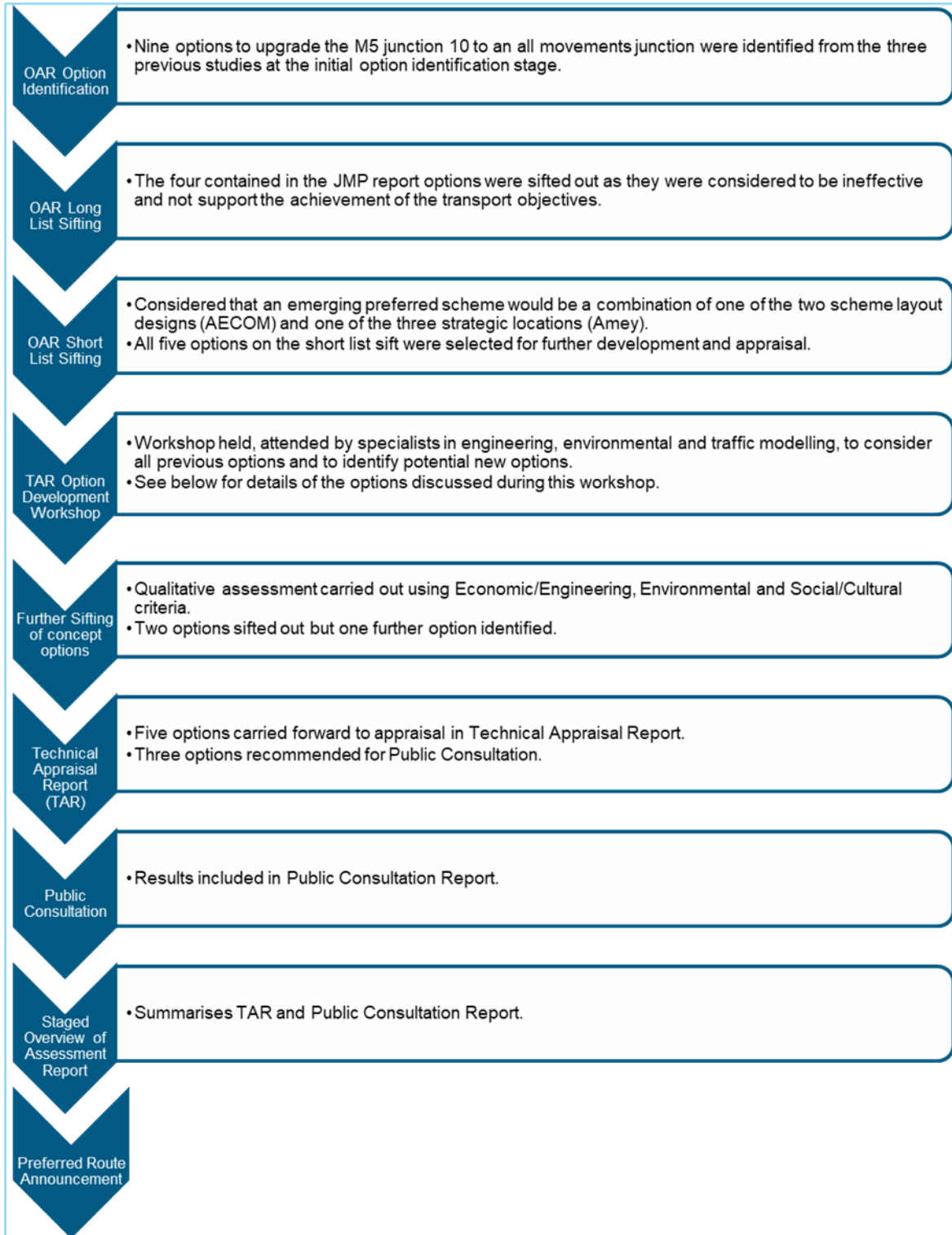


Figure 3-1 - Summary of the options sifting and assessment exercise undertaken

3.2. Identification of options for M5 Junction 10

3.2.1. In summary nine options have been identified from three studies undertaken between 2012 and 2018.

National Highways and JMP Consultants Ltd (2012)

3.2.2. National Highways and JMP Consultants Ltd produced a report in July 2012 titled “M5 Junction 10 – Feasibility. Study of conversion to an all movements junction”. This considered four options for converting the existing junction into an all movements junction. All options proposed to keep the existing northbound entry slip loop and avoid any impact on the commercial properties in the north-west quadrant of the junction. They also sought to minimise the impacts on the residential properties on Withybridge Gardens. Because of this, all four options included at least one signalised slip road junction with the A4019.

- JMP Option 1 - incorporated loop slip roads with southbound on and off-slips as a mirror image of the proposed north facing slips.
- JMP Option 2 - incorporated parallel slip roads.
- JMP Option 3 - incorporated a new eastern roundabout on the A4019.
- JMP Option 4 - incorporated a new eastern signalised junction on the A4019.

National Highways and AECOM (2018)

3.2.3. National Highways and AECOM proposed two options, in an incomplete draft report titled “Option Assessment Report – M5 Junction 10 and access to the Cyber Park Access Road” (February 2018).

- AECOM Option 1 - incorporated an upgrade of the existing M5 Junction 10 to an all movement roundabout interchange.
- AECOM Option 2 – incorporated an upgrade of the existing M5 Junction 10 to an all movement dumb-bell interchange.

GCC and Amey (2018/2019)

3.2.4. Gloucestershire County Council (GCC’s) local highway authority and Amey developed three Concept Options (from a long list of six options) for a proposed West Cheltenham Link Road and an improved or new M5 Junction 10 (July 2018). These included various options of all movements junctions at M5 Junction 10, to the south, to the north and at its existing location. The three Concept Options included in the bid to Homes England for funding in 2019.

- Amey Concept 1 – Junction 10 moved north of its current location.
- Amey Concept 2 – Upgrade to the existing Junction 10.
- Amey Concept 3 – Junction 10 moved south of its current location.

3.3. Sifting of the M5 Junction 10 concept options

3.3.1. The three options identification studies identified nine options for subsequent sifting and assessment.

- The four JMP options (summarised in Section 3.2.2) were sifted out as they were considered to be ineffective and not support the achievement of the transport objectives.
- The AECOM and Amey options were taken forward for further consideration at the Technical Appraisal Report (TAR) Development Workshop.

3.3.2. The TAR Development Workshop was attended by specialist in engineering, environmental and traffic modelling, to consider the AECOM and Amey options and to identify any potential new options. This review identified six concept options, which are listed below and shown in Figure 3-2 (provided in Appendix 1.3, application document TR010063 – APP 6.15).

- Option 1A – as per Amey Concept Option 1, but with M5 Junction 10 roundabout configuration amended to an elongated junction – new junction to the north of the existing Junction 10.
- Option 2 – as per Amey Concept Option 2, and AECOM Option 1 – upgrade existing M5 Junction 10 with Gyratory Roundabout.
- Option 2A – as per Amey Concept Option 2, and AECOM Option 1, but the Junction moved slightly north to enable the retention of the existing bridge as the southern part of the gyratory carriageway.
- Option 3 – as per Amey Concept Option 3 – new junction south of the existing Junction 10.
- Option 4 – as per Amey Concept Option 2 and AECOM Option 1, with a dumbbell roundabout arrangement instead of a gyratory roundabout.
- Option 5 – as per Amey Concept Option 1, but with the junction located between the new junction proposed in Option 1 and the existing Junction 10.

3.3.3. All options included the widening of the A4019 and a new road link to the West Cheltenham development site. The options considered specifically for the widening of the A4019, and the Link Road are described below (Section 3.4 and Section 3.5 respectively).

3.3.4. A sifting exercise was undertaken on the six concept options considered in the TAR Option Development Workshop (Options 1, 2, 2A, 3, 4 and 5). A qualitative assessment was carried out using a range of sustainability criteria comprising economic/engineering, environmental and social/cultural metrics, and the options were scored on a seven-point scale (+3 to -3). The six options were assessed against:

- Economic / engineering metrics:
 - Impact to existing M5 J10 structures (scored on a yes/no basis).
 - New or extension of structures on the M5 mainline (yes/no).
 - Impact due to major utilities (gas and power lines) (yes/no).
 - Area of land required (for the Scheme).
 - Land take from the area of safeguarded land north-west of Cheltenham (yes/no).
 - Traffic operation and capacity (roundabout type).
 - Weaving length proximity for J9 and J11 (yes/no).
 - High level construction programme (days).
 - Impact on strategic road network during construction (assessed qualitatively).
 - Cost estimate (cost derived based on Construction Programme) (relative) (Based on Benchmark HE Delivery Estimate) (£).
- Environment metrics:
 - Potential impact on flood plain (yes/no).
 - Impact on historic landfill site (GR247059) – potential contaminant area (yes/no).
 - Impact on Noise Import Areas (yes/no).
 - Impact on listed buildings (yes/no).
 - Impact on Air Quality Management Areas (yes/no).
- Social / cultural metrics:

- Safety / road traffic accidents (assessed qualitatively).
 - Impact on adjacent properties to M5 Junction 10 (yes/no)
 - Impact on the informal Traveller site (yes/no).
 - Compulsory purchase order risk (yes/no).
 - Impact on public rights of way (PRoWs) (yes/no).
- 3.3.5. Option 3 was considered to have unacceptable impacts on the River Chelt floodplain as it was located within the area identified as a flood zone by the Environment Agency; this option would require a large viaduct to minimise the impacts on the floodplain. The other options taken forward have lesser impacts on the floodplain. Option 4 was considered to be unable to manage the level of traffic expected to occur, relative to the other options. These two options (Options 3 and 4) were therefore sifted out at a first review stage.
- 3.3.6. As part of the sifting process, it became apparent that there was a further sub-option of Option 2, which was similar to Option 2A, but moved the junction slightly south, to enable the retention of the existing bridge as the northern part of the gyratory carriageway. This layout was called Option 2B.
- 3.3.7. The options carried forward to the appraisal stage are listed below. These are shown in Figure 3-3 (provided in Appendix 1.3, application document TR010063 - APP 6.15):
- Option 1A – new junction North of existing.
 - Option 2 – upgrade existing M5 Junction 10 with gyratory roundabout.
 - Option 2A - upgrade existing M5 Junction 10 with gyratory roundabout offset to the north.
 - Option 2B – upgrade existing M5 Junction 10 with gyratory roundabout offset to the south.
 - Option 5 - new junction north of existing (in alternative position to Option 1A).

Figure 3-2 – The six options identified at the TAR workshop.

Options 1A, 2, 2A, 3, 4 and 5 for the M5 Junction 10 Improvements Scheme (without earthworks). All five options include the widening of the A4019 and the provision of the West Cheltenham Link Road. Option 4 is not shown on this figure, but comprises a dumbbell form roundabout centres on the existing A4019 overbridge.

Figure 3-3 – All five options carried forward to appraisal stage.

Options 1A, 2, 2A, 2B and 5 for the M5 Junction 10 Improvements Scheme (without earthworks). All five options include the widening of the A4019 and the provision of the West Cheltenham Link Road.

Appraisal of the options

- 3.3.8. Details of the assessment undertaken of the five options (Options 1A, 2, 2A, 2B and 5) in the appraisal stage are presented in the Technical Appraisal Report¹. An environmental assessment of the five options was undertaken alongside the Technical Appraisal Report, and presented in the Preliminary Environmental Assessment of Options Report (PEAOR)². Summaries of each environment topic assessed in the PEAOR are included in the Technical Appraisal Report.

¹ M5 Junction 10 Improvement Scheme, Volume 1 – Report, Technical Appraisal Report (2020). Gloucestershire County Council. www.gloucestershire.gov.uk/highways/major-projects-list/m5-junction-10-improvements-scheme/

² M5 Junction 10 Improvement Scheme, Preliminary Environmental Assessment of Options – Non-technical summary (2020). Gloucestershire County Council. www.gloucestershire.gov.uk/highways/major-projects-list/m5-junction-10-improvements-scheme/

- 3.3.9. A summary of each of the options appraised in the Technical Appraisal Report is presented below, followed by a summary of the key findings from the assessment.

Option 1A – New Junction to the north of the Existing Junction 10

- 3.3.10. Option 1A proposed a new M5 gyratory roundabout junction with two new overbridges, replacing the existing Elmstone Hardwicke bridge approximately 1,250m north of the existing M5 Junction 10. This junction would provide access to the M5 in all directions, and would replace the existing M5 Junction 10. As a result, the existing northbound on-slip and south bound off-slip at Junction 10 would no longer be required and would be removed.
- 3.3.11. A new 50mph two-lane dual carriageway would connect the new M5 junction with the A4019 by means of a new gyratory roundabout junction approximately 650m east of the M5. From this junction the new dual carriageway would continue south, passing over the River Chelt before tying into the B4634 approximately 300m east of the existing Withybridge Lane Junction. This section of dual carriageway would provide access from the M5 to the West Cheltenham Development Area.
- 3.3.12. In addition to the new sections of dual carriageway, this option proposed that the A4019 between the new gyratory roundabout and traffic signalised B4634 junction would be widened to provide a two lane dualled carriageway. New signalised junctions would be required at the staggered crossroads of The Green and Moat Lane in Uckington and at the Homecroft Drive junction.
- 3.3.13. As part of the improvement works, the existing Green Farm Access Bridge would be demolished and replaced at the same location with a new longer overbridge spanning the new slip road tapers. Another new bridge would be provided approximately 400m south to replace the demolished Elmstone Hardwicke bridge.

Option 2 – Upgrade Existing Junction 10 with Gyratory Roundabout

- 3.3.14. Option 2 proposed that the existing M5 Junction 10 overbridge be demolished, and a new gyratory roundabout junction be constructed over the M5, centred either side of the existing overbridge. A roundabout was considered to offer better traffic capacity than a signalised junction. To construct this roundabout and to tie into the existing A4019, the properties to the north and south of the A4019 carriageway would need to be demolished. Slip roads would connect the junction to the M5, providing access in all directions.
- 3.3.15. This option included the widening of connecting sections of the A4019 from the new junction to both the east and west, the west tying in approximately 250m west of the M5 Junction 10, and the east tying in to a new A4019 gyratory roundabout junction approximately 650m east of the junction. A connection stub to the north would provide access for potential future development. From this roundabout a proposed new 50mph dual carriageway continued south, passing over the River Chelt before tying into the B4634 with a new gyratory roundabout approximately 300m east of the existing Withybridge Lane junction. This section of dual carriageway would provide access from the M5 to the West Cheltenham Development Area.
- 3.3.16. In addition to the new sections of dual carriageway, the option proposed that the A4019, between the new gyratory roundabout and traffic signalised B4634 junction was widened to provide a two lane dualled carriageway. New signalised junctions would be required at the staggered crossroads of The Green and Moat Lane in Uckington and at the Homecroft Drive junction.

- 3.3.17. This option would impact upon all fourteen of the residential properties at Withybridge Gardens, the two properties on the A4019 (at Withy Bridge), a large proportion of the buildings at Sheldon Nurseries and the three properties nearby, and approximately a third of the Barn Farm storage area.

Option 2A – Upgrade Existing Junction 10 with Gyratory Roundabout offset to the north

- 3.3.18. Option 2A is the same as Option 2 (and Option 2B) except for the changes to the existing M5 Junction 10.
- 3.3.19. For the M5 Junction 10, Option 2A proposed that the upgrade of the existing M5 Junction 10 to a gyratory roundabout junction would utilise the existing M5 overbridge as the southern part of the roundabout and construct one new overbridge north of the A4019. To construct the gyratory roundabout and tie the junction into the existing A4019, the properties to the north of the carriageway, both east of and west of the M5 would need to be demolished. Slip roads connect the junction to the M5, providing access in all directions. Whilst this option retained the existing overbridge, and therefore does not require the construction of two new overbridges, the existing overbridge does have headroom limitations (for traffic on the M5) and requirements for future refurbishment (as a consequence of its age), that would not be realised with a new overbridge.
- 3.3.20. This option would impact upon at least four of the residential properties at Withybridge Gardens, the two properties on the A4019, a large proportion of the buildings at Sheldon Nurseries and the three properties nearby, and approximately a third of the Barn Farm storage area.

Option 2B – Upgrade Existing Junction 10 with Gyratory Roundabout offset to the south

- 3.3.21. Option 2B is the same as Option 2 (and Option 2A) except for the changes to the existing M5 Junction 10.
- 3.3.22. For the M5 Junction 10, Option 2B proposed that the upgrade of the existing M5 Junction 10 to a gyratory roundabout junction would utilise the existing M5 overbridge as the northern part of the roundabout and construct one new overbridge south of the A4019. To construct the gyratory roundabout and tie the junction into the existing A4019, the properties to the south of the carriageway would need to be demolished. Slip roads connect the junction to the M5, providing access in all directions. Whilst this option retained the existing overbridge, and therefore does not require the construction of two new overbridges, the existing overbridge does have headroom limitations (for traffic on the M5) and requirements for future refurbishment (as a consequence of its age), that would not be realised with a new overbridge.
- 3.3.23. This option would impact upon all fourteen of the residential properties at Withybridge Gardens, a large proportion of the buildings at Sheldon Nurseries and two of the properties nearby, and approximately a third of the Barn Farm storage area.

Option 5 - New Junction to the north of the Existing Junction 10 (in alternative position to Option 1A)

- 3.3.24. Option 5 included a new M5 gyratory roundabout junction with two new overbridges approximately 1,000m north of the existing M5 Junction 10, and south of the existing Elmstone Hardwicke bridge which would be demolished. This junction included access to

the M5 in all directions, as a result the existing northbound on-slip and south bound off-slip at M5 Junction 10 would no longer be required. To accommodate the new M5 junction, some buildings at Barn Farm would also have to be demolished and the existing access road to the farm realigned.

- 3.3.25. A new 50mph two-lane dual carriageway was included to connect the new M5 junction with the A4019 by means of a new gyratory roundabout junction, approximately 650m east of the M5. From this junction the new 50mph dual carriageway continued south, passing over the River Chelt before tying into the B4634 approximately 300m east of the existing Withybridge Lane Junction. This section of dual carriageway would provide access from the M5 to the West Cheltenham Development Area.
- 3.3.26. In addition to the new sections of dual carriageway, it was also proposed that the A4019, between the new gyratory roundabout and signalised B4634 junction, be widened to provide a two lane dualled carriageway. New signalised junctions would also be required at the staggered crossroads of The Green and Moat Lane in Uckington and at the Homecroft Drive junction.
- 3.3.27. As part of the improvement works, the existing Green Farm Accommodation Bridge would be retained.
- 3.3.28. This option would not impact upon any of the residential properties at Withybridge Gardens, the two properties on the A4019, Sheldon Nurseries and the three properties nearby. However, it would affect all buildings and storage areas at Barn Farm.

Summary of the M5 Junction 10 options sifting

- 3.3.29. In summary, the five options were assessed with regards to environmental impact, buildability and programme, compatibility with key design considerations, option cost, benefit cost ratio (BCR) and value for money (VfM).
- Environmental impact – the assessment of each option against the seven-point scale from WebTAG identified that all five options are likely to have a positive impact on people and communities, Options 2, 2A and 2B would have benefits in terms of air quality, noise and vibration, and generally performed favourably to Options 1A and 5 in the comparative assessment by environmental topic. All options would have a negative impact on road drainage and the water environment, cultural heritage, landscape and nature/conservation, although the adaptation of the existing M5 Junction 10 and utilisation of the existing A4019 (Options 2, 2A or 2B) was generally preferable to construction of a replacement junction in a new location to the north which would necessitate the construction of new lengths of carriageway across existing floodplain (Options 1A and 5).
 - Buildability and programme - all options will require the existing entry and exit to and from the M5 to be removed, and Options 1A, 2 and 5 require the demolition of a structure currently crossing the M5. All of the options require the link road between the A4019 and B4634 to be constructed, which will require construction over the existing high-pressure gas main and under the 132kv electric cables. All of the options, both during construction and in completion of the A4019 will maintain the existing walking, cycling and horse riding routes and facilities along the A4019. Additional land take will be required for all options to accommodate the revised junction and associated slip roads. For Options 2, 2A and 2B this will require properties adjacent to the existing junction to be demolished.
 - Compatibility - all options are considered to be compatible with the Scheme objectives as set out within the in the brief provided by GCC's local highway authority.
 - Option cost – Option 2A had the lowest expected option cost, and Option 1A the highest. Options 1A and 5 were estimated to cost more than Options 2, 2A and 2B.

- BCR and VfM – Options 2, 2A and 2B achieved a BCR of between 2.0 and 4.0, and subsequently a ‘High’ category of VfM. Options 1A and 5 achieved a slightly lower BCR of between 1.5 and 2.0 and therefore a slightly lower VfM category of ‘Medium’.
- 3.3.30. All options were compatible with the objectives of the Homes England Bid and provided an integrated scheme of transport infrastructure improvements that could facilitate the planned housing and economic development.
- 3.3.31. From this process it was concluded that Options 1A and 5 should not be taken further forward, as they provided a less sustainable option compared to Options 2, 2A and 2B, primarily in relation to affordability, value for money and environmental reasons. Options 1A and 5 would also result in land take from the safeguarded land to the north-west of Cheltenham, and thereby reducing the area for subsequent development within that safeguarded land. The assessment concluded that Options 2, 2A and 2B would all meet the Scheme objectives, but that there was marginal difference in the overall benefits or disadvantages of these three options when compared with each other. A preferred solution was not recommended as part of the TAR and therefore, Options 2, 2A and 2B, with the A4019 widening and West Cheltenham Link Road, were taken forward to the non-statutory public consultation (Autumn 2020).

3.4. Options for improvements to the A4019

- 3.4.1. Improvements to the A4019 were first identified in the August 2016 Transport Assessment as part of the Elms Park (North-west Cheltenham) application for planning permission, which included plans to improve the A4019 over the approximate extents from the West Cheltenham Fire Station to its junction with the B4634.
- 3.4.2. Following this development application, Amey Consulting developed a Concept Option for extending the proposed improvements of the A4019 to the west to link to the proposed M5 Junction 10 and the Link Road improvements. These proposed improvements included the widening and upgrade of the existing A4019 to dual carriageway standard with improvements to existing junctions. The Concept Option was included and assessed in the Homes England Bid for funding in March 2019.
- 3.4.3. Following submission of the Homes England Bid a review was undertaken to consider the Concept Option included with the submission and to identify potential new options.
- 3.4.4. As part of this exercise, options for wide single carriageways and part dualling of the A4019 were considered, as well as route corridors.
- Wide single carriageways and part dualling - WebTAG TAG Unit A5.4 – Marginal External Costs includes guidance on average capacities for urban roads by road type and geographical area. Table A2 of this includes Cheltenham in Area 7 – Urban large (>100,000) and using this area in Table A6 for an ‘A Road’ gives a suggested average capacity (passenger car units (PCU) per lane km per hour) of 1100. However, following an assessment using forecast traffic flows obtained from the Saturn model for the Scheme, it was found that all the individual links along the A4019 within the study area had a forecast flow exceeding 1100 PCU in either the eastbound, westbound or both carriageways. This assessment therefore ruled out wide single carriageways and part dualling as options for the A4019.
 - Alternative route corridors – no alternative route corridors in place of the A4019 were identified due to severity of impacts on land, existing property and the planned development (the North West Cheltenham Development Area, and the land safeguarded for development to the north-west of Cheltenham).

3.4.5. The road alignment options for the cross section of the A4019, that were considered most likely to provide the required benefits and have the least impact on known constraints, are listed in the bullet points below. The required benefits are those related to facilitating the planned developments by providing additional capacity on the A4019 to cope with the additional traffic associated with them:

- Road alignment option 1 – Urban all-purpose dual carriageway cross section (D2UAP).
- Road alignment option 2 – Reduced central reserve width dual carriageway cross section.

Road alignment option 3 – No central reserve dual carriageway cross section.

3.4.6. A sifting exercise was undertaken on the above three concept road alignment options based on an assessment of their ability to provide the benefits required.

3.4.7. The main difference between road alignment options 1, 2 and 3 relates to the proposed width of the central reserve. Lane widths, verge widths and walking/cycling facilities are common on all three options. Within road alignment option 1 the central reserve width would be 1.8m, Road alignment option 2 would have a central reserve width of 1.0m and road alignment option 3 would not have a central reserve. The suitability of each of these options are considered below. The A4019 has been split into three distinct sections for this assessment, based on changing characteristics such as location of junctions and frequency of accesses.

- **M5 J10 to West Cheltenham Link Road** - This section of the A4019 is the most open of the three sections with fewer direct accesses and junctions. This, combined with its proximity to the M5 would indicate that traffic speeds are more likely to be higher on this section than the other two sections. A wider central reserve along this section would offer the advantage of physical segregation between the opposing westbound and eastbound A4019 traffic flows, particularly at the M5J10 junction.

At the proposed West Cheltenham Link Road junction a wider central reserve would provide the opportunity for a pedestrian/cyclists refuge at a two stage crossing of the A4019. A physical central reserve would also restrict the right turn movements at the Withybridge Lane junction, which would otherwise be potentially unsafe within the proposed layout due to the proximity to the M5 J10 junction. It was therefore considered that road alignment option 1 would be the most appropriate layout for this section of the A4019, combined with a 50mph proposed speed limit. A vehicle restraint system (VRS) could also be provided with this option, should assessment determine that this is required.

- **West Cheltenham Link Road to Uckington** - The section of the A4019 starts to become more developed around the proposed Uckington junction with frequent direct property accesses. West of Uckington there is an existing junction with Cooks Lane and several field accesses, including several properties located around The Forge informal layby area. A wider central reserve along this section would offer the advantage of physical segregation between the opposing westbound and eastbound A4019 traffic flows. At the proposed Uckington junction a wider central reserve would provide the opportunity for a pedestrian refuge at a two stage crossing of the A4019. A physical central reserve would also restrict the right turn movements at the existing junctions and direct accesses along this section of the A4019. These right turn movements would likely raise safety concerns as they would involve unsignalised crossing of multiple lanes of opposing traffic on the A4019. It was therefore considered that road alignment option 1 would be the most appropriate layout for this section of the A4019, combined with a 50mph proposed speed limit, which would reduce to 40mph on approach to the Uckington Junction, due to the increase in the built up character of the road from this point eastwards. A VRS could also be provided with this option, should assessment determine that this is required.

- **Uckington to Gallagher Junction (Elms Park Section)** - The section of the A4019

is the most developed of the three sections, with a mixture of residential and field accesses to the west and residential and commercial access to the east. There are two existing junctions, Homecroft Drive and the Gallagher junction. The proposed scheme also incorporates two additional junctions along this section for proposed development access. A wider central reserve along this section would offer the advantage of physical segregation between the opposing westbound and eastbound A4019 traffic flows and prevent potentially unsafe right-turning movements to/from these accesses. It would also provide the opportunity for pedestrian/cyclist refuge at two stage crossings of the A4019. It was therefore considered that road alignment option 1 would be the most appropriate layout for this section of the A4019, combined with a 40mph proposed speed limit, due to the increasing built up character of the road. A VRS could also be provided with this option, should assessment determine that this is required.

- 3.4.8. Road alignment options 2 and 3 were therefore sifted out at this stage, and road alignment option 1, an urban all-purpose dual carriageway with an active travel corridor on the northern side of the A4019 was therefore carried forward into all M5 Junction scheme options.

Active travel corridor

- 3.4.9. The scheme design developed by GCC and Amey (see Section 3.2) included a continuous footway along the northern verge of the A4019 from the Link Road junction to the scheme tie in point, east of the Gallagher junction. In the southern verge (in this design), there was a length of proposed footway at Uckington, then a footway starting at the West Cheltenham Fire Station and extending continuously to the scheme tie in point, east of the Gallagher junction.

- 3.4.10. The design produced by the developers for the North West Cheltenham Development Area, which included the section of the A4019 adjacent to that development, included the following active travel provisions:

- **Northern side of the A4019** - On the northern side of the A4019, segregated pedestrian and cyclist facilities were shown from the Gallagher Retail Park to a proposed pedestrian/cycle route into the North West Cheltenham Development Area, located to the east of the proposed signalised junction at Homecroft Drive/Site Access 'A'. The segregated facilities consisted of a 2m wide footway and a 4m wide two-way cycleway.
- **Southern side of the A4019** - On the southern side of the A4019, the Developer's drawings include for a 3m wide unsegregated SUP. This would allow pedestrians and cyclists from the properties on the southern side of the A4019 to travel to the nearest signalised crossing and access the segregated pedestrian/cyclist facilities on the northern side of the A4019.

- 3.4.11. These plans for an active travel corridor were included subsequently in the development of the Scheme design, with such a corridor extending along the north side of the A4019, and the west side of the Link Road.

Development of the A4019 cross section

- 3.4.12. During the design development of the junctions along the A4019, it became necessary to include dedicated right turn lanes at the signalised junctions along the route. These would require central islands in order to accommodate the traffic signals and widening of central islands to accommodate the tapers into the right turn lanes. It became apparent that a central reserve would be necessary over the whole length of the sections between the junctions in order to provide a consistent cross section between the junctions.

3.4.13. Road alignment option 1, an urban all-purpose dual carriageway with central reserve widening to accommodate right turn lanes and an active travel corridor on the northern side of the A4019 was therefore carried forward into all of the shortlisted M5 Junction scheme options (Options 2, 2A and 2B).

3.5. Options for the Link Road

3.5.1. The Bid to Homes England identified the need for a new road to connect the proposed West Cheltenham Development Area to the M5 Junction 10. The new road was a dual carriageway with no active travel corridor. The need for this road was based on consideration of how the existing infrastructure would need to be adapted to accommodate the increased trips generated by the West Cheltenham Development Area.

Sensitivity test

3.5.2. Various potential scenarios were modelled to consider how best to provide future-proofed access for the West Cheltenham Development Area as part of the M5 Junction 10 Scheme. The model used M5 Junction 10 Option 2 from the Stage 3 traffic forecasts.

- Core scenario R: trips from the West Cheltenham Development Area were connected to the wider network from the north as well as the south, but with no through link.
- Sensitivity test 1: trips from the West Cheltenham Development Area were connected to the wider network to the north only, via a new roundabout at the B4634.
- Sensitivity test 2: trips from the West Cheltenham Development Area were connected to the wider network via a new through link road within the West Cheltenham Development Area, joining a new roundabout at the B4634 in the north and Fiddler's Green Ln/Telstar Way Junction in the south.

Table 3-1 - A4019/B4634 Link Rd Flows in PCU's (Worst Peak Hours)

Direction	Core Model Flows (in PCUs)		Sensitivity Test 1 Model Flows (in PCUs)		Sensitivity Test 2 Model Flows (in PCUs)	
	AM	PM	AM	PM	AM	PM
NB	254	347	384	568	396	551
SB	271	194	669	359	491	391

3.5.3. The overall two-way demand on the West Cheltenham Link Road varies between 525 to 1053 PCUs in AM peak and 541 to 942 PCUs in PM peak. The majority of the traffic using this link road is from the development with the rest being drawn from the local area, trying to avoid the already congested B4634 and Princess Elizabeth Way.

3.5.4. The sensitivity test concluded that without the West Cheltenham Link Road, all this traffic will use the existing network causing much more pressure on the already congested network. The expected link road flows clearly established the requirement for the West Cheltenham Link Road.

Environmental considerations

3.5.5. The baseline environment is summarised in Chapter 2 – The Scheme (application document TR010063 – APP 6.2).

3.5.6. The extensive flooding that occurs on the River Chelt floodplain presents one of the most significant constraints to the location and design of the road. The National Planning Policy Framework (NPPF) (2021) requires *development that would be safe for its lifetime taking account of the vulnerability of its users*, and therefore the road will need to be raised to

remain operable during flood. The impact of that raising would have the consequence of displacing floodwater and would need to be mitigated for. Given the pattern of flooding, the further east the West Cheltenham Link Road is located, the less it will be impacted by flooding.

3.5.7. Four route corridor options were developed and assessed (shown in Figure 3-4). The assessment of the route corridors was carried out using the following main assessment categories:

- Impact on floodplain.
- Directness of route from M5 Junction 10.
- Impact on properties.
- Impact on environment (in addition to the floodplain and properties).

3.5.8. The assessment was carried out in two stages – a route corridor assessment and an assessment of route options within the corridor taken forward. It was assumed that the location of the access to the West Cheltenham Development Area is fixed to the general area proposed for the junction on the B4634, which has been discussed and agreed with the West Cheltenham Development Area developer.

West Cheltenham Link Road route corridor options assessment

3.5.9. A summary table of the rankings is set out at Table 3-2 below. For each factor considered, the options were ranked against each other.

- 1 (Pale green) - best when compared with the other options.
- 2 (Dark green) - second best when compared with the other options.
- 3 (Orange) - third best when compared with the other options.
- 4 (Red) - worst of the options for this factor.

Table 3-2 - Summary of the West Cheltenham Link Road route options assessment

Receptor / factor in consideration	Corridor 1	Corridor 2	Corridor 3	Corridor 4
Floodplain	4	3	2	1
Directness of route	3	2	1	4
Properties	2=	2=	1	2=
Hedgerows and trees	2=	4	2=	1
Buried archaeology	2=	1	2=	2=
Listed buildings	3	2	1	4
Noise and air quality impacts	1=	1=	1=	4

3.5.10. For several environmental factors, more than one option was considered to have the same level of impact.

Sifting of the Link Road options – Route corridor

3.5.11. Corridor 1 had the greatest impact on floodplain and Corridor 4 was the least direct. These two corridors were therefore discounted from further consideration.

3.5.12. Overall, it was found that Corridor 3 was the most direct, had least impact on properties, second least impact on floodplain and generally the scale of environmental impacts was less than the other corridors. Corridor 2 was the second-best performing corridor and

contains existing highway infrastructure in the form of Withybridge Lane. Corridors 2 and 3 were taken forward for further consideration.

Route Corridor 2

- 3.5.13. Corridor 2 was identified as the second-best performing corridor as part of the initial route corridor assessment. This corridor contains existing highway infrastructure in the form of Withybridge Lane. The suitability of the existing Withybridge Lane route as an alternative to constructing the Link Road was investigated.
- 3.5.14. Two options were investigated for upgrading the existing Withybridge Lane to provide enhanced highway standards including segregated facilities for pedestrians and cyclists and improved resilience to flooding.
- 3.5.15. Corridor 2 Option 1 - developed as a 'do minimum' option to address the highway layout and cross section deficiencies within the current layout. This option was developed following existing road levels as much as possible in order to minimise land, property and environmental impacts. However, the flooding assessment has shown that the road, retained at existing levels, is likely to suffer from flooding during the 1% annual exceedance probability event (1 in 100-year return period), and would not meet the requirement of the NPPF as a *development [that] would be safe for its lifetime taking account of the vulnerability of its users*. As a primary access route into new development sites this amount of flooding would not be appropriate and measures would be required to protect the road, reduce the risk for users, and better afford safe access and egress to the land served by the road. The environmental assessment of this option also concluded that there would be significant loss of hedgerows on at least one side of the lane and potential direct impacts on the Grade II listed buildings at Millhouse Farm.
- 3.5.16. Corridor 2 Option 2 - developed to address concerns raised from the flooding assessment and improve the route's resilience to flooding. However, the elevation of the route (which would achieve compliance with the NPPF requirement) would introduce greater environmental impacts than Option 1 for this route corridor, including greater loss of existing floodplain, hedgerows and trees and the likelihood of more severe direct impacts on the Grade II listed buildings at Millhouse Farm. It was also considered that because of level differences in the existing carriageway, then a new full pavement would need to be constructed, and the re-use of the existing carriageway would not be possible.
- 3.5.17. The options considered for Corridor 2, utilising the existing Withybridge Lane layout concluded that this is unlikely to be suitable to cater for future traffic and walking, cycling and horse-riding demand after the Scheme and surrounding developments are in place due to the existing alignment and cross sectional restrictions.

Route Corridor 3

- 3.5.18. Corridor 3 was taken forward into all of the shortlisted M5 Junction 10 scheme options (Options 2, 2A and 2B) as it was the most direct, has least impact on properties, second least impact on floodplain and generally the scale of environmental impacts would be less than the other corridors. The selection of Option 3 also allows the Withybridge Lane to remain open during construction to minimise impacts on existing users.

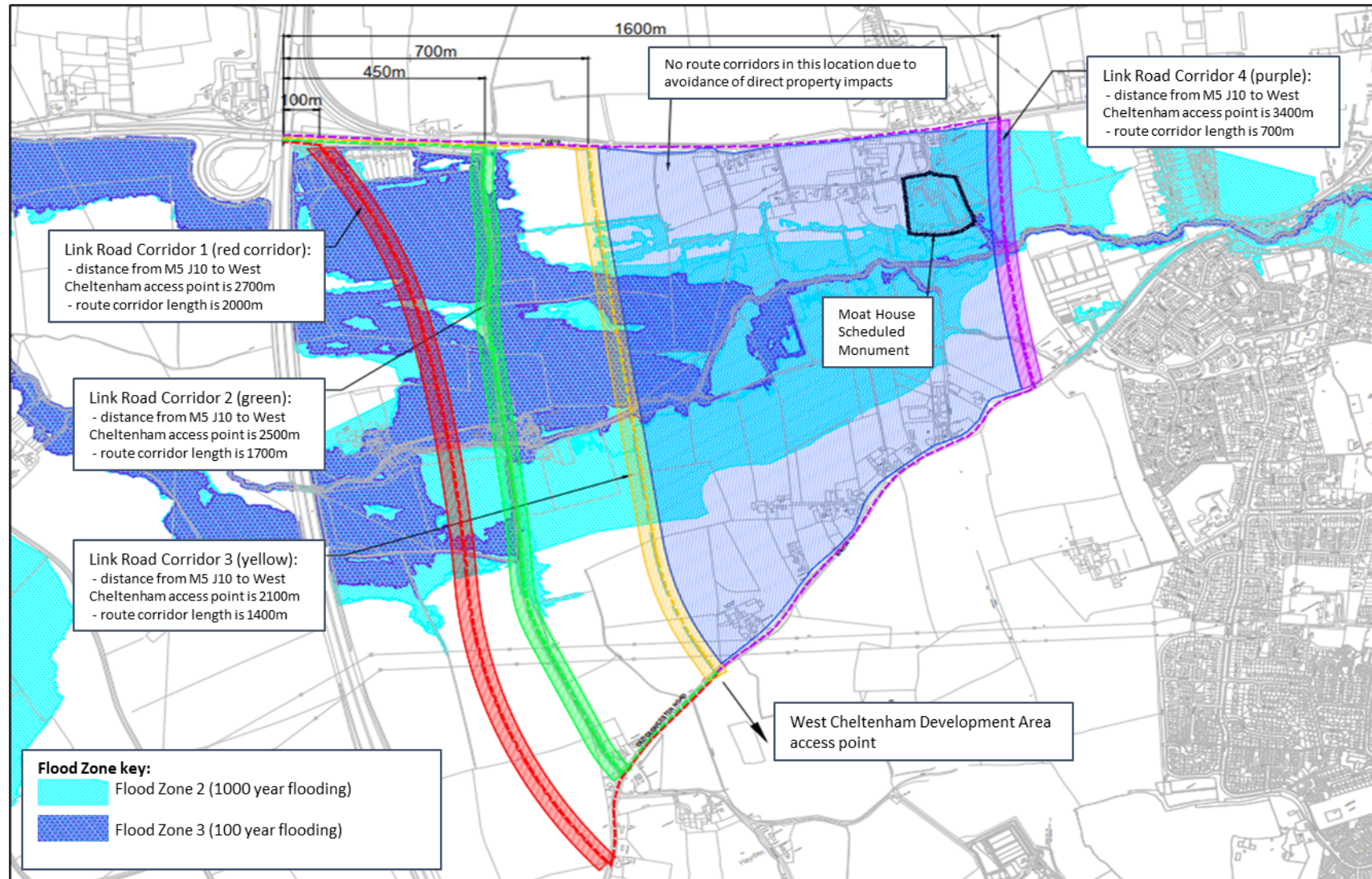


Figure 3-4 - West Cheltenham Link Road Route Corridors

3.6. Non-statutory consultation

- 3.6.1. For the reasons presented in Section 3.3, the Options 2, 2A and 2B were selected to be taken forwards for consideration in the non-statutory consultation held in Autumn 2020 (and discussed in Section 1.7 of Chapter 1 – Introduction (application document TR010063 – APP 6.2)). Each of the Options 2, 2A and 2B included the same proposal for the Link Road and the widening of the A4019.
- 3.6.2. Full details of the non-statutory consultation are presented in the Consultation Report (application document reference TR010063 – APP 5.1). In summary, the consultation survey participants expressed a high level of support for the scheme, with 84% agreeing that the proposals for M5 Junction 10 and a link road to West Cheltenham are required. Of the three options presented during the public consultation, the preferred option for the improvements at Junction 10 was shown to be Option 2 (37%), followed by Option 2A (28%). The lowest level of preference was for Option 2B (6%).

3.7. Preferred route option for the M5 Junction 10 Improvements Scheme

- 3.7.1. Of the three options shortlisted for the Scheme and considered at the non-statutory consultation, Option 2 was the option that GCC (Applicant) recommended should be taken forward to as the preferred route for the M5 Junction 10 Improvements Scheme. Option 2 was the option identified as the preferred option from the non-statutory consultation process (as summarised in Section 3.6), and is also the option that results in the removal of the existing Piffs Elm Interchange Bridge which is currently in poor condition and requires substantive improvements, whereas this is retained in both Option 2A and 2B. The response received from National Highways in the non-statutory consultation expressed a preference for the removal of this existing bridge and the construction of two new structures, as per Option 2.
- 3.7.2. The details of this option are those set out in Chapter 2 – The Scheme (application document TR010063 – APP 6.2) in the description of the Scheme elements (Section 2.4) and Figure 2-1, provided in Appendix 1.3 (application document TR010063 – APP 6.15). Options 2A and 2B (described in Section 3.3) were not taken forward for further consideration.
- 3.7.3. Option 2 comprises the changes to M5 Junction 10, the widening of the A4019 and the Link Road. These changes are:
- For M5 Junction 10 – upgrading the existing junction with a gyratory roundabout centered around the existing bridge. The existing bridge will be demolished.
 - For the A4019 – an urban all-purpose dual carriageway with an active travel corridor on the northern side of the A4019.
 - For the Link Road – a new road along route corridor 3.

3.8. Development of the preferred route option for the M5 Junction 10 Improvements Scheme

- 3.8.1. Further assessment and design development work was undertaken following the non-statutory public consultation in Autumn 2020. This took into account feedback received during that public consultation and the results of further survey and assessment work.
- 3.8.2. This work considered:

- Review of the alignment and cross section of the Link Road.
- A4019 widening at Uckington.
- Extending the improvement works on the A4019 eastwards as far as Gallagher Retail Park (junction of the A4019 and B4634).
- Repurposing Withybridge Lane.

3.8.3. Table 3-3 (presented at the end of this Section 3.8) provides a summary of the design options selected for the Scheme, and taken forwards for assessment in the PEIR, and presentation at the Statutory Consultation (December 2021 – February 2022). As described in Section 3.9 further minor changes were made in the design following the statutory consultation and taken forwards for assessment in the ES. These changes did not alter the overall Scheme design that is presented in Table 3-1.

The Link Road

- 3.8.4. The DF1 design of the Link Road was for a two-lane dual carriageway for its full extent. Updated traffic modelling identified that the estimated peak traffic flows in both directions would be within the capacity of a single lane, and therefore a single carriageway layout would provide sufficient capacity for the forecast flows.
- 3.8.5. Five route options were identified and assessed for the alignment of the Link Road within Route Corridor 3, as shown in Figure 3-5 below. The assessment of the five route options identified little differentiation between the routes for many of the assessment categories. The largest differentiator was the need for an engineered river channel in the vicinity of the River Chelt bridge for Options 2, 4 and 5, due to the bend in the river at this location. This would likely give rise to additional impacts.
- 3.8.6. Based on the above issues it was considered that Options 2, 4 and 5 should be sifted out from selection.
- 3.8.7. For Options 1 and 3, Option 3 was considered to have a slightly more efficient use of land and was therefore considered to be the best performing option within Route Corridor 3.
- 3.8.8. It was therefore recommended that Option 3 from Route Corridor 3 was taken forward as the preferred option for connectivity between the M5 Junction 10 and the West Cheltenham Development Area.
- 3.8.9. Following a review of the vertical height of the River Chelt bridge, the height was reduced, reducing the headroom from the underside of the bridge to the top of the riverbank from 3.8m to 2.8m. The revised height will still allow access for small farm vehicles, livestock and pedestrians underneath the bridge on both sides of the river but will provide savings in the material requirements for the embankments on either side. The reduction in the vertical alignment will also reduce the prominence of the bridge within the surrounding landscape.

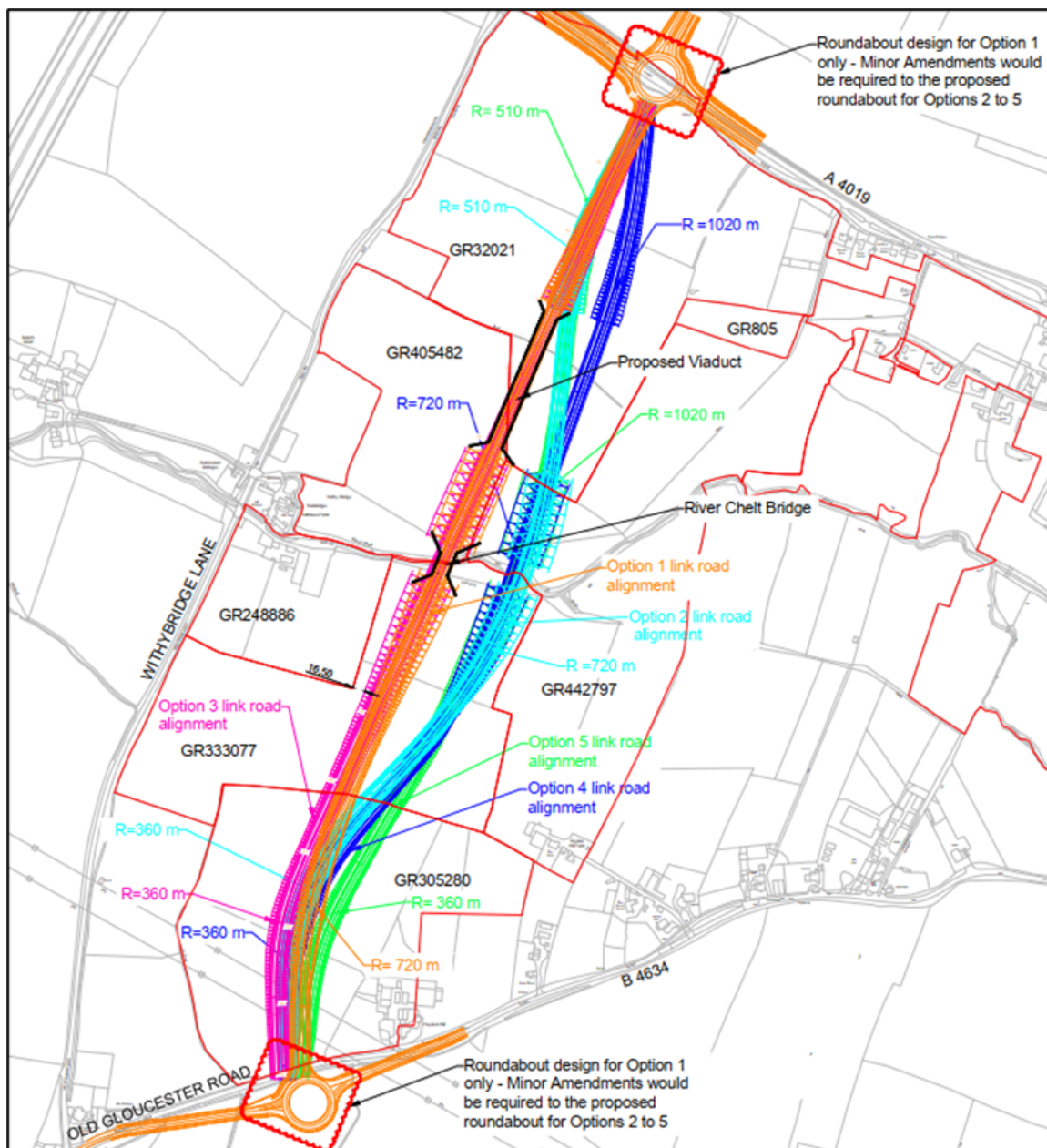


Figure 3-5 - Alignment options within Corridor 3 for the West Cheltenham Link Road (note the roundabouts shown in this figure at each end of the Link Road were replaced with signalised junctions during the development of the DF2 design)

A4019 widening at Uckington

- 3.8.10. Options were considered for widening the A4019 to the north or to the south through Uckington.
- 3.8.11. Widening to the north would impact on eleven separate plots on the northern side of the A4019 at Uckington, including the potential requirement to demolish at least two residential properties and result in the significant loss of frontages to six residential properties. Land take would be required in nine separate plots to achieve the widening to the northern side at Uckington.
- 3.8.12. Widening to the southern side of the A4019 would impact on six separate plots located to the south of the A4019 and would require the potential demolition of three residential properties and a farm building.

- 3.8.13. Widening to both the north and south sides of the A4019 would require land take within at least fifteen separate plots, affecting almost every plot bounding the A4019 at the Uckington junction. This option would result in the loss of frontages to eleven properties and require the potential demolition of a farm building.
- 3.8.14. The review concluded that widening to the southern side of the A4019 at Uckington was the preferred option, as it would impact a lesser number of plots/properties, and also allow for the introduction of pedestrian crossings on the A4019 at the junction with Moat Lane and The Green.

Eastern extent of the Scheme on the A4019

- 3.8.15. Under the Grant Determination Agreement (GDA) with Homes England, the remit of the Scheme covered the widening of the A4019 from Junction 10 to the junction with B4634. This includes the section of the A4019 adjacent to the North-west Cheltenham Development Area, which is also in the remit of the proposed Elms Park development and included in their application for planning permission.
- 3.8.16. Due to this overlap, it was decided during early design development stage to remove the section of A4019 widening adjacent to the Elms Park development from the Scheme on the assumption that it would be delivered using the developer's planning permission.
- 3.8.17. However, the developer's design for the A4019 widening as it stands would not meet the requirements identified by the updated M5 Junction 10 Traffic model. This is because the Gloucestershire Countywide Traffic Model (GCTM) is used as the base for M5 Junction 10 traffic model and it has been found to significantly increase forecasted traffic volumes when compared to the previous Central Severn Vale (CSV) base model that was used by the developer for their traffic modelling.
- 3.8.18. A planning application for the Elms Park development (ref. 16/02000/OUT) was submitted in September 2016 and has undergone a lengthy determination process. Subsequent further applications (ref. 20/00759/FUL) also await determination. At the time of submission of the DCO it is not clear as to when and in what format these applications are likely to be approved.
- 3.8.19. To minimise risk and uncertainty over timing of the delivery of this section, it was subsequently proposed that the section of A4019 linked to the Elms Park development to be included within the M5 Junction 10 DCO package. Based on this the eastern extent of the Scheme on the A4019 has been reinstated to include the extents to A4019/B4634 junction at Gallagher Retail Park. This extended section also includes two new accesses to the future North-west Cheltenham Development Area.

Withybridge Lane – Repurposing of this road

- 3.8.20. The potential for repurposing Withybridge Lane was considered so that the movement of traffic through it is restricted.
- 3.8.21. This could be achieved through the closure of the road for through traffic, or the implementation of traffic calming and traffic management measures. Any measures would be designed to be in keeping with the local environment.

Summary of the Scheme elements

3.8.22. Table 3-3 provides a summary of the Scheme elements which were subsequently assessed in the Preliminary Environmental Information Report (PEIR) and presented to consultees at the Statutory Consultation.

Table 3-3 - Summary of the Scheme elements which constitute the selected design as presented and assessed in the PEIR

Scheme element	Description of the element selected
M5 Junction 10	Option 2 - upgrading the existing junction with a gyratory roundabout centred around the existing A4019 bridge. The existing bridge will be demolished.
A4019	Road alignment option 1 - an urban all-purpose dual carriageway with an active travel corridor on the northern side of the A4019. Widening of the existing A4019 will be to the south of the current alignment through Uckington. Improvements on the A4019 will extend eastwards to the Gallagher junction (A4019/B4634 junction).
The Link Road	A new road along route corridor 3. Within route corridor 3, option 3 was selected as the preferred route alignment (Figure 3-5). The road will comprise a two-way single carriageway road, with an active travel corridor along the western side. New signalised junctions will connect the Link Road into the A4019 (to the north), and the B4634 (to the south).

3.9. Development of the design following Statutory Consultation

3.9.1. Further design development work was undertaken following the statutory consultation (held December 2021 – February 2022). This took into account feedback received during that public consultation and the results of ongoing survey and assessment work.

3.9.2. The design changes identified are summarised below for each of the three elements of the Scheme. These changes, along with the design developed to the statutory consultation (and summarised in Table 3-3) form the preliminary design for the Scheme that has been assessed in this ES.

M5 Junction 10

3.9.3. The further design changes incorporated for the M5 Junction 10 element comprised measures to mitigate potential impacts to both bats and to an area of recently identified priority habitat, and the design of the flood storage area.

Mitigation for bats

3.9.4. The environmental assessment undertaken in the PEIR identified a potential impact to bats from traffic at an identified bat crossing point over the A4019 to the east of the M5. The Scheme will widen and elevate the A4019 in this location, compared to the existing road (the new Junction 10 gyratory roundabout is 1.6m above ordnance datum (AOD) higher than the existing A4019 overbridge). An assessment of the options to mitigate the impacts to bats identified the construction of an underpass (the Withybridge (A4019) underpass) underneath the A4019 on its eastern approach up to the gyratory roundabout as the most effective option to mitigate impacts to bats. Other options such as the use of

gantries or planting to encourage the bats to fly higher as they cross the A4019 are considered to be much less effective than an underpass.

3.9.5. It was also identified that as long as this underpass was not illuminated internally from dusk to dawn, then the underpass could also be used by pedestrians and equestrians as a safe crossing point under the A4019 at this location. For equestrians in particular this would provide a traffic free link from bridleway ref. AUC1 which meets the A4019 opposite Withybridge Lane, into Withybridge Lane, and thereby provide a better alternative to an at grade crossing for equestrians across the A4019, and provide permeability for equestrians through the Scheme.

3.9.6. An arch or a box design was considered for the underpass structure, with a box design selected on the basis that an arch was likely to require a piled foundation, which would be difficult and more costly to construct within the alignment of the A4019.

Priority habitat

3.9.7. Ecology survey work undertaken since the statutory consultation identified an area of priority habitat along part of the northern edge of Stanboro Lane, just to the west of Junction 10. The embankment for the A4019 in the DF2 design for the Scheme impacted this area directly. Options to steepen the embankment were considered and a design selected that meant the embankment and drainage channels did not encroach into the priority habitat area. The change made to the embankment in this location also enabled the retention of the section of Stanboro Lane between its junction with the A4019 and Sheldon Cottages, as well as the retention of Sheldon Cottages.

Flood storage area

3.9.8. The shape of the flood storage area was reviewed so that the excavated area, and surrounding strip of landscaping was compressed into a smaller area of land adjacent to the M5, A4019 and Withybridge Lane. This enabled a more efficient use of the land between the A4019, Withybridge Lane and the M5. The attenuation basin that receives highway drainage from the northern end of the Link Road was relocated to within the landscaped area surrounding the flood storage excavated area, to enable further efficiencies in the permanent land take required for the Scheme. These changes do not affect the capacity of the flood storage area to provide its required function of flood storage.

Withybridge Lane

3.9.9. Feedback received during the statutory consultation regarding possible changes to access for vehicles through Withybridge Lane identified a preference to retain the current level of access through Withybridge Lane, albeit with the junction with the A4019 change to left turn only onto the A4019, and left turn only in off the A4019. No further design changes were made to vehicular access through Withybridge Lane.

The Link Road

3.9.10. The further design options considered for the Link Road element considered the design of the flood mitigation structures and the requirement for hard bank protection under the River Chelt bridge.

- A corrugated arch and a concrete box design were considered for the flood mitigation structures underneath the Link Road (to the north of the River Chelt). The concrete box design was selected on the basis of ease of construction and the requirement for more significant foundation works for the corrugated arch design.

- The identification of existing active bank erosion along the River Chelt in the vicinity of the new River Chelt bridge, combined with potential high stream powers, mean that there is a likely need for bank protection, comprising rip-rap or non-biodegradable geotextile, along both river banks through the new bridge. This is required to ensure that access under the River Chelt bridge is maintained. Specific details have not been identified at this preliminary design stage, and this mitigation measure has been included as a worst case. Further assessment and consultation with the Environment Agency will be undertaken at detailed design stage.

A4019

- 3.9.11. The further design options considered for the A4019 element considered the following aspects.

Reducing impacts to Moat House Scheduled Monument

- 3.9.12. The requirement for the new road linking Cooks Lane and Moat Lane was reviewed, along with the alignment of the junction of Moat Lane and the A4019 in Uckington.
- 3.9.13. The new road linking Cooks Lane and Moat Lane (as presented in the DF2 design) would provide eastbound access for residents and businesses onto the A4019, via the signalised junction in Uckington (A4019 and Moat Lane). This would have resulted in an increase in traffic along Moat Lane, past the scheduled monument and listed buildings at Moat House. On review, this new connection was removed from the design, and a new connection created through to the northern end of the Link Road. As a result, traffic numbers along Moat Lane in the Scheme will be unchanged from existing levels.
- 3.9.14. The junctions of Moat Lane and The Green, with the A4019 in Uckington were presented in the DF2 design as an offset crossroads. In order to reduce visual impacts of the new junction to Moat House Scheduled Monument, the alignment of Moat Lane was changed so that its junction with the A4019 and The Green was changed to form a more straightened crossroads.

Improved alignment for Site Access B

- 3.9.15. Site Access B refers to the middle of the three junctions off the A4019 that tie into the planned North-west Cheltenham Development Area. Site Access A is to the west, and the Gallagher Junction (Site Access C) is to the east.
- 3.9.16. The DF2 design showed Site Access A as a signalised crossroads junction with Homecroft Drive and the A4019; Site Access B as a signalised T-junction, and the Gallagher Junction as a signalised crossroads with the B4634 and the A4019.
- 3.9.17. In order to improve traffic flow along the A4019 in the Scheme, the layout of these three junctions was reviewed, with the following changes made:
- Site Access A – changed to a signalised T-junction with the A4019. No direct access from Homecroft Drive onto the A4019. The noise barrier along this section of the A4019 will be extended across the end of Homecroft Drive. This will provide improved noise mitigation for residents living on Homecroft Drive. Residents in Homecroft Drive will access the A4019 via an access road to the reconfigured signalised Site Access B junction.
 - Site Access B – changed to a signalised crossroads with the A4019, with the access point into the North-west Cheltenham Development Area moved 50m to the west, to directly opposite the Civil Service Sports Ground. A new access road providing access to Homecroft Drive will also feed into this junction.
 - Gallagher junction (Site Access C) – minimal changes from the DF2 design, with the crossings of the northern arm moved further north to allow the bus gate to be

added (as described below); and the removal of the left turn lane at the B4634 which reduces the length and stages of the Toucan crossing across this arm of the junction.

Improved provision for buses

3.9.18. Provision for buses within the Scheme was reviewed, with the inclusion of the following changes made to the design:

- The inclusion of bus gates in the design of Site Access A, Site Access B and the Gallagher junctions into the North-west Cheltenham Development Area.
- A bus lane along the eastbound side of the A4019 from the West Cheltenham Fire Station to the Gallagher junction.

Futureproofing for the development of the safeguarded land to the north-west of Cheltenham

3.9.19. Two aspects of the design of the A4019 were reviewed to enable the future development of the safeguarded land to the north-west of Cheltenham for development (shown in Chapter 2 – The Scheme (application document TR010063 – APP 6.2) Figure 2-3).

- The size and design of the northern arm of the signalised crossroads with the Link Road and the A4019 junction was reviewed. A simplified version was selected that resulted in a reduced land take, compared to the previous design, whilst still providing the required access to the land parcels and the informal Traveller site. The simplified design would allow a future developer of the safeguarded land to the north-west of Cheltenham more flexibility in the design of the junction onto the A4019.
- The width of the central reserve between this junction and Uckington has been increased to accommodate the inclusion of a future junction into the safeguarded land to the north-west of Cheltenham, without a requirement to widen the A4019. Noting that this future junction would be a secondary access into the safeguarded land.

Changes to the lighting design to provide mitigation for bats

3.9.20. The lighting design for short sections (~150m) of the A4019 to the east and west of Uckington was reviewed to remove the street lighting in these areas. This will create two dark corridors along the A4019 for bats to forage across the A4019. Lighting along the length of the A4019 was assessed to impede the foraging ability of bats in this area.

Mitigation for dormice

3.9.21. Survey work has identified the presence of dormice to the north of the A4019. To mitigate for the loss of hedgerows (dormouse habitat) along the A4019 that will occur as a result of the widening of the A4019, improvements to existing hedgerows, and the creation of new hedgerows along existing field boundaries have been included in the design, in fields to the north of the A4019. The improvements include new planting to fill in gaps for example.

3.10. Justification for the chosen option

3.10.1. As described in this chapter the design selected as the preliminary design for the Scheme has been chosen through the consideration of a range of sustainability criteria, comprising strategic development and local requirements, environmental factors, engineering considerations and cost.

- Strategic development – the preliminary design meets the overarching

requirements of the JCS and the wider transport network with a design to provide the transport network connections required in west and north-west Cheltenham that will support economic growth and facilitate growth in jobs.

- Local requirements – the preliminary design has been developed through three sets of public consultation with engagement with the local community, landowners and statutory consultees. The feedback received from each stage of consultation has been considered in the development of the next design iteration, with multiple changes highlighted at the consultation incorporated into the design.
- Environmental factors – the preliminary design has been developed to minimise environmental impacts posed by the Scheme, and to maximise the opportunities for enhancements. This has been developed from a Scheme alignment level, for example through the utilisation of existing infrastructure and route corridors that will minimise the impacts of the Scheme to the floodplains of the River Chelt, Leigh Brook and River Swilgate for example, down to the retention and enhancement of existing vegetation to mitigate effects to a single protected species such as the dormouse. Alongside the mitigation of impacts to the environment, the preliminary design has sought to maximise opportunities for people living and working in the area through the creation of new active travel corridors along both the A4019 and the Link Road.
- Engineering considerations – the preliminary design has sought to develop a sustainable design through a multidisciplinary team of engineers and environmental specialists, with the design developed through an iterative process of development, testing and refining the design and the consideration of feedback received through the consultation process. Existing infrastructure has been retained and utilised within the Scheme where possible, for example the existing A4019 route corridor; and the scale of all new infrastructure has been challenged through the design review process to ensure that it provides a Scheme that meets its objectives without unnecessary construction, for example the reduction of the Link Road from a dual to a single carriageway road.
- Cost – the preliminary design has considered buildability, cost and programme implications through the development of its respective components.

3.10.2. In summary, the preliminary design for the Scheme has been achieved through an active consideration of all aspects of sustainability to provide a Scheme that meets the requirements of the JCS, alongside improvements in connectivity and access for local people, and a net gain in biodiversity.

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