

A417 Missing Link  
TR010056

6.2 Environmental Statement  
Chapter 3 Assessment  
of Alternatives

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

**A417 Missing Link**

Development Consent Order 202[x]

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**6.2 Environmental Statement  
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## 3 Assessment of alternatives

### 3.1 Introduction

- 3.1.1 This chapter of the Environmental Statement (ES) presents a summary of the alternative options which have been considered and the justification for the scheme. Developing alternative modes of transport to solve the identified capacity problem on the Existing A417 Missing Link has been considered.
- 3.1.2 Regulation 14(2)(d) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) requires that an ES should include at least, *'a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment'*. That requirement is repeated in similar terms at paragraph 2 of Schedule 4 of the EIA Regulations.

### 3.2 Alternative assessment methodology

- 3.2.1 The scheme has been subject to a process of staged development and evolution through Highways England's major project lifecycle steps which include the following stages:
- Strategy, shaping and prioritisation (identification of the need for the scheme).
  - Option identification.
  - Option selection (leading to Preferred Route Announcement (PRA)).
  - Preliminary design (the current stage).
- 3.2.2 Each stage is aligned to specific milestones to reflect the significant decision points in a scheme's development and delivery. The scheme is currently at the preliminary design stage.

### 3.3 Reasonable alternatives studied

- 3.3.1 This section highlights the reasonable alternatives studied and summarises the process that has led to the development of the preferred route and includes the main reasons for selection of chosen options and the rejection of the alternatives, taking into account the effects of the development on the environment.

#### Identification of the need for the scheme

- 3.3.2 The scheme has been under consideration for over 20 years. Though 90% of the length of the A417/A419 – M4/M5 link had seen dual-carriageway improvements by 1998, this section, near Birdlip in Gloucestershire, had not been included. A study by the Highways Agency (now Highways England) between 2001 and 2003 concluded that an on-line dualling option would be appropriate for this section. However, development of the project, named the 'modified brown route', stalled when it was not included in the National Roads Programme.
- 3.3.3 In December 2014, it was announced that the A417 Missing Link scheme would be 1 of 15 new schemes to be included for development in the Department for Transport's £15.2 billion Road Investment Strategy (RIS1). The scheme is now proposed to be delivered as part of improvements to the strategic road network in England in the next Road Investment Strategy period (RIS2). RIS2 was published

in March 2020 and sets out the road investment strategy for April 2020 to March 2025.

### Option Identification (2016 – 2018)

3.3.4 The process of options identification was undertaken in two parts and is summarised as:

- Options identification, initial sifting and appraisal.
- Options appraisal and sifting to identify options to take forward for further appraisal.

#### Option identification, initial sifting and appraisal

##### *Initial sifting methodology*

3.3.5 A four-step process was followed to identify options for solution to the A417 Missing Link, and then reduce these options down to a number of routes to be fully assessed and to inform the choice of route to be taken forward for public consultation. The sifting methodology had four distinct sifting steps, detailed in Table 3-1. For full details refer to the Technical Appraisal Report (Document Reference 7.9).

**Table 3-1 Sifting methodology**

Sifting steps	Assessment work
Step 1 Initial option identification	Development and categorisation of 30 options. For details see Chapter 5 of the Technical Appraisal Report (Document Reference 7.9).
Step 2 Engineering assessment	Engineering assessment of viability of options and compliance with the Design Manual for Roads and Bridges (DMRB). For details see Section 6.2 of the Technical Appraisal Report (Document Reference 7.9).
Step 3 Early Assessment and Sifting Tool Plus	Assessment of remaining routes using Early Assessment and Sifting Tool <sup>1</sup> (EAST) Plus methodology - a version of the standard Department for Transport (DfT) tool for early stage sifting. For details see Section 6.3 of the Technical Appraisal Report (Document Reference 7.9).
Step 4 Value for money and affordability assessment	Assessment of highest scoring routes on value for money and affordability. For details see Section 6.4 of the Technical Appraisal Report (Document Reference 7.9).

##### *Step 1 Initial option identification*

3.3.6 Initial option identification generated 30 route options, a combination of surface and tunnel options. The initial 30 options were categorised into 5 escarpment corridors, A, B, C, D and E, based on where the surface or tunnel options run across and down the escarpment. This enabled the review and comparison of smaller groups of routes categorised by escarpment zone, as shown in ES Figure 3.1 Escarpment Zones (Document Reference 6.3). These 30 route options are identified in Table 3-2 and are shown in ES Figure 3.2 Initial 30 Options (Document Reference 6.3).

**Table 3-2 Initial 30 options defined by escarpment corridor**

Escapement corridor	Options	Option(s) taken forward
A	6, 7, 26	None – The three routes scored poorly, particularly against environmental objectives and were discounted.
B	3, 4, 8, 11, 12, 15, 16, 17, 18, 19, 27, 30	3 (highest scoring option) 12 (second highest scoring surface route) 30 (highest scoring surface route)
C	2, 9, 10, 13, 14, 20, 21, 22, 28	21 (highest scoring option)
D	1, 29	29 (highest scoring option)
E	5, 23, 24, 25	24 (highest scoring option)

### *Step 2 Engineering assessment*

- 3.3.7 To ensure that options to be considered offer an improvement to the geometry of the existing route, the routes were assessed against the relevant current design standards for tunnels and dual carriageways. The 30 options were reviewed to confirm compliance with DMRB.
- 3.3.8 Ten of the initial 30 options were removed during this stage, with 20 progressing to step 3.

### *Step 3 Early Assessment and Sifting Tool Plus*

- 3.3.9 A multi-criteria assessment using the Client Scheme Requirements (noted under “Need for the scheme” in ES Chapter 2 The project (Document Reference 6.2)) and the Early Assessment and Sifting Tool (EAST) was carried out. The EAST tool was modified (EAST plus) for the A417 to provide a ranking between options and include additional criteria to represent the scheme objectives (see section 2.3 in ES Chapter 2 (Document Reference 6.2)). These were developed collaboratively with stakeholders to reflect a landscape-led approach to the scheme’s development. For further details on how the tool was modified, see section 6.3 of the Technical Appraisal Report (Document Reference 7.9).
- 3.3.10 The results of this assessment were used to ensure the sifting process was inclusive and robust, and to enable the selection of the best performing options from each corridor.
- 3.3.11 The highest scoring options from escarpment corridors B, C, D and E were taken forward – Options 3, 21, 29 and 24 respectively. The 3 routes within escarpment corridor A scored poorly, particularly against environmental objectives, and were therefore discounted. In the place of a route from escarpment corridor A, the highest scoring surface route was progressed – Option 30.

### *Step 4 Value for money and affordability assessment*

- 3.3.12 In autumn 2017, a cost range for the scheme was set at £250 million to £500 million. At the same time, the results of the economic appraisal on Options 3, 21, 24 and 29 showed that tunnel options were going to provide poor value for money, with a high cost exceeding the cost range set. In comparison, the surface route (Option 30), provided positive value for money and was within the cost range.

- 3.3.13 To ensure that a second affordable route was taken forward, the next best performing surface route from the first 3 steps of the sifting was taken forward for full assessment and appraisal. This route was Option 12, a route from historic studies which was formerly known as the modified brown route.
- 3.3.14 The six options taken forward for further assessment at this step were Option 3 (tunnel), Option 12 (surface), Option 21 (tunnel), Option 24 (tunnel), Option 29 (tunnel) and Option 30 (surface).
- 3.3.15 As a result of the four sifting steps, six options, Options 3, 12, 21, 34, 29 and 30 were fully assessed and appraised to inform the choice of options to be taken to public consultation.
- 3.3.16 The Scheme Assessment Report (SAR) (Document Reference 7.4) provides an overview of the sifting process, associated assessment and options selection stage conclusions.

Options appraisal and sifting to identify options to take forward for further appraisal

- 3.3.17 The SAR states how as a result of the four sifting steps, six options – Option 3 (tunnel), Option 12 (surface), Option 21 (tunnel), Option 24 (tunnel), Option 29 (tunnel) and Option 30 (surface) were fully assessed and appraised following guidance set out in WebTAG to inform the choice of options to be taken to public consultation. These options are shown in ES Figure 3.3 Six Options taken forward for full assessment (Document Reference 6.3).
- 3.3.18 The SAR's conclusions on the assessment and appraisal at options selection stage are set out below:

*Economic appraisal*

- 3.3.19 Para 4.7.6 of the SAR (Document Reference 7.4) states “The tunnel options (options 3, 21, 24 and 29) all had high benefit values, however they were also shown to give poor value for money for the taxpayer. The most significant factor causing this was the high estimated costs of the tunnel options, all of which were estimated to cost significantly more than the upper limit of the cost range of £500 million. Options 12 and 30, the surface routes, had lower benefits but significantly lower costs. Option 30 was the only route to offer positive value for money, meaning the returns were estimated to be greater than the cost.”

*Environmental appraisal*

- 3.3.20 Para 4.7.11 of the SAR (Document Reference 7.4) states “Across the areas assessed, Option 21 was found to generally outperform the other options due to the length of the route within a tunnel, and the route avoiding sensitive areas. All options were identified to have net benefits in noise reduction compared to the existing route, however in all other areas the options showed disbenefits.’
- 3.3.21 Para 4.7.13 of the SAR (Document Reference 7.4) states ‘Of the tunnelled solutions, Options 24 and 29 were found to perform less well across all measures than Options 3 and 21. Between the two surface options, there was little difference in the appraisal results. Option 12 was identified to outperform Option 30 in noise reduction, while Option 30 was found to have lower air quality disbenefits.’

### *Social assessment*

- 3.3.22 Para 4.7.15 of the SAR (Document Reference 7.4) states “The routes largely performed at a similar level within the social appraisal area. The key differentiator between the routes in this area was the reduced journey time for commuters. Relative to the current route, the six options were found to deliver significant benefits in terms of net present value. The tunnel options were identified as delivering greater benefits than the surface routes; out of the two surface routes, Option 30 delivered greater benefits than Option 12.”

### *Appraisal summary*

- 3.3.23 Appraisal Summary Tables (ASTs) were produced for each of the six options to collate all the assessments against the criteria of Economy, Environmental, Social and Public Accounts.
- 3.3.24 Comparison between the ASTs for each option showed that the tunnel options, Options 3, 21, 24 and 29 outperformed the surface options in most of the economy, environmental and social measures.
- 3.3.25 This was balanced against an estimated cost substantially higher than either surface route, which took the tunnel routes above the upper limit of the cost range (£500 million). After a value for money appraisal to estimate the economic impact of the options was completed, the surface options outperformed the tunnel options.
- 3.3.26 The tunnel options were shown to give poor value for money to the taxpayer due to their estimated cost which was also significantly more than the upper limit of the cost range of £500 million. Consequently, despite their high monetised and intangible benefits, these routes could not be recommended for further development. The two highest scoring surface options were taken forward to option selection.

### **Option Selection (2018)**

- 3.3.27 The process of option selection which led to the current scheme is summarised as:
- Recommended route options for consultation.
  - Selection of a preferred route.

#### Recommended route options for consultation

- 3.3.28 Two options were recommended within the SAR to be taken forward for further appraisal and were taken to public consultation in February and March 2018:
- Option 12: a surface route with a mixture of widening of the existing road and construction of new sections of road, broadly following the route of the existing road whilst bypassing Nettleton Bottom. A map of Option 12 can be seen in ES Figure 3.4 Option 12 (Document Reference 6.3).
  - Option 30: a surface route with the existing road on Crickley Hill widened. The road then takes a new route to the east, re-joining the Exisitn near Cowley roundabout. The existing road between Air Balloon roundabout and Cowley roundabout would be returned to the ownership of Gloucester County Council. A map of Option 30 can be seen in ES Figure 3.5 Option 30 (Document Reference 6.3).



3.3.29 These are described in section 6.3 and section 6.4 of the SAR (Document Reference 7.4). ASTs were produced for each of the two options, which are included in ES Appendix 3.1 Scheme Assessment Report Appraisal Summary Tables (Document Reference 6.4).

#### Selection of a preferred route

3.3.30 The environmental assessment of the options presented for consultation led to a preferred option. The reasoning for the preferred option is set out in the SAR (Document Reference 7.4) which was published in March 2019 and provides a full description and assessment of the alternative options, including the public consultation and Highways England's recommendation of Option 30 as the preferred route.

3.3.31 Option 30 received greater support in the public consultation. Almost 2,000 responses were received. Of these 72% of all respondents were supportive of Option 30, as set out in section 4.3 of the Report on Public Consultation<sup>2</sup> (March 2019). From an engineering perspective it provides a safer and higher quality road for all road users and road workers.

3.3.32 Option 30 was announced as the preferred route on the 14 March 2019 and forms the basis of the scheme taken into preliminary design. Further details can be found in the Preferred Route Announcement<sup>3</sup>.

#### **Preliminary design (2019 – 2021)**

3.3.33 The preliminary design (the current stage) has involved the following design development:

- Post PRA design development for 2019 statutory consultation.
- Design development post statutory consultation 2019.
- Design development post supplementary statutory consultation 2020.

#### Post PRA design development for 2019 statutory consultation

*Statutory consultation: 27 September 2019 – 8 November 2019*

3.3.34 The scheme presented at the statutory consultation between 27 September 2019 and 8 November 2019 was based on the preferred route.

3.3.35 The 2019 statutory consultation sought views on the scheme design; the selection of Alternative 2 for the A436 link road; the contents of the 2019 PEI report, including proposed environmental mitigation and the construction of the scheme.

#### *A436 alternative*

3.3.36 Three alternative routes for the A436 link road were presented at the PRA in March 2019. The three alternatives, which are shown in Figure 1.1: Option 30 alternatives of ES Appendix 3.2 Option 30 Alternatives Technical Note (Document Reference 6.4), are as follows:

- Alternative 1: bridge over A417.
- Alternative 2: parallel to the A417.
- Alternative 3: via South Hill.

3.3.37 An assessment of the alternative A436 link road routes was carried out and presented in the 2019 Preliminary Environmental Information (PEI) report

published at the statutory consultation held between September and November 2019. The assessment is presented in ES Appendix 3.2 Option 30 Alternatives Technical Note (Document Reference 6.4).

- 3.3.38 The 2019 PEI report was circulated to prescribed stakeholders, which included local councils, environmental bodies and other organisations. The report was also made available to the public during the statutory consultation. At statutory consultation, a specific question on the consultation feedback questionnaire asked, “*Do you have any comments on our proposal for Alternative 2 as the preferred A436 link road?*”.
- 3.3.39 Alternative 2 was presented as the preferred link to the A436 link road at the 2019 statutory consultation. Alternative 2 has formed the basis of the A436 link road in the scheme considered in this ES.
- 3.3.40 Alternative 2 has a number of advantages as a result of running alongside the A417 mainline, particularly regarding the environmental opportunities it presents. Compared to the alternatives, it would cause significantly less disruption to the local environment, landscape and ecology during construction.

#### Design development post statutory consultation 2019

- 3.3.41 Following the 2019 statutory consultation, work was undertaken to analyse and consider the feedback to inform further design and development work on some elements of the scheme. This identified that there were opportunities to improve the scheme design and its deliverability through further design refinement. Engagement with affected landowners and ongoing environmental assessment also informed the amendments made.
- 3.3.42 Collaboration between the environmental disciplines and scheme engineers has been an integral part of the design development process. This has sought to avoid and reduce the environmental impacts of the design, whilst taking into account responses received during the 2019 statutory consultation.
- 3.3.43 A key change in the scheme was to remove the previously proposed green bridge at Crickley Hill in response to concerns raised about its location, purpose, scale and visual impact, and its effect on veteran trees and a Site of Special Scientific Interest (SSSI).
- 3.3.44 As a result of feedback and design review, the statutory consultation also prompted a change in the gradient of the A417 mainline from 7% to 8% as it climbs the escarpment near Crickley Hill.
- 3.3.45 The main amendments made to the scheme design following the 2019 statutory consultation are documented in Table 3-3. Table 3-4 details the amendments to the scheme during the preliminary design phase. Where a change has been made in response to the 2019 consultation, this is noted in the reason for the change.

**Table 3-3 Main design changes following 2019 statutory consultation**

Design change	Description	Reason
Gradient of A417 mainline as it	The scheme design presented at 2019 statutory consultation sought	A review of the scheme design as part of the EIA process and 2019 statutory consultation

Design change	Description	Reason
climbs the escarpment at Crickley Hill increased from 7% to 8%	<p>to reduce the gradient of the A417 from its existing 10% gradient to a 7% gradient.</p> <p>It was identified that the gradient of the mainline as it climbs the escarpment near Crickley Hill would be increased from a 7% gradient to an 8% gradient.</p> <p>The 8% gradient would still provide the benefits to traffic flow and road safety that the previously proposed 7% gradient design.</p>	<p>feedback led to the refining of the scheme design to an 8% gradient on Crickley Hill. This would improve local connectivity and accessibility, reduce the scheme's impact on communities, the environment and the local landscape. The design change provided many benefits including:</p> <ul style="list-style-type: none"> <li>• Reduce the depth of the cutting from approximately 25 metres to approximately 17 metres.</li> <li>• Reduce the visual intrusion on this special landscape and the road's impact on the Cotswold AONB and Emma's Grove scheduled monument.</li> <li>• Reduce the effects on groundwater.</li> <li>• Reduce the impact on geological features at Crickley Hill and Barrow Wake SSSI.</li> <li>• Reduce the impact on valuable agricultural land.</li> <li>• Reduce the surplus earthworks by nearly one million cubic metres, therefore reducing the construction carbon footprint associated with moving excavated material.</li> <li>• Reduce the number of vehicle and lorry movements during construction and help minimise the impact on communities, and businesses.</li> <li>• Reduce the scheme's impact on local waste management facilities, as there would be less material to dispose of.</li> <li>• Remove the need for around 1,200 metres of retaining walls, therefore reducing the construction carbon footprint of the scheme.</li> <li>• Reduce the impact of the scheme on veteran trees in the area.</li> <li>• Reduce construction noise for nearby properties.</li> <li>• Reduce the construction period by up to six months, meaning less disruption.</li> </ul>
Removal of the green bridge at Crickley Hill	Removal of the green bridge at Crickley Hill, originally provided as a footbridge to mitigate the severance of the Cotswold Way National Trail and to create ecological corridors and connect the Crickley Hill and Barrow Wake SSSI.	A number of concerns were raised at the 2019 statutory consultation regarding the impact of the structure on the Crickley Hill and Barrow Wake SSSI. Further survey data also established that the construction footprint of the structure would require the cutting down of veteran trees.
Provision of two new crossings	Cotswold Way crossing - a new crossing in the region of 5m wide near Emma's Grove for WCH users, including disabled users,	To provide a crossing to mitigate the severance of the Cotswold Way National Trail, and enable users to safely cross the A417 (meaning users of this national trail would no longer have to

Design change	Description	Reason
	<p>which would accommodate the Cotswold Way National Trail.</p> <p>Gloucestershire Way crossing - a new 25 metre wide multi-purpose crossing near Shab Hill.</p>	<p>walk down the hill to the Air Balloon roundabout and cross the busy and noisy A417) The crossing broadly follows the historical alignment of the Cotswold Way National Trail.</p> <p>To provide essential mitigation for bats and for landscape integration. To link key landscape features in the area, including Ullen Wood, Emma's Grove and the proposed new Air Balloon Way. It also further benefits from accommodating the Gloucestershire Way long distance footpath, which enables users to safely cross the A417, without having to navigate the busy Shab Hill junction, thus providing an improved visitor experience. It also broadly follows the historical alignment of the Gloucestershire Way.</p>
Rerouting of the B4070 to Birdlip via Barrow Wake	<p>The route of the proposed B4070 link road between Shab Hill junction and Birdlip has been refined via the entrance of Barrow Wake, using the existing highway and underbridge. A roundabout is incorporated (replacing the existing T-junction), which would provide improved speed controls to traffic.</p> <p>The car park at Barrow Wake would be resurfaced and new Cotswold drystone walls would be built along the edge of the car park to minimise light pollution from cars at night and reduce the impact on the Crickley Hill and Barrow Wake SSSI.</p>	<p>Feedback was received at the 2019 statutory consultation relating to the potential opportunity to improve facilities, parking and access at Barrow Wake. Concern was also raised over the safety of the proposed design of the B4070 for users of the 'Air Balloon Way'.</p> <p>The rerouting of the B4070 to Birdlip via Barrow Wake removes the need for a crossing on the 'Air Balloon Way' and introduces natural surveillance to the Barrow Wake car park to help manage anti-social behaviour.</p> <p>The changes would mean that the B4070 would no longer cross the repurposed A417, and the new roundabout would help slow traffic, increase the natural surveillance of the area and make Barrow Wake a more welcoming place to visit.</p>
Cowley junction – removal of access to Cowley village	<p>The junction design has been refined and vehicular access from Cowley junction to the village removed. Access would be retained along Cowley Lane for local properties as well as for walkers, cyclists and horse riders, including disabled users.</p>	<p>During 2019 statutory consultation, concerns were raised over the safety and potential for rat running in relation to the proposed link from Cowley junction to Cowley village. This is a narrow, single-lane road and it was considered that an increase in traffic would cause disruption in Cowley village.</p>
WCH connectivity between Dog Lane and Cold Slad Lane	<p>A new connection for WVH users, including disabled users, along and between Dog Lane and Cold Slad Lane, to improve pedestrian links between Brockworth and Nettleton Bottom via Crickley Hill, the Cotswold Way crossing and the new Air Balloon Way.</p>	<p>In response to 2019 statutory consultation feedback it was established that a connection be provided between Dog Lane and Cold Slad to provide east-west connectivity.</p>
Replacement of Common Land	<p>The location of replacement Common Land to be provided is adjacent but separate to the proposed Air Balloon Way as part</p>	<p>The scheme results in the loss of Common Land including near Crickley Hill and at Barrow Wake, and the location and scale of replacement Common Land was consulted</p>

Design change	Description	Reason
	of the repurposed A417, east of Barrow Wake car park. It would be connected to the existing area of Common Land and Crickley Hill and Barrow Wake SSSI, be bigger than the area lost, and could be used for the same purposes.	upon during the 2020 supplementary consultation, which has led to its refinement.

### Design development post supplementary statutory consultation 2020

- 3.3.46 As a result of the statutory consultation 2019 feedback, improvements were made to the scheme, as outlined in Table 3-3 and presented at the supplementary consultation between 13 October and 12 November 2020.
- 3.3.47 The 2020 supplementary consultation sought views on the scheme design changes, and the responses are detailed in the Consultation Report (Document Reference 5.1).
- 3.3.48 Table 3-4 details the amendments to the scheme during preliminary design phase. Where a change has been made in response to the 2020 consultation, this is noted in the reason for the change.

### Amendments to the scheme during preliminary design (2019 – 2021)

- 3.3.49 A list of the amendments made to the scheme design that have taken place during preliminary design is provided in Table 3-4 and notes the reason for the change. ES Figure 3.6 Amendments to the scheme during preliminary design (Document Reference 6.3) identifies the location of each of the changes. A full description of the scheme is provided in ES Chapter 2 The project (Document Reference 6.2).

**Table 3-4 Amendments to the scheme during preliminary design**

No. (see ES Figure 3.6)	Design change	Description	Reason
<b>Highways</b>			
1	B4070 alignment	Reroute the B4070 to Birdlip via the entrance of Barrow Wake to re-use existing underbridge.	Improved design and avoids new infrastructure in the landscape.
2	Cowley Lane stopping up to traffic	Restrict vehicular access from Cowley junction to Cowley Lane. Access to residential properties will be retained.	2019 consultation and landowner feedback.
3	Move western Shab Hill roundabout	Move roundabout away from Shab Hill barn.	2019 landowner consultation feedback.
4	Eastern Shab Hill roundabout redesign for traffic projections	Detailed traffic modelling was undertaken, and the assessment identified queuing. The roundabout design was changed to accommodate the traffic.	2019 consultation design did not allow for detailed traffic modelling. Traffic modelling results required design change.

No. (see ES Figure 3.6)	Design change	Description	Reason
5	Ullenwood junction and alignment	Redesigned to allow for projected traffic flows and improved safety.	Improved design, safety and traffic modelling.
6	Rushwood Kennels alignment change	Realignment to move road away from the properties and provide room for noise bunding and planting screening.	2019 landowner consultation feedback.
7	Passing place on access road to Rushwood Kennels, Cuckoopen	Passing place to allow vehicles to pass heavy goods vehicles (HGVs).	2019 landowner consultation feedback.
8	Parking space for Air Balloon Cottages	Roadside bay added and positioned to avoid National Trust access point.	2019 landowner consultation feedback.
9	Road layout improvements around Shab Hill junction	Southbound merge changes to include parallel lane instead of direct merge.	Road safety audit feedback.
10	Vertical alignment change at Cowley Lane overbridge	Change of vertical alignment to reduce height.	Improved design and reduces impact on the landscape.
N/A	Amendments to carriageway widths	Side road width alterations to align with Gloucestershire County Council requests.	2019 consultation feedback.
11	Byway open to all traffic (BOAT) south west of Shab Hill junction	New section of BOAT to address severance of existing unclassified road.	2019 consultation feedback.
12	Parking for Air Balloon Way	Parking provision for accessing the Air Balloon Way restricted byway adjacent to Golden Heart Inn. Disabled parking located adjacent to the Stockwell Farm turning. See also No. 51 below.	2019 consultation and Technical Working Group feedback.
13	Cowley overbridge verges	Cowley overbridge verges improved to accommodate planting of a continuous native species-rich hedgerow.	Design refinement.
14	Stockwell overbridge lane verges	Stockwell overbridge verges improved to accommodate planting of two continuous native species-rich hedgerows.	Design refinement.
15	Grove Farm underpass	To provide additional vehicular crossing of the A417 and access to land and properties. Provides a new right of way.	Design refinement and 2019 consultation feedback. Improvement in Safety.
16	Removal of mainline access to Grove Farm	Removal of previously proposed access to Grove Farm to improve safety and accommodate mainline alignment changes, with alternative	Design refinement and 2019 consultation feedback.

No. (see ES Figure 3.6)	Design change	Description	Reason
		access provided by Grove Farm underpass.	
17	Mainline vertical alignment change	Mainline alignment changed from 7% gradient to 8% gradient on Crickley Hill. This change: <ul style="list-style-type: none"> <li>• Reduces cutting required.</li> <li>• Eliminates structures and retaining walls.</li> <li>• Reduces cost.</li> <li>• Creates an earthworks balance and reduces off-site disposal of waste.</li> <li>• Improves buildability and reduced construction time.</li> </ul>	Design refinement and 2019 consultation feedback.
18	Mainline horizontal alignment change	Mainline horizontal alignment modified in the vicinity of Cold Slad Lane on Crickley Hill. This change: <ul style="list-style-type: none"> <li>• Improves buildability and reduced construction time.</li> <li>• Improves traffic management and improves safety during construction.</li> <li>• Eliminates retaining walls.</li> <li>• Reduces cost.</li> <li>• Improves earthworks balance.</li> </ul>	Design refinement and 2019 consultation feedback.
19	A436 alignment	Vertical and horizontal alignment amended to reduce footprint and facilitate the Gloucestershire Way crossing.	Design refinement and 2019 consultation feedback.
20	Gloucestershire Way crossing	A new 37m wide multi-purpose crossing to provide essential mitigation for bats and for landscape integration. It would also further benefit from accommodating the Gloucestershire Way long distance footpath and provide an improved visitor experience.	Design refinement and 2019 and 2020 consultation feedback.
21	Cotswold Way crossing	A new crossing near Emma's Grove for walkers, cyclists and horse riders including disabled users, which would accommodate the Cotswold Way National Trail.	Design refinement and 2019 consultation feedback.
22	Cold Slad alignment amendment	The horizontal and vertical alignment at Cold Slad has been amended to reduce impact on Crickley Hill ridge and incorporate passing places.	Design refinement and 2019 consultation feedback.
23	Access to Crickley Hill Country Park	Access to Crickley Hill Country Park improved.	Design refinement.

No. (see ES Figure 3.6)	Design change	Description	Reason
N/A	Provision of field accesses	Provision of additional accesses to fields.	2019 landowner consultation feedback.
24	Access to track on northwest side of Cowley Lane	Provision of access to track on northwest side of Cowley Lane.	Design refinement.
N/A	Accesses added to all drainage basins	Provision of access track to drainage basins to facilitate maintenance.	Design refinement.
N/A	Minor changes to redline boundary	Minor amendments to reduce landtake.	Design refinement.
NA	Minor changes to land take	Small amendments to change permanent land take to temporary land take at various locations	Design refinement and 2019 and 2020 consultation feedback.
25	Cricket club access re-located	Cricket club access relocated to the west to minimise vegetation loss and improve visibility of oncoming traffic.	Design refinement.
26	Access road to Birdlip Radio Station from B4070 widened	Widened to allow vehicles to pass	2020 landowner consultation feedback.
27	Cowley Junction westbound diverge extended	Westbound diverge extended.	Design refinement.
28	Shab Hill junction roundabout geometry	The geometry of Shab Hill junction roundabouts have been amended to perform more efficiently under revised design year flows	Design refinement and responding to traffic modelling results.
<b>Drainage</b>			
N/A	Drainage basin amendments	Various drainage basins changes resulting in additional, relocated and/or reshaped basins.	Design refinement due to changes in drainage, landscape integration and reduction in earthworks.
29	Drainage cascade	Drainage cascade added in vicinity of Grove Farm underpass.	Design refinement due to EIA.
30	Additional outfall	Additional overflow route north Ullen Wood to accommodate road drainage.	Design refinement.
31	Relocate drainage pipe in land plot and re-use the A417 existing drainage pipe	Relocate drainage pipe from centre of plot to eastern edge and re-use the existing drainage A417 drainage adjacent to Bentham Lane	Design refinement.
<b>Structures</b>			
32	Stockwell overbridge skew change	Make structure more perpendicular. Improved design and reduced span.	Design refinement due to EIA.



No. (see ES Figure 3.6)	Design change	Description	Reason
33	Cowley overbridge skew change	Make structure more perpendicular. Improved design and reduced span.	Design refinement due to EIA.
34	Minor vertical alignment change to Cowley Lane	Lower the structure in the landscape. Improved design and minimise impact on the landscape.	Design refinement due to EIA.
35	Bat underpass east of Fly-Up	Bat flight path mitigation required east of bike park across Crickley Hill.	2019 bat survey results.
36	Shab Hill underbridge span	Span of Shab Hill underbridge reduced.	Design refinement due to EIA.
37	Removal of green bridge	Green bridge removed at Crickley Hill.	2019 landowner and stakeholder consultation feedback. Ecological survey results.
<b>Public Rights of Way (PRoW)</b>			
38	Rights of way through Fly-Up consolidated	Remove proposed bridleway through property and realigned rights of way along new access with footpath connection.	2019 landowner and stakeholder consultation feedback.
39	East-West connection created north of A417 with connection between Cold Slad and Dog Lane	Provide proposed east-west walking, cycling and horse-riding connection with new section of bridleway to connect Cold Slad and Dog Lane.	2019 consultation feedback.
40	Restricted byway created along Cowley Lane	To address stopping up to traffic with redesigned junction.	2019 consultation feedback.
41	WCH access Barrow Wake to A417	Improve alignment of PRoW access between the detrunked A417 and Barrow Wake car park along existing access on north end of carpark	Design refinement due to EIA and improve restricted mobility access.
42	Revised Gloucestershire Way long distance footpath diversion	Realignment of footpath diversion between Gloucestershire Way crossing and the Cotswold Way crossing to improve pedestrian experience.	2019 consultation and design refinement.
43	BOAT connection east of Shab Hill junction	Provision of a BOAT connection between unclassified road UCR50853 and Basin 8 access track	2020 consultation feedback.
44	Removal of PRoW	Removal of PRoW through the SSSI and routing along the reclassified A417.	2020 consultation feedback.
45	Equestrian holding areas	Provision of equestrian holding areas on either side of WCH crossing on B4070.	2020 consultation feedback.

No. (see ES Figure 3.6)	Design change	Description	Reason
46	Footway adjacent to road added	Footway has been added in verge to provide WCH connection between the east side of Cowley Junction and the road to Stockwell and The Golden Heart.	2020 consultation feedback.
N/A	Changes in proposed designations	<p>Changes in proposed rights of way designations to address connectivity and safety matters, including:</p> <ul style="list-style-type: none"> <li>- A restricted byway across the proposed Cotswold Way crossing (previously proposed bridleway).</li> <li>- BOAT south west of Shab Hill (previously a proposed unclassified road) (11 above).</li> <li>- BOAT east of Shab Hill junction (previously a proposed footpath) (44 above).</li> <li>- A bridleway over Stockwell overbridge (previously proposed restricted byway).</li> <li>- A bridleway to connect unclassified roads to B4070 (previously proposed restricted byway).</li> </ul> <p>A bridleway to connect part of Cowley Wood Lane to Cowley Junction (previously whole section proposed as restricted byway)</p>	Responding to 2020 consultation feedback and Technical Working Group feedback.
<b>Geotechnical</b>			
47	Relax cut slopes south of Shab Hill	Geotechnical design requirement to avoid hard engineering measures.	Improved design to avoid hard engineering solution in landscape.
<b>Common Land</b>			
48	Replacement Common Land	The location of replacement Common Land to be provided is adjacent but separate to the proposed Air Balloon Way as part of the repurposed A417, east of Barrow Wake car park. It would be connected to the existing area of Common Land and Crickley Hill and Barrow Wake SSSI, be bigger than the area lost, and could be used for the same purposes.	Design refinement following 2019 and 2020 consultation feedback.
<b>Landscape</b>			
N/A	Refinement of planting mitigation, scheme-wide	Refinement of planting mitigation and bunding at targeted locations.	Design refinement due to EIA, visual screening and landowner consultation feedback.

No. (see ES Figure 3.6)	Design change	Description	Reason
49	Landscape bunding at Crickley Hill	Introduction of new landscape bunding at Crickley Hill between Fly-up and Grove Farm for screening.	Design refinement due to EIA.
50	Bund design changes south of Shab Hill	Redesign of bunds south of Shab Hill.	Improved design and minimise impact on the landscape.
51	Inclusion of car park spaces adjacent to The Golden Heart Inn	10 parking spaces proposed in freed up detrunked area. Provision for detrunked WCH route. Disabled parking moved and now located adjacent to the Stockwell Farm turning.	Feedback from stakeholders in 2019 and 2020.
52	Barrow Wake improvements	Planting removed on south side of car park.	Improved design and minimise impact on the landscape.
53	Planting adjusted to revised Crickley Hill Farm access track	Additional planting to extend visual screening along edge of A417.	Design refinement due to EIA and landscape integration.
54	Bat roost barn	One bat barn is to be built.	Design change reacting to changes in drainage, resulting in loss of outbuilding containing bat roost.
55	Additional planting on escarpment sides	Additional visual screening to escarpment to help screen and integrate the higher road alignment.	Design refinement due to EIA.
56	Existing vegetation to escarpment now retained	Reduced cutting depth reduces footprint, allowing less woodland to be lost.	Improved design and minimise impact on the landscape.
57	Existing calcareous grassland field now retained adjacent to Crickley Ridge	Reduced footprint from removal of green bridge from escarpment.	Feedback from stakeholders in 2019.
58	Existing trees to Air Balloon public house now retained	Adjusted design now allows for two trees to be retained.	Design refinement due to EIA.
59	Scrub layer surrounds Emma's Grove.	New buffer added to Emma's Grove edge to protect.	Design refinement due to EIA.
60	Additional false cutting on south side of Shab Hill.	False cutting on north-west bound side extended to continue to Shab Hill.	Design refinement due to EIAf or noise and landscape.
61	False cutting to north east side of Shab Hill at Coldwell Bottom	False cutting at head of valley to break visual connection of road from valley.	Design refinement due to EIA for noise and landscape to improve tranquillity.
N/A	Planting adjusted around drainage basins	Planting adjusted to integrate drainage basins into landscape.	Integrate drainage basins into landscape. Design refinement due to EIA.

No. (see ES Figure 3.6)	Design change	Description	Reason
62	Additional planting to Cowley Lane	Planting added to realignment of Cowley Lane to maintain a hedgerow and tree-lined track.	Design change reacting to changes in highways and PRow.
63	Install stone walling	Install stone wall at Barrow Wake roundabout and carpark (along works boundary). Mitigation for light spill from cars across Barrow Wake.	2020 consultation feedback.
64	Steepening earthworks	Steepen earthworks on western side of Birdlip link road to 1 in 2. Minimise permanent landtake along SSSI boundary.	Design change to minimise environmental effects.
65	Barrow Wake roundabout design amendment	Steepen earthworks at Barrow Wake roundabout to reduce footprint and minimise impact on SSSI on western side.	Design refinement and 2019 consultation feedback.
66	Compound relocation	Compound near Ullen Wood relocated to south of A417 to reduce impact on Ullen Wood.	Design refinement due to EIA for biodiversity.
67	Fill in the Existing A417 cutting adjacent to the Roman Road to Birdlip	Fill in the Existing A417 cutting to return the levels to their original landform	To return the levels to their original landform before the road was built.
68	Additional 'stepping stones' grassland corridor	Grassland 'stepping stones' added provide ecological corridor between the Gloucestershire Way crossing and Crickley Hill via Emma's Grove	2020 consultation feedback.

### 3.4 Justification for chosen option

3.4.1 The two-part method of options identification in 2016 – 2018 and the process of option selection in 2018 led to a preferred option. The reasoning for the preferred option is set out in the SAR (Document Reference 7.4), which was published in March 2019. This provides a full description and assessment of the alternative options, including the public consultation and gives the key reasons for progressing Option 30 to preliminary design.

3.4.2 As discussed in Section 3.3, the development of the scheme design up to and including the preliminary design stage has considered and balanced the engineering design with the potential environmental effects and opportunities, as part of an iterative process, being informed by stakeholders and consultation feedback. This has resulted in a scheme which:

- Seeks to balance the sensitive nature of the Cotswold escarpment, the shape of the landscape and the area being part of the AONB.
- Improves safety compared with the existing route and contributes to the target of reducing the number of people killed or seriously injured on the network.
- Makes journey times more predictable, reducing the cost and inconvenience of unexpected delays on businesses and other people who use the road and enabling goods and services to be moved around more easily.

- Reduces rat-running through neighbouring communities, improving the lives of people who live close to the route and making it easier for drivers, walkers, cyclists, horse riders and other users of rights of way and roads to get around.
- Limits the loss of veteran trees and ecological habitat losses.
- Improves landscape integration and ecological connectivity through planting new woodland, locally important grassland, trees and hedgerows to improve habitat connectivity and maximise biodiversity.
- Enhances local connectivity and accessibility and reduces the scheme's impact on communities.
- Improves landscape integration and ecological connectivity through the provision of a multi-purpose crossing and two wildlife-friendly overbridges to maintain local connectivity
- Improves air quality and reduces pollution caused by congestion and idling vehicles
- Improves access to public rights of way for WCH users, including disabled users.
- Reconnects the Cotswold Way National Trail and the Gloucestershire Way long distance route through new traffic-free crossings that broadly follow their historical alignment, helping more people to enjoy the area safely.
- Supports the predicted growth in jobs and housing in the Gloucestershire area by improving this key road connection.
- Has responded to consultation feedback in terms of alignment, design and mitigation to provide a balance between the scheme objectives and all environmental, social and economic impacts.

3.4.3 More details on the scheme design can be found in ES Chapter 2 The project (Document Reference 6.2) and the Design Document (Reference 7.7).

## References

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<sup>1</sup> Department for Transport, Early Assessment and Sifting Tool (EAST) Guidance

Available at:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/918396/east-tool-guidance.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918396/east-tool-guidance.pdf)

<sup>2</sup> Highways England (2019), A417 Missing Link: Report on Public Consultation, Available at:

[https://highwaysengland.citizenspace.com/he/a417-missing-link/results/a417\\_missing\\_link\\_report\\_on\\_public\\_consultation.pdf](https://highwaysengland.citizenspace.com/he/a417-missing-link/results/a417_missing_link_report_on_public_consultation.pdf)

<sup>3</sup> Highways England (2019), A417 The Missing Link: Preferred Route Announcement, Highways

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