

A428 Black Cat to Caxton Gibbet improvements

TR010044

Volume 9

9.80 Update on Overview of the Alternatives considered at the
Black Cat Junction

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Rule 8(1)(k)

Infrastructure Planning (Examination Procedure) Rules
2010

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Planning Act 2008

**The Infrastructure Planning (Examination Procedure)
Rules 2010**

**A428 Black Cat to Caxton Gibbet
improvements
Development Consent Order 202[]**

**9.80 Update on Overview of the Alternatives considered at the
Black Cat Junction**

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1 Introduction

- 1.1.1 This report addresses Action Points 13 and 14 that were identified by the Examining Authority (ExA) following Issue Specific Hearing 4 (ISH4) held on Tuesday 30 November 2021 covering social, economic and environmental matters. The ISH was held as part of the Examination into the A428 Black Cat to Caxton Gibbet improvements (the Scheme).
- 1.1.2 The Action Points identified by the ExA were as follows:
- a. Action Point 13 - Explanation, including where appropriate any factual information to support the narrative described in the relevant tables in **[REP4-032]** and **[REP4-033]** relating to assessment of alternatives at Black Cat junction. Key to aid understanding for the Examining Authority being the chronology of decisions taken and sign posting to relevant information in the Examination Library for non-statutory consultation, specifically, the described effects on Brook Cottages and why the view changed
 - b. Action Point 14 - With reference to the submitted evidence, including [REP4-033 Table 10.2], explain why Option C+ was not combined with the Orange route in design selection process, and the implications of this for that process.
- 1.1.3 The work undertaken during Project Control Framework (PCF) Stage 2 “Option Selection” is described in Section 4.5 of the Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]** and also refers to the reports in the Appendices G to K to the Overview of the Alternatives considered at the Black Cat Junction **[REP4-033]**.
- 1.1.4 In addition, other responses on this topic have been provided previously by the Applicant at ISH1, which examined strategic matters, and in response to Action Point 4 from ISH1. That Action Point required a “Summary narrative of the criteria considered in the assessment of alternatives for the Black Cat junction and alignment of the A1 in the immediate and wider area, with particularly reference to historic environment, flood risk and floodplain compensation, land take, effects on other residential and commercial uses, the restoration of the quarry, and on the gas main to the south of the existing roundabout”. The Applicant’s response is set out in the Applicant’s response to actions arising from Issue Specific Hearing 1 on 18 August 2021 **[REP1-034]**.

Design Activity	Activity Description	Outcome
	<ul style="list-style-type: none"> Assessment of concept design options by the multi-disciplinary team 	<ul style="list-style-type: none"> Assessment of the 12 options with input recorded in the RAG Table of assessment [REP4-032 Appendix C] and summarised in Table 4-4 of the Overview of the Alternatives considered at the Black Cat Junction Report [REP4-032]
	<ul style="list-style-type: none"> Sift of options based on assessment 	<ul style="list-style-type: none"> 8 Options were discounted and Options 1a/1c, 3b and 5 progressed, but all of these options were considered to have the potential to require demolition / removal of Brook Cottages at that stage
2. Junction Concept Development and Refinement	<ul style="list-style-type: none"> Options 1a and 1c combined and refinements added. As described in Sections 2.3.6 and 2.4.7 and as shown in Figure 2-6, the slip road to the A1 northbound did not extend as far as Brook Cottages Renamed Option A 	<ul style="list-style-type: none"> Option A for assessment and inclusion in Non-Statutory Consultation. On developing this combined option further, it was thought that this option would avoid direct impacts on, and the loss of, Brook Cottages, see the comparison of options tables in the Non-Statutory Consultation Brochure [APP-035 Part B2] Section 10
	<ul style="list-style-type: none"> Some issues identified with Option 5 addressed with addition of elements from Option 6 added Renamed Option B 	<ul style="list-style-type: none"> Option B for assessment and inclusion in Non-Statutory Consultation. Further development of this option did not change the assessment that this option may result in the removal of Brook Cottages, see the comparison of options tables in the Non-Statutory Consultation Brochure [APP-035 Part B2] Section 10
	<ul style="list-style-type: none"> Option 3b refined Renamed Option C 	<ul style="list-style-type: none"> Option C for assessment and inclusion in Non-Statutory Consultation. Further development of this

Design Activity	Activity Description	Outcome
		<p>option did not change the assessment that this option may result in the removal of Brook Cottages, see the comparison of options tables in the Non-Statutory Consultation Brochure [APP-035 Part B2] Section 10</p>
3. Non-Statutory Consultation	<ul style="list-style-type: none"> Assessment of Options for Non-Statutory Consultation 	<ul style="list-style-type: none"> Traffic movements and comparison of options tables in the Non-Statutory Consultation Brochure [APP-035 Part B2] Sections 8 and 10
4. 3-D Development of Junction Concepts	<ul style="list-style-type: none"> In parallel with the Non-Statutory Consultation, development of the three junction options into 3 dimensional designs to support further assessment and understanding of the impact on Brook Cottages and other constraints 	<ul style="list-style-type: none"> Developed concept designs for the three junction options that could be assessed in more detail to inform the identification of a preferred option, see ES Chapter 3 - Assessment of Alternatives [APP-072] Tables 3-2 and 3-4, Scheme Assessment Report [REP4-033 Appendix K] Section 8
5. Junction Option C+ Concept Developed	<ul style="list-style-type: none"> Refinement of Option C to identify whether it was possible to provide the 	<ul style="list-style-type: none"> An option that was a variant of Option C that could be considered in the more

Design Activity	Activity Description	Outcome
	junction without impacting on the Grade II Listed Building, Brook Cottages, to the point of removal	detailed assessment of options to inform the identification of a preferred option, see ES Chapter 3 - Assessment of Alternatives [APP-072] Table 3-4, Black Cat Junction Design Options report [APP-247] Scheme Assessment Report [REP4-033 Appendix K] Tables 5.1 to 5.7 and 10.2. However, it was not possible to do so in particular due to unacceptable safety and technical issues
6. Full Scheme Assessment	<ul style="list-style-type: none"> Assessment of the Scheme including Black Cat Junction options 	<ul style="list-style-type: none"> Environmental Assessment Report (June 2017) [REP4-033 Appendix J] Economic assessment Report (January 2018) Appraisal Summary Tables (January 2018) Scheme Assessment Report (January 2018) [REP4-033 Appendix K] All reasonable alternatives have been fully considered by the Applicant and there is no reasonable alternative to the Scheme which would avoid direct impacts on, and the loss of, Brook Cottages
7. Preferred Route Decision (PRD)	<ul style="list-style-type: none"> Based on the full PCF Stage 2 Scheme Assessment a preferred route was identified for further refinement prior to a Preferred Route Announcement (PRA) PRD is a project team recommendation to Ministers who decide on the later PRA 	<ul style="list-style-type: none"> Decision point for the project team to focus efforts on refining the Orange Route and Black Cat Junction Option C and satisfy the Applicant's governance process. See Appendix A. The process confirmed that Option C is the only viable option to take forward, but would be likely to require the removal of Brook Cottages
8. Development of Refined Option C	<ul style="list-style-type: none"> Refinement of Option C to develop the design with 	<ul style="list-style-type: none"> An evolution of the design of Option C that that allows the

Design Activity	Activity Description	Outcome
	consideration for road user and road worker safety, operational resilience, satisfy design standards, a more familiar, standard layout for road users, etc.	safe movement of strategic and local traffic to inform the selection of a preferred route, see Black Cat Junction Design Options report [APP-247]
9. Preferred route Announcement	<ul style="list-style-type: none"> Assessment of refined Option C for value for money, environmental impact, economic return and public support 	<ul style="list-style-type: none"> Key decision point to publicly announce Refined Option C as the preferred route for the Black Cat Junction, see Preferred Route Announcement [APP-035] The Applicant acknowledges the demolition of Brook Cottages will result in a significant adverse effect and substantial harm, but this is necessary in order to deliver the Scheme objectives and the substantial public benefits of the Scheme which are considered to outweigh the harm to Brook Cottages as explained in the Case for the Scheme [APP-240]

- 2.1.2 Initially 12 concept options were identified, assessed and sifted, in January 2017, establishing three junction arrangements for further development prior to Non-Statutory Consultation. Through January and February 2017, the three junction concepts, A, B and C, were developed and refined with further assessment completed to inform the Non-Statutory Consultation.
- 2.1.3 Following establishment of the Non-Statutory Consultation concepts, and through March and April 2017 in parallel with the consultation process, the three junction concept designs were developed in a 3-dimensional (3D) model and with further design considerations to support the proof of concept and allow more detailed assessment of the options prior to the identification of a preferred option.
- 2.1.4 On completion of the Non-Statutory Consultation in April 2017, the responses showed that Option C received the most support from respondents with 60% expressing it as their preferred option. As described in Section 4.3 of the Black Cat Junction Design Options report [APP-247], since the further review and design development had shown that all three options would result in the demolition of Brook Cottages, the Applicant sought to develop a variation of the Option C design with the specific aim of retaining Brook Cottages, whilst still delivering the Scheme objectives. The arrangement was referred to as Option C+.

- 2.1.5 PCF Stage 2 Assessment of the Scheme was completed through the period from April 2017 to January 2018 with the completion of the various PCF products including the Scheme Assessment Report **[REP4-033 Appendix K]**, Environmental Assessment Report **[REP4-033 Appendix J]**, Economic Assessment Report and Appraisal Summary Tables.
- 2.1.6 Following completion of the PCF Stage 2 Assessment and governance process, a Preferred Route Decision was made in February 2018 confirming Option C as the preferred option for the Black Cat Junction. A similar Preferred Route Decision was made for the Orange Route between Black Cat and Caxton Gibbet. The Preferred Route Decision is a project team recommendation to Ministers who decide on the later Preferred Route Announcement. Further design refinements were then completed to the Option C layout in the period May 2018 to June 2019 with a Preferred Route Announcement made in February 2019.
- 2.1.7 The initial development and assessment of the Black Cat Junction Options has primarily been detailed in Table 4.4 of the Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]**, which gave an overview of the reasons for discounting initial junction layout options, primarily for safety reasons. In the details below, greater detail has been added to support the case that sufficient exploration of junction options were considered in respect of the impact on Brook Cottages.
- 2.1.8 Prior to the identification of a Preferred Route, the potential impact on Brook Cottages was presented to the public in Section 10 of the Non-Statutory Consultation Brochure **[APP-035]**. The impacts reported at that time were consistent with the Applicant's understanding of the impacts arising from option development work and assessment which had been completed at that point in time. The following sections of this report explain the rationale for the conclusions reached and reported at that time and why these subsequently changed as the junction layout evolved.
- 2.1.9 The Scheme assessment at the end of PCF Stage 2 – Option Selection is brought together in the Scheme Assessment Report **[REP4-033]**, Appendix K. An overview of the performance and impact of key options are summarised in Table 10.2. A great deal of further assessment feeds into this simplified summary table. The sections below give examples of the assessments completed across the wider range of options to demonstrate that all relevant options under consideration at the time formed part of the process in identifying a preferred option.
- 2.1.10 The details of the Black Cat Junction development and assessment are detailed below in chronological order

2.2 Initial Concept Options – January 2017

- 2.2.1 As part of the whole route development, in PCF Stage 1, initial junction layouts were considered for all potential junctions required on the Scheme. These initial layouts were not developed options for assessment and sifting but simply proof of concepts i.e. can a junction that would likely work be provided?

- 2.2.2 Early in PCF Stage 2 it was decided, due to the significance of the junction, that specific options for the Black Cat Junction should be considered and presented at the Non-Statutory Consultation. Options that were considered compatible with the three whole route options identified in PCF Stage 1, were developed by a multi-disciplinary team in an initial concept review. The multi-disciplinary team consisted of highway, environment, operational safety, traffic, construction, and planning specialists
- 2.2.3 The review by the multi-disciplinary team identified 12 initial concept options for assessment and sifting. The 12 options are detailed in Table 4-4 in the Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]** and Table 5-1 in the Annex to the TAR **[REP4-033 Appendix H]** and ES Chapter 3 - Assessment of Alternatives **[APP-072]**.
- 2.2.4 Based on the initial concept layouts developed, of the 12 initial concept options, it was considered that 10 of the options had the potential to impact the listed building to the north of the Black Cat Junction, Brook Cottages, to the point of requiring demolition. It was judged that the other two options may impact the setting of the listed building.
- 2.2.5 The two options (1d and 1e) that were considered unlikely to require the demolition of the listed building were discounted primarily on the grounds of safety implications, see **Figure 2-2** and **Figure 2-3** which detail the specific safety concerns raised by the team i.e. the potential number of collision points inherent in the junction layouts and the non-intuitive nature of the proposed layouts summarised in the Table 4-4 and the RAG Table at Appendix C in the Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]**.

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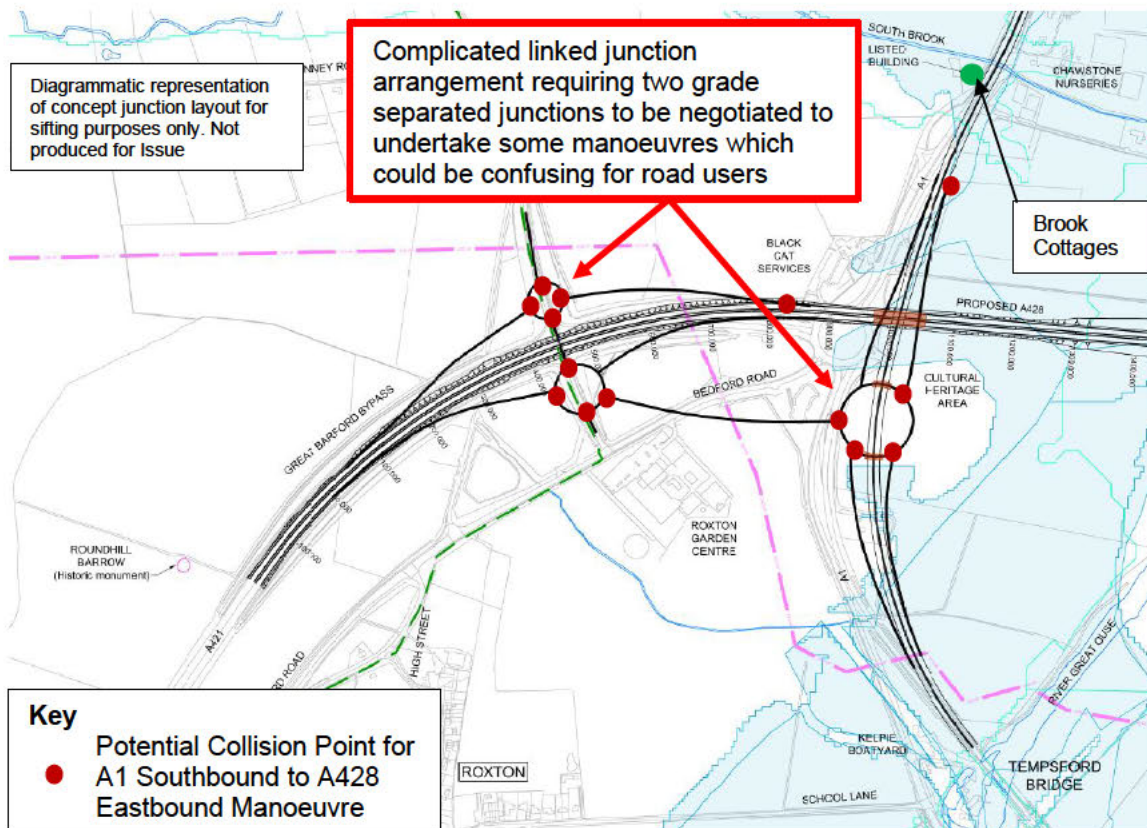


Figure 2-1 - Option 1d Safety Implications

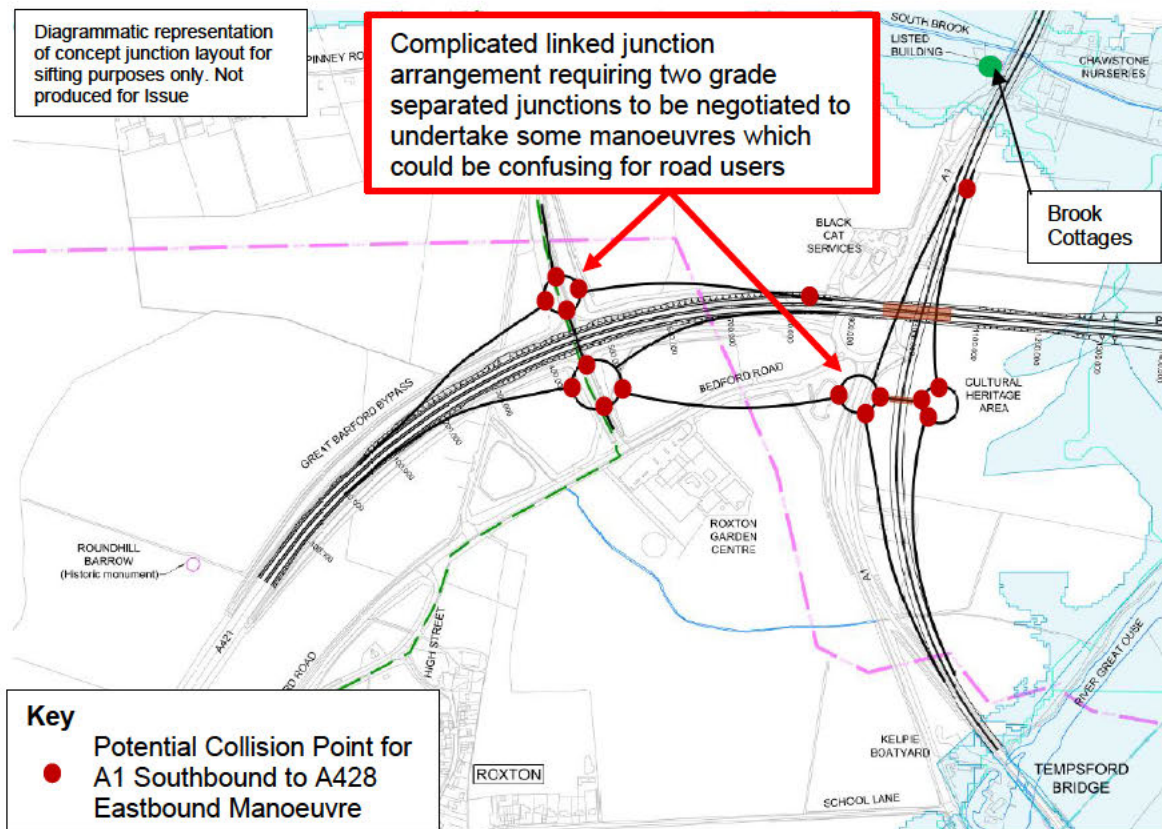


Figure 2-2 – Option 1e Safety Implications

- 2.2.6 In Figure 2-2 and Figure 2-3, the red dots signify each potential collision point travelling from the A1 Southbound to the A428 eastbound. At each point the driver is at risk of conflicting with another traffic movement. On the exit from the A1 there are potential weaving issues with traffic changing lanes to make the exit movement, increasing the risk of collision. At each point where the driver has to enter, exit or pass an entry/exit on a roundabout/gyratory, they are at increased risk of collision with traffic making conflicting movements, there are 12 such movements on Option 1d and 14 movements on option 1e. On merging with the A428 from the junction, the driver is at an increased risk of collision with traffic already travelling on the A428 from the A421.
- 2.2.7 The junction layouts in Option 1d and Option 1e are considered complicated and confusing due to the need for drivers to negotiate two grade separated junctions to complete one manoeuvre. They are also considered counter intuitive as they require a driver to leave one junction in the opposite direction to the direction they want to travel i.e. a driver wanting to travel from the A1 northbound to the A428 eastbound has to leave the first grade separated junction and travel west before negotiating another grade separated junction and heading eastbound as desired.
- 2.2.8 The Design Manual for Roads and Bridges document TD22/06 – Layout of Grade Separated Junctions (the design standard in place at the time of the option development) details in paragraph 5.17 that for interchange movements “*Good design minimises conflict points and ensures that the path between them is easily understood by drivers*”.

- 2.2.9 When designing a highway junction, the aim is to design a junction which (i) reduces the number of potential collision points and (ii) offers a junction which is intuitive for road users to navigate. This results in a safer junction with less potential for collisions. Where junction designs are complicated, it may not be possible to achieve both aims but, provided one aim is delivered, safety will not necessarily be comprised. For example, if the junction is intuitive to navigate a higher number of potential collision points will not necessarily result in a junction which compromises safety. Similarly, where the junction is less intuitive to navigate, this may still be acceptable from a safety perspective if there are few potential collision points. However, where a junction has a high number of collision points and is not intuitive to navigate, it will rarely be considered as a safe junction which can be taken forward. Ultimately, professional judgement is used to determine the level of safety risk for each junction design based on the particular circumstances of the junction in question.
- 2.2.10 As detailed in the Black Cat Junction Options Assessment Red Amber Green (RAG) Table, as presented in Appendix C of Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]**, it was identified that in Option 1d and Option 1e, a driver would be required to pass through 14 and 16 potential collision points respectively to undertake one manoeuvre (Red rating). In addition, the junction options were considered only partially intuitive because of their complicated linked junction arrangements (Amber rating). Given the high number of potential collision points combined with a non-standard junction arrangement that was not considered to be intuitive, it was determined that the junction arrangements would be unsafe and should not be progressed further.
- 2.2.11 Options 2a and 2b were also discounted on potential safety implications due to Red ratings for both potential collision points and intuitive junction layout, amongst other reasons **[REP4-032 Appendix C]**.
- 2.2.12 The Black Cat Junction was a particularly complex junction to design. It is in a highly constrained location due to the River Great Ouse and its associated tributaries, floodplains, noise important area to the north of the Black Cat junction, various cultural heritage assets other than Brook Cottages such as the Scheduled Monument of Tempsford Bridge, significant utility services and the proximity to numerous properties. In addition, it must facilitate links between parts of the Strategic Road Network, comprising the A1, A421 and A428, as well as maintaining important local road network movements and access. Due to the locational constraints, these links must be facilitated over a relatively short distance for the speed of vehicular travel. This necessarily results in a design which is complex and is likely to have either a high number of potential collision points or have an unusual layout which will not be intuitive for road users to navigate. In these circumstances, the overriding consideration tends to be to design a standard road layout that is intuitive, because even if there are potential collision points, road users will be familiar with these and adapt their driving behaviour accordingly. In contrast, a road layout which is not intuitive but has limited collision points will usually be less preferred because there will be an inherent collision risk in a layout with which road users are unfamiliar. The

balance of safety risk will ultimately be determined by exercising professional judgement given the particular circumstances of the design.

- 2.2.13 Options 1a and 1c were progressed as a combined Option A. Option 1a had 10 potential collision points for the A1 southbound to A428 eastbound manoeuvre and Option 1c had 11. Although still higher than ideally desired, these were considered a more reasonable number when accounting for the high number of movement requirements of the junction, leading to an Amber RAG rating. As the junction arrangements for these options consist of a single standard dumbbell roundabout interchange arrangement, the junctions were considered intuitive and therefore rated Green in the RAG assessment. Overall, the junction layouts were assessed as being suitable from a safety perspective to be progressed.
- 2.2.14 Option 3b was progressed as Option C. This had 9 potential collision points for the A1 southbound to A428 eastbound manoeuvre. Although still higher than ideally desired, this was considered a more reasonable number when accounting for the high number of movement requirements of the junction, leading to an Amber RAG rating. The junction arrangement is a conventional grade separated junction with a single gyratory supporting all movements which was considered intuitive and therefore rated Green in the RAG assessment. Overall, the junction layout was assessed as being suitable from a safety perspective to be progressed.
- 2.2.15 Option 5 was progressed as Option B. As this junction did not directly cater for all traffic movements and relied on the existing junctions to cater for other movements, it only had 3 potential collision points for its most complicated movement. This was considered low and was rated as Green in the RAG assessment. The direct junction arrangement is simple and intuitive for drivers, however, to complete some manoeuvres other junction use is required which could cause confusion. On this basis the junction was rated as Red for intuitive layout. However, unlike the junction layouts, such as Options 1d and 1e, any potential confusion could be overcome with Advanced Direction Signing on the A1 and A428/A421 directing drivers the appropriate junction. This approach would mitigate the threat posed by the junction layout and the junction layout was assessed as being suitable from a safety perspective to be progressed.

2.3 Concept Development for Non-Statutory Consultation – January to March 2017

- 2.3.1 The three junction concept designs that remained following the initial development, assessment and sifting exercise were developed and refined further to enable them to be assessed in greater detail and presented at the Non-Statutory Consultation. The multi-disciplinary team provided input to the development of the options with potential junction traffic flow performance considered in greater detail along with the combination of some options and general layout refinement. The development remained at a concept level with the focus on continuing to provide the proof of concept i.e. does it deliver the Scheme objectives, is it likely that the junction arrangement will work and can it be constructed safely.

2.3.2 Action Point 13 seeks clarity on why the description of potential impacts to Brook Cottages changed from a direct effect resulting in potential demolition during consideration of options (as reported for Option 1a and Option 1c) [REP4-032 Table 4.4] to an indirect effect on Brook Cottage’s setting at Non-Statutory Consultation (as reported for Option A) [APP-035]. The changed assessment of effects occurred as a result of the combination of Options 1a and 1c into Option A and subsequent layout refinements as part of design development, as explained further below.

2.3.3 The potential impact of Options 1a and 1c on Brook Cottages is shown in Figure 2-4 and Figure 2-5 respectively.

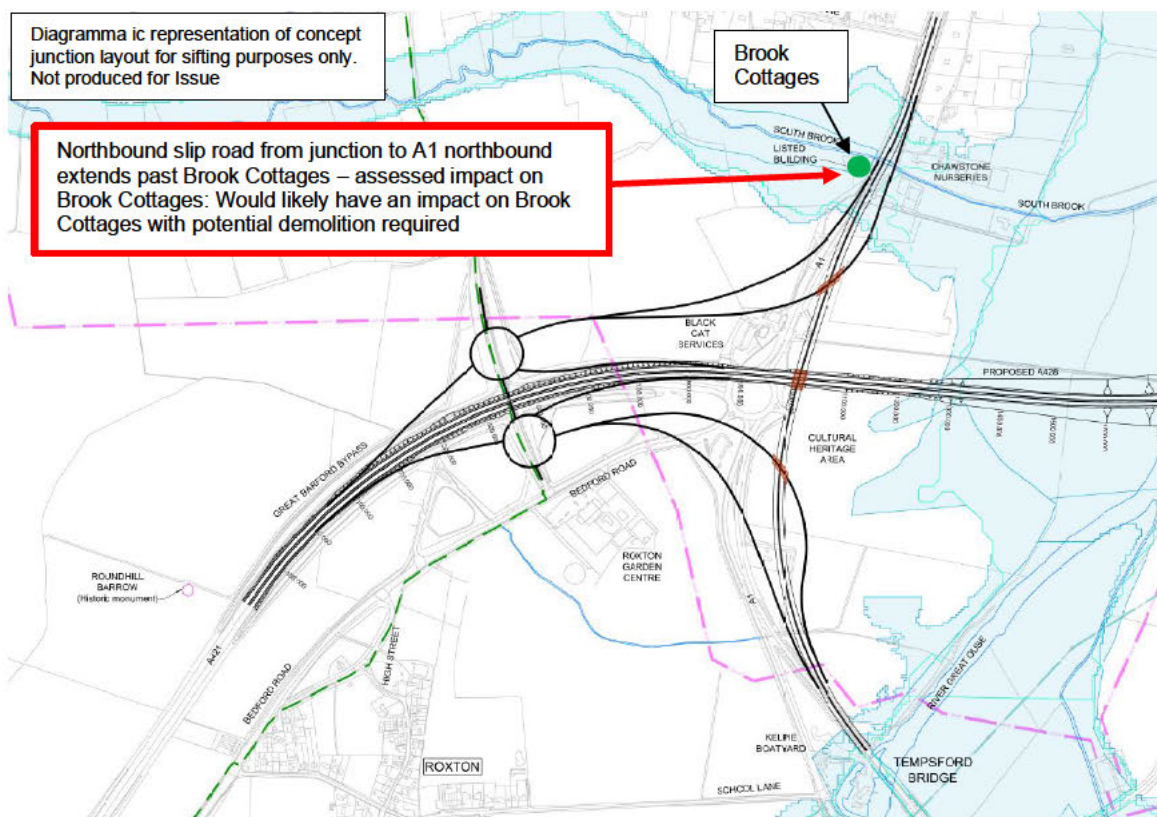


Figure 2-3 – Potential Impact of Option 1a on Brook Cottages

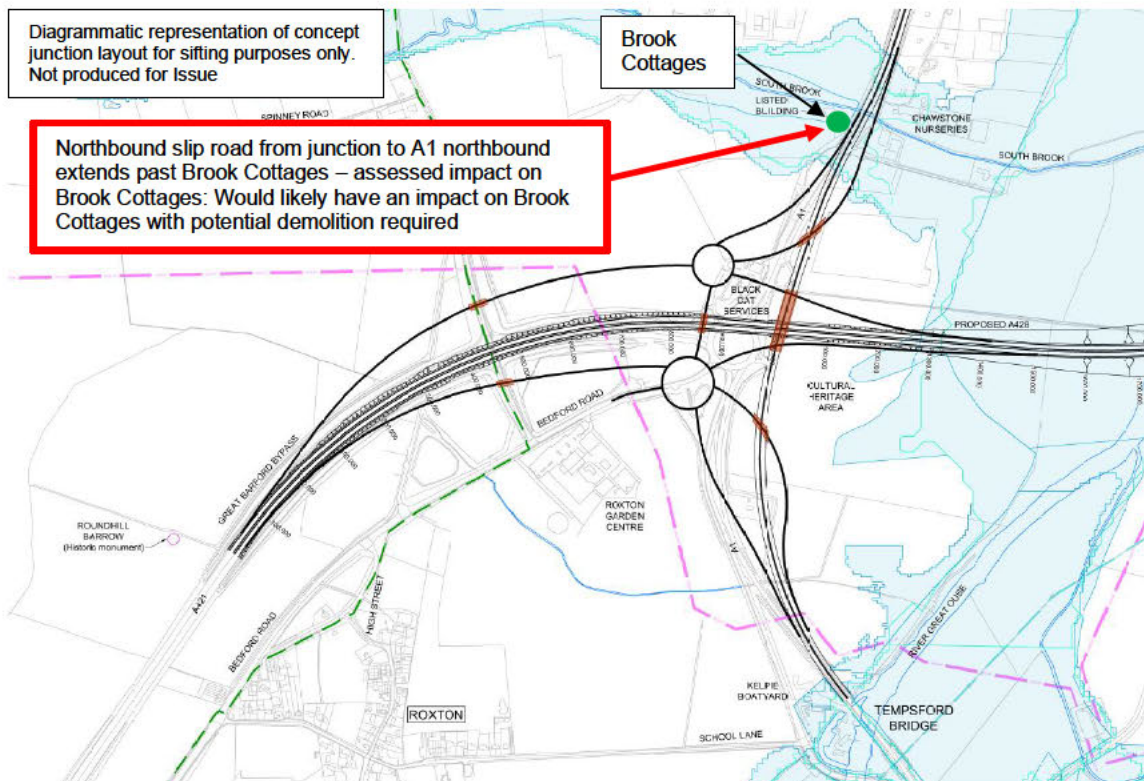


Figure 2-4 – Potential Impact of Option 1c on Brook Cottages

- 2.3.4 In combining options 1a and 1c, and taking into account further multi-disciplinary team input, Option A was produced as shown in **Figure 2-5**. This layout has not been presented previously to the Examination because there are many stages to the development of the concept design options and every iteration is not described in the Scheme reports. It is however relevant to demonstrate the layout development and the resulting change in assessment for the impact on Brook Cottages between option development and Non-Statutory Consultation.

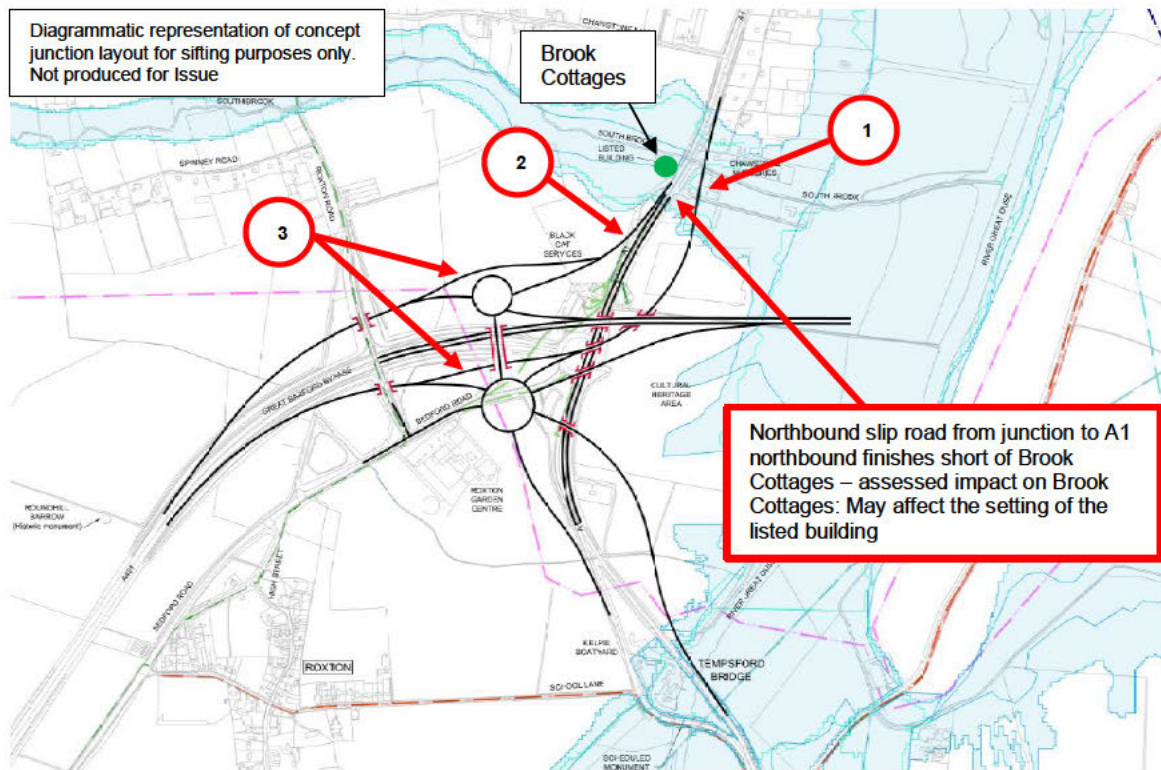


Figure 2-5 – Potential Impact of Option A on Brook Cottages

- 2.3.5 As can be seen from Figure 2-4 and 2-5 above, the concept design for Option 1a and Option 1c showed the slip road to the A1 northbound extended past Brook Cottages and was therefore considered likely to result in the demolition of Brook Cottages. In contrast, as shown in Figure 2-6, for Option A, the slip road to the A1 northbound did not extend as far as Brook Cottages, resulting in an assessment that only the setting of Brook Cottages would be affected.
- 2.3.6 This change resulted from the following refinements being made to Option A following the combination of Options 1a and 1c as described in Section 4.2 of the Black Cat Junction Design Options report [APP-247]:
- The dumbbell roundabout is now located between those shown in Options 1a and 1c (this was the aim of combining the two to move the junction further from Roxton than in option 1a and allowing greater scope for constructing the junction away from the existing A1 than in option 1c)
 - Critically, for the assessment of impact on Brook Cottages, the southbound off-slip from the A1 (see point 1 on Figure 2-6) now goes to the south roundabout allowing the northbound on-slip on to the A1 (see point 2 on Figure 2-6) to be relocated southwards and the merge completed south of Brook Cottages
 - Free-flow links are added for A1 southbound to A421 westbound traffic and A421 eastbound to A1 northbound traffic (see point 3 on Figure 2-6), increasing the capacity for high traffic flow demand manoeuvres.

2.3.7 Option A was presented in the Non-Statutory Consultation alongside Options B and C that had undergone similar further design development from Options 5 and 3b respectively. These 3 options were described to an appropriate level of detail in the tables and narrative in Sections 8 to 10 in the Non-Statutory Consultation Brochure [APP-035 Part B2]. This version of Option A, as detailed in Section 7 of the Non-Statutory Consultation Brochure, is shown in **Figure 2-6** and is a customer friendly graphical image of the concept design layout presented in Figure 2-6 above.

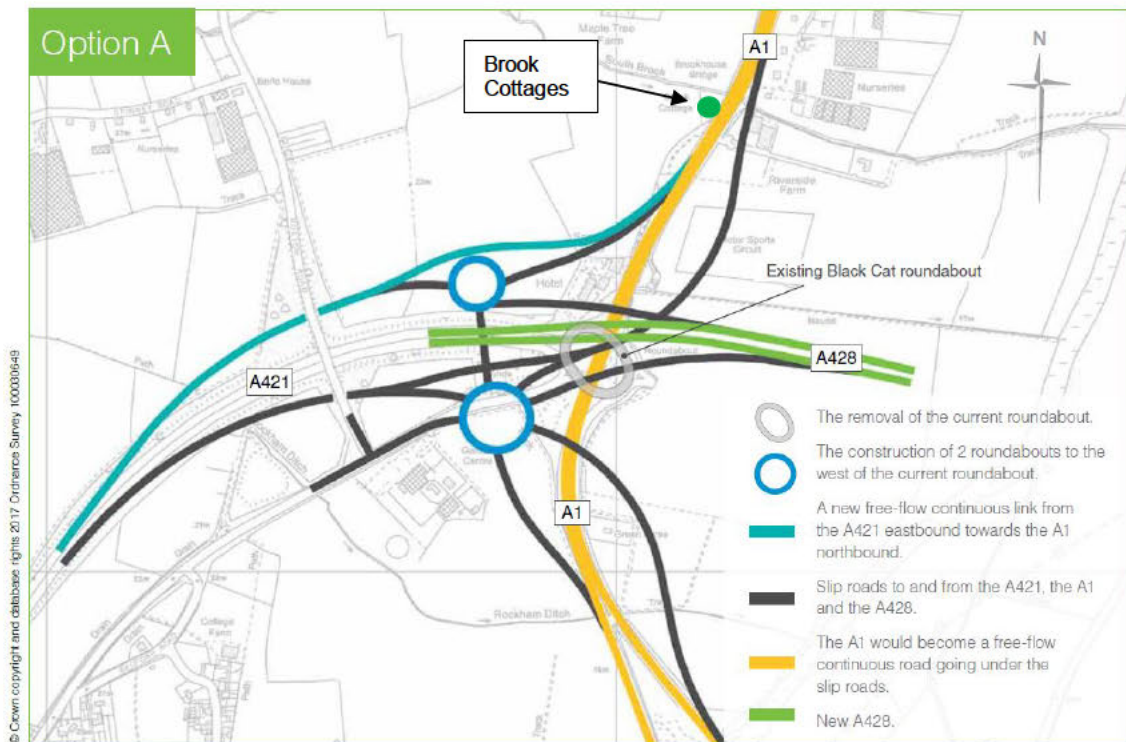


Figure 2-6 - Option A Developed as presented in the Non-Statutory Consultation (March to April 2017)

2.4 3-Dimensional Development of Options – March to April 2017

2.4.1 Once the concept design junction options for Non-Statutory Consultation had been established, the three short-listed options were developed further to support the more detailed assessment required to identify a preferred option. However, none of the options were developed to a preliminary design level, as this is only undertaken in PCF Stage 3, once an option has been chosen as part of the Preferred Route Announcement at the end of PCF Stage 2.

2.4.2 At Section 7.5, the Scheme Assessment Report [REP4-033, Appendix K] states “*There is a Listed Building that lies close to Black Cat junction, which is likely to be affected by all of the Black Cat options, and potentially to the point of removal depending on how the slip roads connect to the A1. A site visit is required at the next stage to assess the effects to this structure and to potentially influence the designs of the slip roads / access roads to avoid the loss of this feature*”.

- 2.4.3 A visual assessment of Brook Cottages took place in March 2018 and is reported in the Brook Cottages Heritage Appraisal [APP-178]. The purpose of the assessment was to gain a full understanding of the significance of the building to inform option assessment and it confirmed the surviving fabric of the building supported the Grade II listing designation.
- 2.4.4 As part of the further development of the three short-listed options, the Design Manual for Roads and Bridges (DMRB) standards for horizontal and vertical alignment and associated visibility requirements were more fully considered for the 3 dimensional design of the new dual carriageways and Black Cat Junction options. This included using the traffic flows which inform the design of the merge and diverge slip roads required to have sufficient capacity and be in accordance with the DMRB standards. This resulted in some links being longer or at a greater lateral clearance to other road elements to meet the standards for gradients, curvature and structural clearances. Any additional structures were identified as a result of this updated design. The earthworks design enabled the land take requirements for each option to be more accurately defined and the footprint of the scheme understood. For Option A, the application of this next level of design development had an impact on the layout and extent of the northbound merge from the junction to the A1, requiring an update to the assessment of potential impact on Brook Cottages as detailed below.
- 2.4.5 The 3-Dimensional development of Option A is shown in **Figure 2-7**.

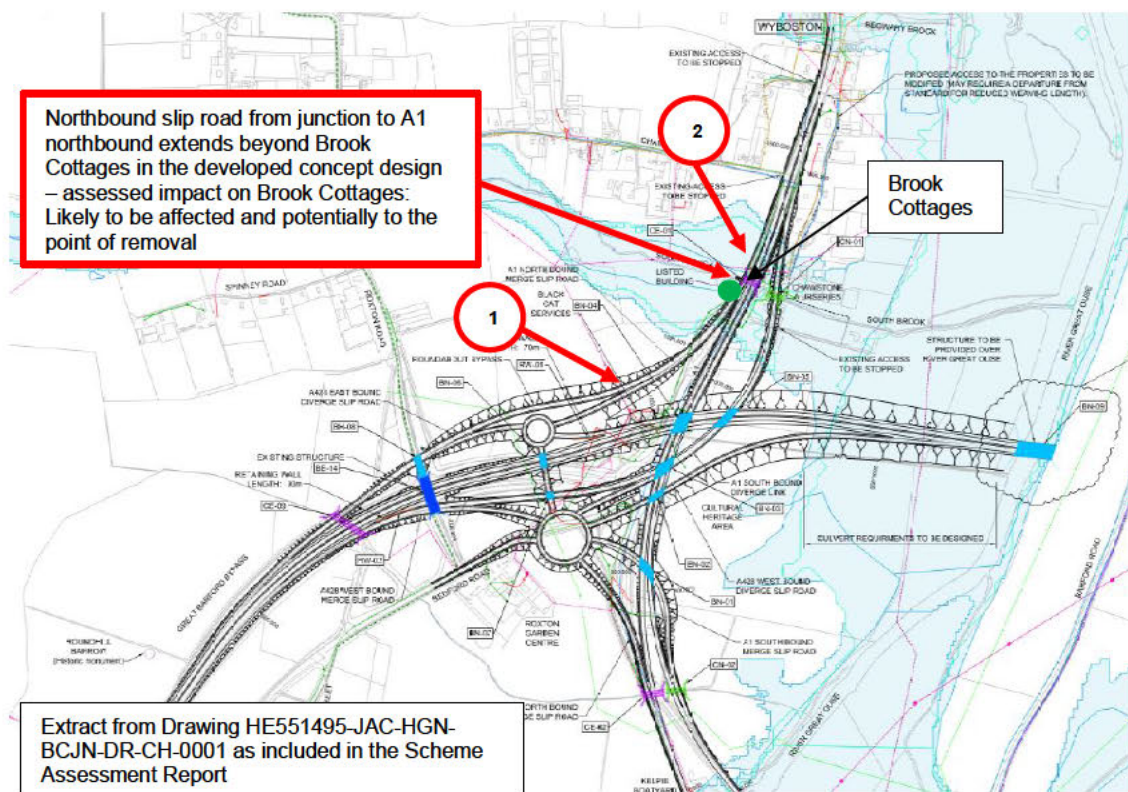


Figure 2-7 - Option A 3D Development (March to April 2017)

- 2.4.6 As can be seen from Figure 2-8, applying this next level of design development results in further refinement of the new dual carriageways and the whole junction layout. Importantly, the update to the junction on-slip merge to the A1 northbound has significant implications for the assessment of potential effects on Brook Cottages. In Figure 2-8, the application of the A421 eastbound free-flow link (segregated left turn lane) and north roundabout exit merge (see point 1 on Figure 2-8), coupled with the merge onto the A1 northbound (see point 2 on Figure 2-8) has led to an extension of the overall slip road length which extends past Brook Cottages. As explained above, where the new infrastructure extended past Brook Cottages, a provisional view was taken that it had the potential to result in the demolition of Brook Cottages. Following the refinements which resulted in the extended northbound merge slip road for Option A, it was recognised in the Environmental Assessment Report [REP4-033] and the Scheme Assessment Report [REP4-033] that the slip road connecting into the A1 required greater land take and extended to the north, resulting in the potential to require the demolition of Brook Cottages, and significantly alter the potential impact on this heritage asset. A summary of these three alternatives considered and the main outcomes of the appraisal and design processes are presented in Table 3-4 of the ES Chapter 3 – Assessment of Alternatives [APP-072].

2.5 Development of Option C+ - April 2017 to April 2018

- 2.5.1 As explained in the Black Cat Junction Design Options [APP-247], section 4.3, the Applicant sought to develop a variation of the Option C junction design with the specific aim of retaining Brook Cottages, whilst still delivering the Scheme objectives and undertook an assessment to compare the variant with Option C. The arrangement was referred to as Option C+ and is shown in **Figure 2-8**.

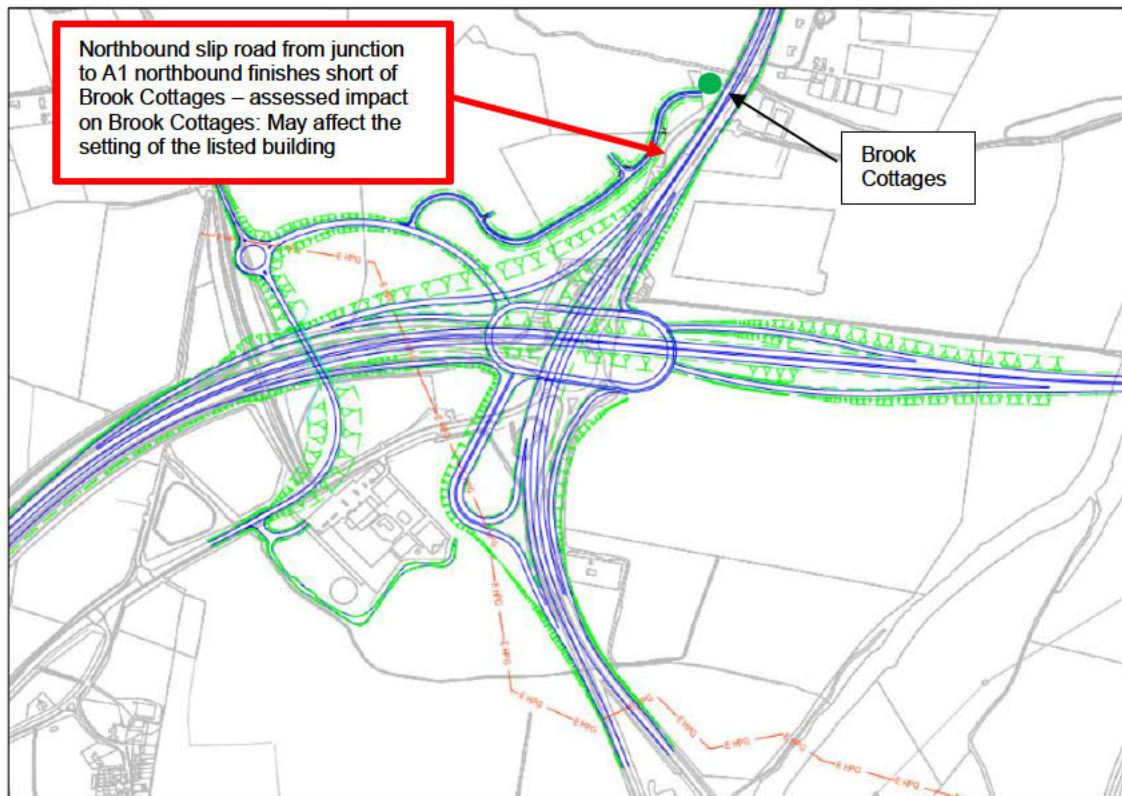


Figure 2-8 - Option C+ Layout April 2017

2.5.2 The primary changes from Option C were:

- a. Reduction in the length of the A421 eastbound/A1 northbound on slip from that proposed in Option C, to avoid Brook Cottages.
- b. Provided a direct access to Brook Cottages to replace the existing access from the A1.
- c. Provision of a half clover leaf arrangement to the south of the Black Cat junction to facilitate a movement from the Black Cat junction circulatory to the A1 northbound, since this connection could not be provided directly as a result of the need to reduce the length of the A421 eastbound/A1 northbound on slip.
- d. Diversion of Bedford Road towards Roxton Road with a new bridge crossing over the A421, a new roundabout junction on Roxton Road and a new link road to tie back into the Black Cat junction circulatory carriageway.

2.5.3 Option C+ was developed over the period of April 2017 to April 2018 and is fully reported in the Black Cat Junction Design Options report [APP-247]. As it was developed key information was provided to the assessment process that is covered in the Section 2.6 below, to enable it to be considered as a variant of Option C. A summary is also provided in Table 3-4 of the ES Chapter 3 – Assessment of Alternatives [APP-072].

2.6 Assessment of the Scheme - April 2017 to January 2018

- 2.6.1 Following the Non-Statutory Consultation and the commencement of design refinement, as detailed above, further assessment was completed to inform the identification of a preferred route and junction option and Preferred Route Announcement. The assessment of the options is detailed in various PCF products but primarily, the Scheme Assessment Report [REP4-033], Environmental Assessment Report [REP4-033], Economic Assessment Report, and Appraisal Summary Tables. The Scheme Assessment Report was prepared after the other PCF Stage 2 assessment reports and the outcome analysis of the Non-Statutory Consultation.
- 2.6.2 The Scheme Assessment Report provides a summary of the overall options identification and assessment and is specifically referred to in ISH4 Action Point 14 [REP4-033 Table 10.2]. Table 10.2 of the Scheme Assessment Report aims to provide an overview of a representative sample of the options and their associated assessments. As a result, it necessarily reports at a high summary level. Each element of the summary is underpinned by a greater depth of assessment from either within the report or other PCF Stage 2 reports produced to support robust scheme decision making and governance. However, there will be similarities in the qualitative assessment results for some criteria due to the level of maturity of the concept design for the options at this stage of Scheme development.
- 2.6.3 Action Point ISH4 Action Point 14 enquires: “With reference to the submitted evidence, including [REP4-033 Table 10.2], explain why Option C+ was not combined with the Orange route in design selection process, and the implications of this for that process.”
- 2.6.4 The Applicant can confirm that the Orange Route was assessed with the Black Cat Junction Option C+ as part of the assessment process. The Economic Assessment Report, as completed in January 2018, details the full suite of options that were assessed, and an extract of Table 2-2 is shown below:

Table 2-2 - Summary of Options Assessed in PCF Stage 2

Option Description	Option Reference
Black Cat Junction Option A	DSA
Black Cat Junction Option B	DSB
Black Cat Junction Option C	DSC
Black Cat Junction Option C+	DSC_P
Orange Route with Black Cat Junction Option A	DS1A
Orange Route with Black Cat Junction Option B	DS1B
Orange Route with Black Cat Junction Option C	DS1C
Orange Route with Black Cat Junction Option C+	DS1C_P
Purple Route with Black Cat Junction Option C+	DS5C_P
Pink Route with Black Cat Junction Option C+	DS6C_P

2.6.5 In this period, the Orange Route (Route 1) was clearly emerging as the best performing route from traffic modelling and economic forecasting and the preferred option from the consultation. It was therefore decided that the Purple (Route 5) and Pink (Route 6) routes would only be assessed with one Black Cat Junction option. As Option C was emerging as the best performing junction from traffic modelling and economic forecasting and the preferred option from the consultation, and Option C+ was a refinement of Option C, it was decided to assess the Purple and Pink Routes with Option C+. This would ensure that the Purple and Pink routes would be represented at their best performance to enable robust comparisons with the Orange route prior to the identification of the preferred route.

2.6.6 **Table 2-3** below is a reproduction of Table 107 (section 5.13, page 92) from the Economic Assessment Report. The table details the summary economic assessment of the 10 options assessed, with the Orange Route and Black Cat Junction Option C+ circled in red for clarity. This clearly shows that the Orange Route with the Black Cat Junction Option C+ layout was fully considered in the assessment

Table 2-3 – Table 107 from the Economic Assessment Report (January 2018)

Table 107: Benefit to Cost Ratios for all options (£000s).

	DSA	DSB	DSC	DSC_P	DS1A	DS1B	DS1C	DS1C_P	DS5C_P	DS6C_P
TOTAL PVB	231,072	163,892	269,098	215,477	842,052	795,154	850,541	855,166	507,164	461,542
TOTAL PVC	111,317	96,465	107,233	104,268	582,229	568,057	578,863	575,732	576,321	576,300
BENEFIT TO COST RATIO (BCR)	2.08	1.70	2.51	2.07	1.45	1.40	1.47	1.49	0.88	0.80

2.6.7 Appraisal Summary Tables detail the forecast impacts in terms of Economy, Environment, Social and Public Accounts. At this stage, Appraisal Summary Tables were produced for the main options, which included the Orange Route with Black Cat Junction Option C+. In total the Appraisal Summary Table consider 24 areas within the above topics and these are set out in Table 2-4:

Table 2-4 – Appraisal Summary Table Considerations

Topic	Area Considered
Economy	Business users & transport providers
	Reliability impact on Business users
	Regeneration
	Wider Impacts
Environmental	Noise
	Air Quality

	Greenhouse gases
	Landscape
	Townscape
	Historic Environment
	Biodiversity
	Water Environment
Social	Commuting and Other Users
	Reliability Impact on Commuting and Other Users
	Physical activity
	Journey Quality
	Accidents
	Security
	Access to Services
	Affordability
	Severance
	Option and Non-Use Values
Public Accounts	Cost to Broad Transport Budget
	Indirect Tax Revenues

- 2.6.8 The selection of a preferred route considered the full suite of assessment evidence in the PCF Stage 2 reports, including the report on the Non-Statutory Consultation **[APP-035 Part B16]**.
- 2.6.9 In order to make a Preferred Route Decision, the evidence from the assessments and stakeholder engagement activities was presented to the Project Committee. The evidence considered and discussed by the committee included:
- a. Assessment of each options performance against the Scheme Objectives, as presented in the Appraisal Summary Tables
 - b. Key constraints
 - c. Public consultation feedback
 - d. Buildability
 - e. Key risks and opportunities
- 2.6.10 The Project Committee, having been presented with the evidence, identified Option C as the preferred option to be combined with the Orange Route (Option 1).

2.7 Refinement Prior to Preferred Route Announcement – January 2018 to February 2019

- 2.7.1 By April 2018, the review of Option C+ determined that whilst it did not require the demolition of Brook Cottages, it presented unacceptable technical and safety issues. In summary it was considered that Option C+:
- Would result in an unacceptable impact on safety due to likelihood of queuing on the slip road. This was due to the design of the Layout A Taper Merge arrangement being insufficient to cope with predicted traffic flows. This is the only merge arrangement that could be accommodated in order to meet the objective of retaining Brook Cottages. As such, Option C+ did not meet the Scheme objectives relating to ‘Connectivity’ and ‘Safety’.
 - Was significantly more expensive than Option C due to additional land being required, complex utility diversions, complex structures and additional traffic management.
 - Increased the scale of engineering works and resulted in a junction layout which would be difficult to understand for road users which could lead to an increase in accidents and a less safe design.
 - Had poor operational resilience if the A1 northbound were to become blocked due to an incident or flooding, and therefore did not meet the Scheme objective relating to ‘Resilience’.
- 2.7.2 Based on the above it was concluded that Option C+ was not a safe design solution and that it would not meet technical requirements or the need or objectives for the Scheme.
- 2.7.3 The recommendation of the Preferred Route Decision was made February 2018 confirming Option C as the preferred option for the Black Cat Junction to enable the project team to continue design development. This Scheme governance process followed the PCF Stage 2 assessment of the junction options which included consideration of safety, congestion relief, free flowing traffic movements, wider economic benefits and impacts, environmental impacts and capacity. The decision was recorded in a “Preferred Route Decision (PRD) for Black Cat” note, provided at Appendix A. The Preferred Route Decision is a project team recommendation to Ministers who decide on the later Preferred Route Announcement.
- 2.7.4 The Black Cat Junction Option C design was refined prior to Preferred Route Announcement to allow for the safe movement of both strategic and local traffic with the development of the Roxton Road Link and the A1 services link road. The grade separation of the Black Cat Junction meant that the A1 junctions with Chawston Lane, The Lane and Nags Head Lane and the egress from the A1 Service area were located with the minimum weaving section length for the A1. To meet DMRB standards, these existing junctions had to be closed and alternative routes provided for road users, which led to the development of the Roxton Road Link and the A1 services link road. These changes to the design did not change the assessment of the effects on Brook Cottages. The refined

Option C design was considered to meet Scheme objectives, be safe, operationally resilient, minimise the overall environmental impact, satisfy the key traffic and design requirements and the standard grade separated junction design offered a more familiar layout for road users which reduced the risk of accidents.

3 Conclusion

3.1 Summary of the responses to Action Points 13 and 14

3.1.1 The Action Points identified by the ExA were as follows:

- a. Action Point 13 - Explanation, including where appropriate any factual information to support the narrative described in the relevant tables in **[REP4-032]** and **[REP4-033]** relating to assessment of alternatives at Black Cat junction. Key to aid understanding for the Examining Authority being the chronology of decisions taken and sign posting to relevant information in the Examination Library for non-statutory consultation, specifically, the described effects on Brook Cottages and why the view changed
- b. Action Point 14 - With reference to the submitted evidence, including **[REP4-033 Table 10.2]**, explain why Option C+ was not combined with the Orange route in design selection process, and the implications of this for that process.

3.1.2 In response to Action Point 13, the main chronological steps and sign posting to relevant information is summarised in the timeline for the development and assessment of the Black Cat Junction options shown in the Gantt Chart in Figure 2.1 and the associated summary of this process, including design development and assessment activities and key outcomes, outlined in Table 2.1.

3.1.3 Changes in the assessment of effects on Brook Cottages as the design developed during PCF Stage 2 is summarised in Table 2-1 and described in Sections 2.1 to 2.6.

3.1.4 The initial development and assessment of the Black Cat Junction concept design options has primarily been detailed in Table 5-1 in the Annex to the TAR **[REP4-033 Appendix H]** and ES Chapter 3 - Assessment of Alternatives **[APP-072]**, RAG Table of assessment **[REP4-032 Appendix C]** and Table 4.4 of the Overview of the Alternatives considered at the Black Cat Junction Report **[REP4-032]**, which gave an overview of the reasons for discounting initial junction layout options, primarily for safety reasons due to the high number of potential conflict points and the complicated non-standard linked junction arrangements which could be confusing for road users. All of these options that were progressed to the next stage of development were considered to have the potential to require demolition / removal of Brook Cottages.

3.1.5 The changed assessment of effects on Brook Cottages for Option A in the table at Section 10 of the Non-Statutory Consultation brochure **[APP-035]** occurred as a result of combining of Options 1a and 1c into Option A and subsequent layout refinements as part of design development. As shown in Figure 2-6 and described in Section 2.3.6 and 2.3.7, the next stage of iteration of the concept design for Option A made refinements that resulted in the merge slip road from junction to A1 northbound not extending as far as Brook Cottages. The design development was possible because the southbound off-slip from the A1 (see point 1 on Figure 2-6) was changed to connect into the south dumbbell

roundabout, rather than the north roundabout and the dumbbell roundabout junction was moved further westwards away from the existing A1 than is shown in Option 1. These concept design developments allowed the northbound on-slip on to the A1 (see point 2 on Figure 2-6) to be relocated southwards and the merge completed south of Brook Cottages. This was the Option A presented at the Non-Statutory Consultation. Moving the slip road merge on the A1 northbound carriageway further to the south of Brook Cottages changed the assessment of the effects to a conclusion that it may affect the setting of the listed building.

- 3.1.6 As described in Section 2.4, the three Black Cat junction concept design options for Non-Statutory Consultation were developed further by producing 3-dimensional (3D) designs to support the more detailed assessment and understanding of the impact on Brook Cottages and other constraints required to identify a preferred option. The horizontal and vertical alignments for all the junction links and slip roads were designed to DMRB standards and the relevant traffic flows. This resulted in some links being longer or at a greater lateral clearance to other road elements to meet the standards for gradients, curvature and structural clearances. The earthworks design enabled the land take requirements for each option to be more accurately defined. For Option A, as shown in Figure 2-8, this next stage of design development had an impact on the layout which extended the A1 northbound slip road further north and increased the proposed land take in that area. This further design development demonstrated that all 3 junction options would be likely to require the removal of Brook Cottages, as described in ES Chapter 3 - Assessment of Alternatives Table 3-4 [APP-072], Black Cat Junction Design Options report [APP-247] and Section 7.5 of the Scheme Assessment Report [REP4-033].
- 3.1.7 Further design development and assessment of options showed there is no reasonable alternative to the Scheme which would avoid direct impacts on, and the loss of, Brook Cottages and all reasonable alternatives have been fully considered by the Applicant.
- 3.1.8 The response to Action Point 14 is described in Section 2.6. The Applicant can confirm that the Orange Route (Route 1) was assessed with the Black Cat Junction Option C+ as part of the assessment process. However, this option together with other scenarios formed part of the iterative assessment and decision making process and was not reported in the Scheme Assessment Report Table 10.2 [REP4-033]. At this stage, Option C+ was considered a variant of Option C. On this basis, it was decided to report the Orange route with the primary Black Cat Junction options (A, B and C), as these were most relevant to selecting a preferred option. It was not possible to report on the primary junction options for the Purple and Pink routes as it had been decided at an earlier stage to test these routes with junction Option C+ only.

Appendix A – Preferred Route Decision (PRD) for Black Cat

A428 BLACK CAT TO CAXTON GIBBET

PREFERRED ROUTE DECISION (PRD) FOR BLACK CAT

As part of the A428 Black Cat to Caxton Gibbet scheme Highways England presented a number of options at non statutory consultation for the Black Cat Roundabout. The Black Cat roundabout has historically suffered from congestion and has some safety issues that need to be resolved. It is also a critical link between the A421 and the A1 for both local and regional journeys therefore it is important that congestion is resolved so that traffic may flow more easily.

Options have been developed for Black Cat roundabout which have considered a wholly or partly new junction which accommodates all traffic movements between the A421 and A1. Grade separated junctions have also been considered as part of this development. Three options were presented at non statutory consultation A, B and C.

Option A proposed that the existing Black Cat roundabout will become a new three tier grade separated junction, with the A1 at the lowest road level. The slip roads from the A1 and A428 will be at level 1, and the new A428 dual carriageway will be at level 2. Option B proposed the current Black Cat roundabout to become a two tier grade separated junction, with the A1 and Black Cat roundabout remaining on the lower level and the new A428 dual carriageway on the second level over the top. Finally Option C proposed the current Black Cat Roundabout will become a three tier grade separated junction, with the A1 at the lowest level. An enlarged Black Cat as the middle level and the new A428 dual carriageway to go over the widened Black Cat Roundabout.

Highways England has conducted further analysis of the performance of the junction, including working with the A1 East of England Strategic Study and Oxford to Cambridgeshire Express Way teams to further understand how each of the options would perform. Aspects that have been considered, include but are not limited to, safety, congestion relief, free flowing traffic movements, wider economic benefits and impacts, environmental impact and capacity. The analysis conducted has concluded that of the options presented C is the only viable solution to take forward. Options A and B do not perform to the desired levels to be considered further at this stage.

Highways England therefore considers option C as its preferred route for the Black Cat roundabout and will continue to work on its development as part of the A428 Black Cat to Caxton Gibbet scheme.

We anticipate that the delivery of the scheme will commence in 2021 subject to the outcome of change control and BICC approval.

Checked and Reviewed by: John Newham, Regional Sponsor

 6/2/18

Approved by: Julie Crawford, Regional Delivery Director

 9/2/18