Norwich Western Link

Environmental Statement

Chapter 4: Reasonable Alternatives Considered

Appendix 4.3: Review of OSR Conclusions in Light of 2022 Alignment Refinement

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1 Introduction

1.1 Introduction

1.1.1 This Report has been produced in light of the alignment refinement of Option C in 2022 (Option C Refined selected in Alignment Refinement Report 2022). A reassessment of options considered in 2019 has been undertaken to establish if the 2019 conclusions remain the same in light of the refinements undertaken to Option C, and changes in knowledge of the baseline.

1.1.2 This report presents:

- a summary of the 2019 option selection process to select Option C (Section 1.2 below);
- a summary of the 2022 alignment refinement of the route to select Option C Refined as the preferred route (Section 1.3 below); and
- an appraisal of how Option C Refined compares against the 2019 options (Section 1.4 onwards).

1.1.3 This Appendix does not discuss the policy considerations in relation to alternatives. These are outlined in the Planning Statement.

1.2 Option Selection Report 2019

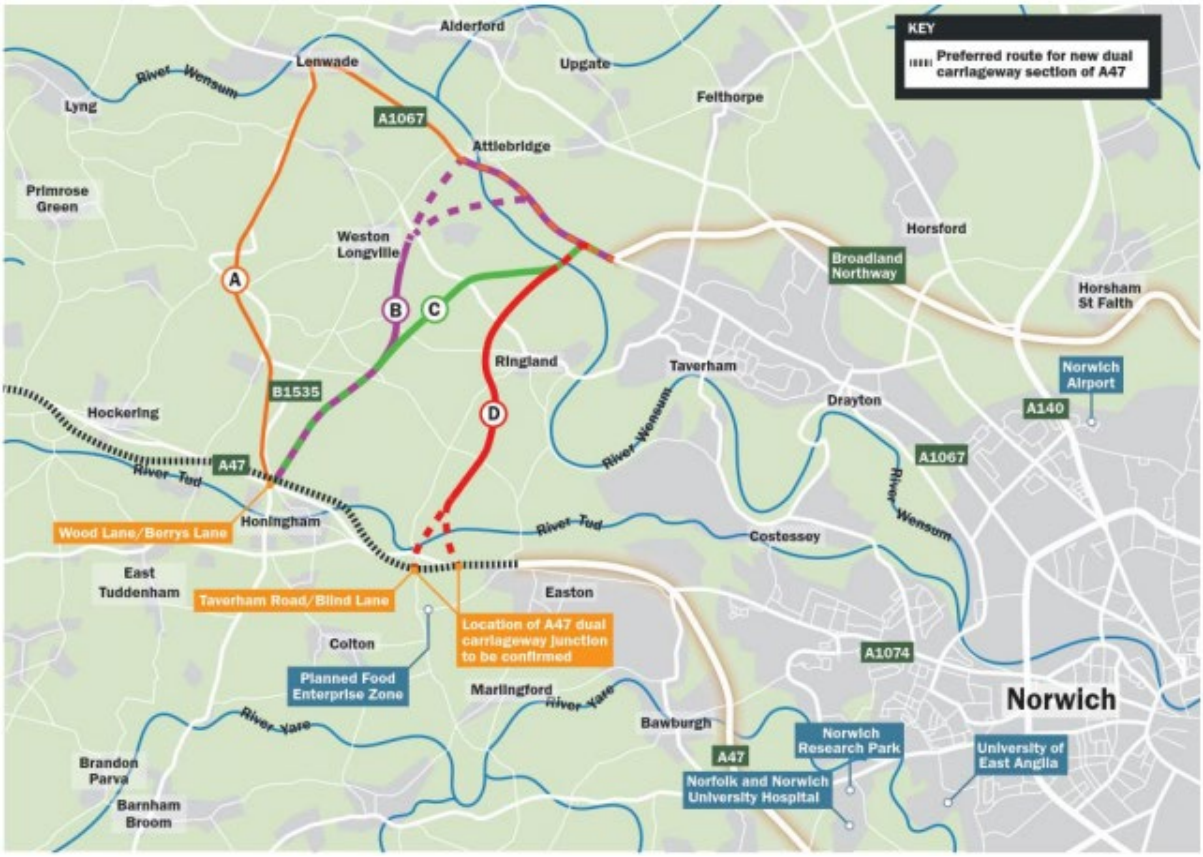
1.2.1 The Norwich Western Link Option Assessment Report 2019 (OAR) appraised and sifted a long list of options and identified 6 shortlisted options that were suitable to be carried forward. The shortlisted options were assessed in the Option Selection Report 2019 (OSR).

1.2.2 The shortlisted options that were considered in the OSR are outlined below and illustrated on **Plate 1**:

- **Route Option A**: Runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road, at its junction with Porters Lane and the B1535 to the south;

- **Route Option B East**: Runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 connecting to a new junction to the east of the existing junction connecting the A1067 to A1270;
- **Route Option B West**: Runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 connecting to a new junction near Attlebridge;
- **Route Option C**: Runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road to the west of its junction with the A1270;
- **Route Option D East**: Runs from the A47 to the east of its junction with Taverham Road to the A1067 Fakenham Road, at its junction with Porters Lane and the B1535 to the south; and
- **Route Option D West:** Runs from the A47 at its junction with Taverham Road to the A1067 Fakenham Road to the west of its junction with the A1270.

Plate 1 OSR Shortlist Highway Options



The OSR assessed the shortlisted options against the following criteria:

- Engineering;
- Cost;
- Traffic and Economic Assessment;
- Environment (including Biodiversity); and
- Feedback from public consultation on shortlisted options.

Conclusion of the OSR Process

1.2.3 The OSR concluded that Route Option C was the preferred route at the time. From a connectivity perspective, the Option C horizontal alignment was well supported by members of the public as it offers good connectivity between A47 and A1270 and would encourage strategic traffic to avoid the villages in the west of Norwich with a more direct route from Wood Lane to Broadland Northway, avoiding Ringland and Weston Longville. This route links well with the A47 North Tuddenham to Easton Improvement Scheme and a connection to Wood Lane was considered preferable to Taverham Road where there are residential properties (including listed buildings) close to the existing A47 junction. Option C was also considered to be less challenging to construct in terms of vertical alignment as it avoids the steep topography through the Ringland Hills and avoids crossing the River Tud on an additional viaduct which was also preferred by the Environment Agency.

1.2.4 Option D was most popular with members of the public based on feedback from consultation, with option C being the second most popular and also well supported, with other options receiving similar support to the Do Nothing option. Stakeholders including parish councils and statutory consultees were also consulted. The closest directly affected parishes of Ringland and Weston Longville naturally preferred options that were further from their villages but agreed that Option C was a suitable compromise. This was because Option C was positioned broadly equidistant between the nearest villages of Ringland and Weston Longville, whereas Option D was close in proximity to Ringland and Option B was close to Weston Longville.

1.2.5 The Environment Agency did not prefer Option D as it involved an extra viaduct over the River Tud. Hence Option C was considered to offer the optimum solution which was assessed as being the route that was most acceptable to local stakeholders. Taking into account its strong compliance with the project objectives, it was noted that Option C:

- Has received significant public support;

- Provides 'high' value for money (as defined in Department for Transport guidance);
- Balances the significant environmental issues;
- Limits environmental impacts (with provision of appropriate mitigation);
- Promotes cycling and walking on the existing local roads due to the reduction in vehicular traffic;
- Provides significant journey and transport benefits and improved network resilience;
- Supports the delivery of future growth by providing appropriate infrastructure;
- Minimises property and community impacts;
- Provides a high quality strategic and direct connection between the A47 strategic road network and A1270 major road network (also linking to Norwich Airport); and
- Improves access to Norfolk and Norwich University Hospital, particularly for north and west Norfolk, and reduces emergency response times.

1.2.6 Route Option C was adopted in 2019 as the preferred route at the time, as presented in **Plate 2** below.

Plate 2 Plan of the 2019 OSR Preferred Route (Option C)

Further detail on the OSR can be found in the **Environmental Statement Chapter 3 Consideration of Reasonable Alternatives**.

1.3 Alignment Refinement Appraisal Report 2022

1.3.1 Detailed ecology surveys of the preferred route were carried out in 2021 and identified a previously unknown impact at one location on bats and their habitats. An Alignment Refinement Appraisal Report was prepared in 2022 to respond to data from these ecology surveys and the discovery of a barbastelle bat maternity roost.

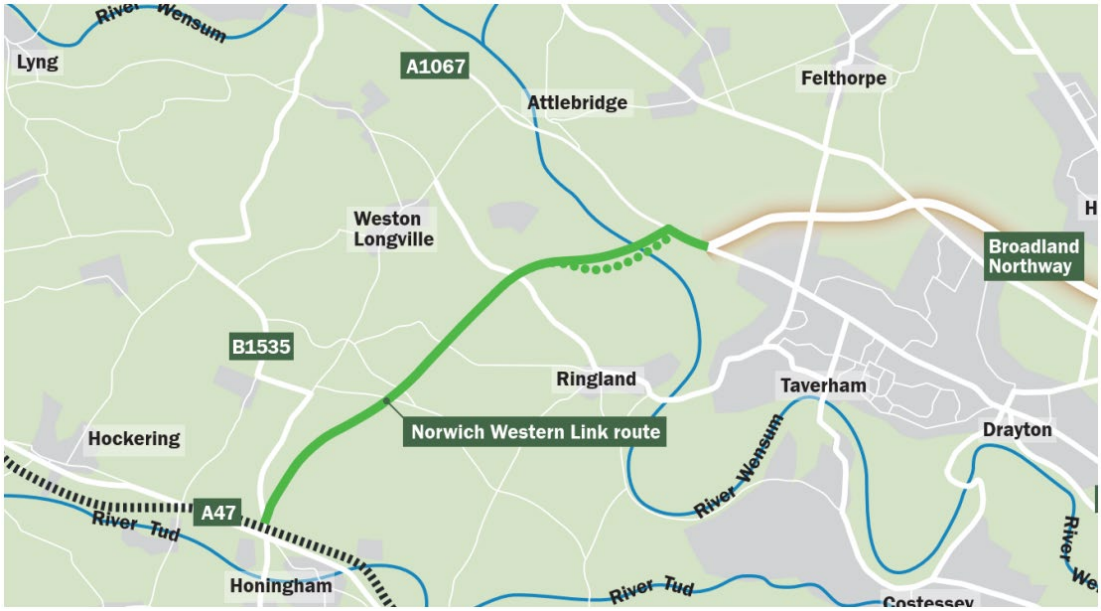
1.3.2 An assessment of seven refinement options (Option 1 to 7) to the preferred route, that would minimise and avoid direct impacts on the bat maternity roost, was carried out in 2022. This further assessment of each refinement option was undertaken and considered biodiversity, environmental, engineering and cost criteria.

1.3.3 On balance, refinement Option 4 was selected as the most suitable alignment refinement to refine the previously adopted OSR Option C (the refinement later referred to as Option C Refined in this report). Further detail on the Alignment Refinement Appraisal Report 2022 and the reason for selection of

Option 4 can be found in the Environmental Statement **Chapter 4 Consideration of Reasonable Alternatives**.

1.3.4 The chosen refined route, known as 'Option C Refined' is presented by the dotted green line on **Plate 3** below.

Plate 3 Plan of Option C Refined



1.3.5 In selecting Option C Refined it was recognised that it would be necessary to understand whether its environmental and other impacts had any implications for the overall selection exercise and that the EIA process would be an appropriate place to ensure a full evaluation of reasonable alternatives and to revisit any discarded options that might be feasible.

1.4 Review of OSR Conclusions in Light of 2022 Alignment Refinement

1.4.1 This Report builds upon the work undertaken in the OSR 2019 and the Alignment Refinement Appraisal Report 2022 summarised above. In response to the selection of the Option C Refined and information that has emerged through the preparation of the Environmental Statement (ES), an additional exercise has been undertaken to ensure the selected Option C Refined, still presents the best performing route option in comparison to the other options discounted at the OSR stage.

1.4.2 This assessment has been proportionate to the stage of the scheme development and undertaken in a manner that allows a comparison to the OSR Options outlined in section 1.2 above. This has included a comparison of the OSR Option C and the Option C Refined to determine how these options compare. This then allowed a proportionate comparison to the other OSR options assessed in 2019. Where additional information has been identified through the assessment reported in the ES or other targeted assessment to support this exercise, these have been outlined in Section 1.5 below.

1.4.3 The assumptions and limitations used in this exercise are outlined below.

1.5 Assumptions and Limitations

1.5.1 To allow a comparable and proportionate assessment to the OSR options a number of assumptions were made (and limitation identified) as follows:

- The traffic model has been updated since the OSR 2019 for the purposes of the Planning Application. However, to allow a comparable assessment of the 2019 Option scoring, it has been assumed there has been no change to the OSR traffic model data for this review exercise. It is to be noted that this means that the values presented for certain topic chapters in this report will differ from those considered in the ES. This includes greenhouse gases, air quality and noise and vibration. However, at option selection stage, the emphasis is upon relative performance of options in comparison with each other, therefore all have been considered on an equal basis. To set this assumption in context, it is noted that the traffic flows on the A1067 at the location where the Proposed Scheme connects to the existing road in the forecast Do Minimum scenario at the time of the 2019 OSR was predicted to be around 20,000 vehicles per day (Annual Average Daily Traffic flows). The updated modelling for the planning stage assessment now predicts a 2042 future year baseline flow of 20,800 in this location, with two years of additional background growth included

and revised National Trip End Model version 8.0 (NTEM 8.0) forecasting.

- The appraisal of Option C Refined has drawn in additional information from the ES including where greater survey effort has been required to support assessments. Additional site surveys have not been undertaken for other options, with the exception to targeted bat surveys for Option B East. This notably applies to impacts to ancient woodland which, for Option C Refined, has been subject to in-depth assessment of potential air quality impacts through a modelling exercise. The assessment, as reported in **Chapter 10: Biodiversity** (Document Reference 3.10.00), has concluded that there is potential for adverse effects on this feature in the absence of mitigation or compensation. It is considered highly likely that the findings for Option C Refined would be equivalent to those for other options (e.g. Option C) due to their similar proximity to sensitive habitats, should they be similarly assessed in the same fashion.
- As part of this appraisal process it was determined that given the adverse impacts associated with Option A, Option B West and Option D (Both variants) it was not considered these options would likely provide a better alternative on balance to the Option C Refined. The adverse impacts associated with these discarded options are outlined below. Further proportionate consideration was however given to Option B East where supplementary surveys were undertaken for bats, ancient trees, and heritage to ensure a clearer understanding of this option before discounting.
- To allow a comparable assessment, the OSR approach to consideration of environmental effects has been applied.
- Where relevant, the appraisal has included the assumption that Low Farm will not be a residential receptor as it is intended to be taken out of residential use.

- The judgments provided in this report in respect to bats are made considering the application of mitigation but not compensation measures. Compensation measures cannot be developed for options away from Option C Refined with any certainty. **Chapter 10: Biodiversity** (Document Reference 3.10.00) and **Chapter 11: Bats** (Document Reference 3.11.00) of the ES present considerable packages of mitigation applied to the Proposed Scheme for relevant impacts on biodiversity and bat features.

- The traffic model has been updated since the OSR 2019 for the purposes of the Planning Application. However, to allow a comparable assessment of the 2019 Option scoring, it has been assumed there has been no change to the OSR traffic model data for this review exercise. It is to be noted that this means that the values presented for certain topic chapters in this report will differ from those considered in the ES. This includes greenhouse gases, air quality and noise and vibration. However, at option selection stage, the emphasis is upon relative performance of options in comparison with each other, therefore all have been considered on an equal basis. To set this assumption in context, it is noted that the traffic flows on the A1067 at the location where the Proposed Scheme connects to the existing road in the forecast Do Minimum scenario at the time of the 2019 OSR was predicted to be around 20,000 vehicles per day (Annual Average Daily Traffic flows). The updated modelling for the planning stage assessment now predicts a 2042 future year baseline flow of 20,800 in this location, with two years of additional background growth included and revised National Trip End Model version 8.0 (NTEM 8.0) forecasting.

- The judgments provided in this report in respect to bats are made considering the application of mitigation but not compensation measures. Compensation measures cannot be developed for options away from Option C Refined with any certainty. **Chapter 10:**

Biodiversity (Document Reference 3.10.00) and **Chapter 11: Bats** (Document Reference 3.11.00) of the ES present considerable packages of mitigation applied to the Proposed Scheme for relevant impacts on biodiversity and bat features.

1.6 Environmental Appraisal

Biodiversity

1.6.1 An updated version of Table 5.33 from the OSR is presented below scoring the assessment of the impact of Option C Refined on Biodiversity (**Table 1**). The scores for Options A to D are as per the OSR 2019 with the exception of bats where the position has changed as outlined in **Table 1** below.

Table 1 Key

Key	**Likely Impacts**
R	Major
A	Moderate
B	Minor
N/A	Not applicable

Table 1 Biodiversity Option Appraisal 2023

Ecological Feature	Option A	Option B Western variant	Option B Eastern variant	Option C	Option D Both variants	Option C Refined	Notes
River Wensum Special Area of Conservation (SAC)	B	R	A	A	A	A	Aquatic ecology surveys for Option C Refined were completed in 2022 and habitats considered to be consistent to the Option C alignment
Barbastelle bats	R	R	A	R	R	A	Option C was previously assessed to have a moderate impact; in light of additional bat survey data this is now major. Option B East was previously assessed to have a major impact; in light of additional bat survey data this is now moderate.
Site of Special Scientific Interest (SSSI)	B	R	A	A	A	A	Aquatic ecology surveys for Option C Refined were undertaken in 2022 and habitats considered to be consistent.

Ecological Feature	Option A	Option B Western variant	Option B Eastern variant	Option C	Option D Both variants	Option C Refined	Notes
Ancient woodland – approx. within 200m	B	N/A	N/A	B	A	R	Option C Refined has large adverse impacts to Ancient Woodland without mitigation in operation of the Proposed Scheme. It is considered likely that similar impacts would occur for Option C (or other options) if modelled.
Habitat of Principal Importance (HPI)	B	A	A	R	R	A	Option C Refined avoids HPI in Rose Carr which was previously impacted upon by Option C.
Woodland	A	A	A	R	R	A	Option C Refined avoids HPI in Rose Carr which was previously impacted upon by Option C.
County Wildlife Sites	B	B	A	A	R	A	Impact on County Wildlife Sites between Option C and Option C Refined remain consistent

Ecological Feature	Option A	Option B Western variant	Option B Eastern variant	Option C	Option D Both variants	Option C Refined	Notes
Watercourses (excluding the River Wensum)	A	B	A	A	R	A	Impacts on Watercourses between Option C and Option C Refined remain consistent.
Habitat fragmentation	B	A	A	A	R	R	N/A
Pond loss	R	A	A	N/A	N/A	N/A	N/A
Reduction in HPI quality	B	A	A	A	R	A	Reduction in HPI remains consistent between C and C Refined
Number of hedgerows dissected	A	A	A	A	A	A	Number of hedgerows remains consistent between C and C Refined.

1.7 Environment Impacts (excluding Biodiversity)

1.7.1 The appraisal of Option C Refined is summarised in this section and is outlined in **Table 2** below. The appraisal undertakes a comparison of Option C Refined against the original assessment of OSR Option C. An exercise to then compare against the other OSR Options (Option A, B (both variants), Option D (both variants)) was undertaken and is outlined in **Table 2** below.

Summary of Option C and Option C Refined Comparison

Noise

1.7.2 The Option C Refined does not change the predicted noise impact from Option C reported in the OSR. Given the similarities with the alignment of the previous Option C, the conclusion that Option C is the second-best option (in terms of the number of moderate and adverse noise impacts on properties) is likely to remain correct for Option C Refined.

Air Quality

1.7.3 The Option C Refined does not change the predicted air quality impact from Option C reported in the OSR. Given the similarities with the alignment of the previous Option C, Option C Refined would still result in a similar negative local air quality impact to Option C.

Greenhouse Gases

1.7.4 The Option C Refined does not change the predicted greenhouse gases impact from Option C for reported in the OSR; therefore there is no change to the traffic greenhouse emissions scored for Options in this appendix. The Option C Refined would have similar impacts as Option C. As per the OSR 2019 methodology this does not consider embedded carbon in the construction phase.

Landscape and Visual Effects

1.7.5 The Option C Refined does not change the predicted landscape and visual impact from Option C reported in the OSR. Potential impacts of Option C in the vicinity of the alignment refinement were impacts on landscape character and visual amenity for the permanent and temporary works.

Greenhouse Gases

1.7.6 The Option C Refined does not change the predicted greenhouse gases impact from Option C for reported in the OSR; therefore there is no change to the traffic greenhouse emissions scored for Options in this appendix. The Option C Refined would have similar impacts as Option C. As per the OSR 2019 methodology this does not consider embedded carbon in the construction phase.

1.7.7 Compared to Option C, Option C Refined allows the retention of woodland and some ancient / veteran trees which are at risk for Option C. In addition, for Option C Refined the viaduct and associated approach roads are slightly further from private properties to the north.

1.7.8 With the ‘change of use’ of Low Farm from residential use this reduces the impact of Option C and Option C Refined. Option C Refined is also closer to users of Public Right of Way (Ringland FP1) and the Golf Club and may result in increased impacts compared to Option C.

1.7.9 Overall, the Landscape and Visual impacts of Option C Refined are not assessed to differ from those impacts identified in the previous assessment of Option C in the OSR (moderate adverse).

Historic Environment

1.7.10 The Option C Refined changes the predicted Historic Environment impact from Option C as it includes a new elevated road and viaduct abutment located approximately 45-50m away from the Grade II listed Barn 50m north west of Low Farm House. Given the proximity to this listed building as a result of the refinement, a heritage site assessment of the area was undertaken in 2022. The Option C Refined brings the road into the immediate setting of the

barn, impacting on its rural setting, but is considered to result in moderate adverse impacts as discussed in the Historic Environment chapter of the Environmental Statement.

1.7.11 Whilst Option C Refined would have a greater impact than Option C on Low Farm Barn due to the proximity of the road and viaduct, overall both options would still result in a moderate adverse impact on the Historic Environment.

1.7.12 The heritage site assessment in 2022 also reviewed the impacts of Option B East on the Historic Environment (as outlined in Section 1.5). This concluded that Option B East would have resulted in moderate adverse impacts to six designated heritage assets (one listed at Grade I, one listed at Grade II* and four listed at Grade II). Overall, the score of moderate adverse did not change from that reported in the OSR 2019.

1.7.13 This work also informed an assessment of Option B West. This concluded that Option B West would result in the potential for physical impacts to one Grade II listed building. In summary, this option included one major adverse impact to one Grade II listed building and five moderate adverse impacts to designated heritage assets (one listed as Grade I, one listed as Grade II* and three listed as Grade II). Overall, the score of large adverse did not change from that reported in the OSR 2019.

Water Environment

1.7.14 Option C Refined does not change the impact from Option C for the Water Environment reported in the OSR. The proposed localised refinement continues to require a viaduct across the River Wensum. With all other potential impacts remaining consistent, the change in alignment is assessed to not alter the outcome of the assessment of effects on the Water Environment.

Geology and Soils

Option C Refined does not change the impact from Option C for Geology and Soils reported in the OSR because conditions are similar with localised alignment changes.

Table 2 Comparison Of Option C Refined to OSR Options

Environmental Topic	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D (west and east)	Option C Refined	Comments on Option C Refined
Noise	Considered to be the best option as it adversely affects (in terms of moderate and major impacts) the fewest properties.	Considered to be the worst option as it adversely affects (in terms of moderate and major impacts) the highest number of properties.	Considered the third best option in terms of moderate and major adverse impacts on properties.	Considered the second-best option in terms of moderate and major adverse impacts on properties.	Considered the second worst option in terms of moderate and major adverse impacts on properties.	Noise modelling for Option C refined has not been undertaken. However, given the similarities with the alignment of the previous Option C, the conclusion that Option C is the second best option in terms of moderate and adverse noise impacts on properties is likely to remain correct for Option C Refined.=	As part of the OSR 2019, detailed noise modelling was undertaken for each route option based on the 3D highways design and traffic data for key roads. The noise model has not been updated to account for the change in alignment of the chosen option (Option C Refined); however, a qualitative appraisal of the potential impacts of the alignment refinement is set out below. The altered route alignment of Option C Refined will affect the predicted noise levels, particularly at the northern end of the Proposed Scheme. The new alignment will mean that properties to the north west of the scheme are likely to experience lower noise levels than those predicted from Option C. However, properties to the south east are likely to experience higher noise levels. As there are fairly few receptors in this area, the overall impact, in terms of numbers of receptors experiencing adverse/beneficial effects is considered unlikely to change significantly from that presented in the OSR. It is therefore considered that the previous conclusions with regard to Option C remain much the same for the new alignment as those presented within the OSR. Noise contour plots for each option (both absolute noise levels and noise level changes) were presented in Appendix D of the OSR. The noise contour plots for Option C would change as a result of the re-alignment. Assuming the vertical alignment of the scheme will be fairly similar for the new alignment (and on the basis that the traffic data would remain the same) it is likely that the general pattern of the noise contours for the new alignment would be fairly similar, albeit shifted to the south east in line with the new alignment. It was previously concluded (in paragraph 5.2.145 of the OSR) that Option C was not the best option from a noise perspective, but that it provided (along with Option B East) the most desirable balance in term of impacts and beneficial effects. Given there are few receptors in close proximity to the Proposed Scheme at the northern end where the alignment has changed, it is considered unlikely that the re-alignment would significantly alter this judgement.
Air Quality	Slight beneficial local air quality impact; affects fewest numbers of properties	Negative local air quality impact	Negative local air quality impact	Negative local air quality impact	Worst negative local air quality impact; affects largest numbers of properties	Negative local air quality impact	No traffic changes are assumed, therefore the results for air quality remain unchanged. As the Option C Refined moves the alignment approximately 15m closer to the Ancient Woodland it would therefore likely have a slightly worse impact compared to the original Option C as outlined in Section 1.6 above and discussed in Section 1.10 below. For other receptors the Option C Refined and Option B East are broadly similar.

Environmental Topic	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D (west and east)	Option C Refined	Comments on Option C Refined
Greenhouse Gases	Net present value $(CO_2)_e$ of £8,622,855; lowest emissions of greenhouse gases	Net present value $(CO_2)_e$ of -£1,358,528; second lowest emissions of greenhouse gases	Net present value $(CO_2)_e$ of -£4,900,284; second highest emissions of greenhouse gases	Net present value $(CO_2)_e$ of -£4,149,699; third highest emissions of greenhouse gases	Net present value $(CO_2)_e$ of -£10,575,555; highest emissions of greenhouse gases	Net present value $(CO_2)_e$ as per Option C (-£4,149,699)	It has been assumed that the there are no traffic changes, therefore there is no change to the traffic greenhouse emissions reported here. The Option C Refined would have similar impacts to Option C. The net present values $(Co_2)_e$ are based on the OSR 2019 calculation. In addition, this comparison is only in relation to traffic emissions in operation and does not cover the greenhouse gas emissions used to construct the Proposed Scheme (materials). This is consistent with the OSR 2019 assessment.
Landscape	Slight Adverse	Slight Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	The Option C Refined retains a proposed viaduct structure of a similar height and scale to the original. The proposed viaduct is of a shorter span than for Option C and would require nine piers within the landscape as opposed to the 12 piers for the original alignment therefore reducing potential impacts and reducing the extent of permanent structures within the landscape. Option C Refined would move the viaduct to the south-east. This realignment would result in a reduction of impact on existing woodland and ancient/ veteran trees compared to Option C. It also moves the viaduct structure and associated approaches further away from sensitive residential properties to the north along the A1067. The realignment, however, does move the viaduct closer to users of local Public Right of Way and Wensum Valley Hotel, Golf and Country Club increasing potential impacts on these receptors. Potential impacts identified from Option C in the vicinity of the alignment refinement were impacts on landscape character and visual amenity for the permanent and temporary works. The impacts of Option C Refined has been assessed to not differ from those impacts identified from Option C. With the 'change of use' of Low Farm from residential use this reduces the impact of Option C and Option C Refined.

Environmental Topic	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D (west and east)	Option C Refined	Comments on Option C Refined
Historic Environment	Large Adverse	Large Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	The 2019 OSR applied a study area of 500m for the identification of heritage assets. Note that the study area for the historic environment desk-based assessment (HEDBA) in the ES is 1km, although reference would be made to assets beyond this study area where appropriate, e.g., where such assets are particularly significant and/or where they contribute to current understanding of the historic environment. The 2019 OSR assessment used information from the following sources: • Historic England National Heritage List for England (NHLE). • Norfolk Historic Environment Record (HER) • Heritage Constraints Report (WSP, November 2018). In the 2019 OSR, in terms of options with the least and highest impact in respect of adverse impacts on known buried heritage assets, and potential for possible, previously unrecorded remains, Route Option C had the least impact and Option D had the highest impact. In the 2019 OSR, in terms of options with the least and highest impact in respect of adverse impacts on designated heritage assets, Route Option C had the least impact and Route Options A, and B West had the highest impact. Option C Refined potentially reduces the overall impact to designated heritage assets at the Morton Hall Estate. However, Option C Refined introduces a new elevated road structure located approximately 45m away from the Grade II listed Barn 50m north west of Low Farm House. The alignment of Option C Refined brings the road into the immediate setting of the barn and its curtilage structures, significantly impacting on its overall rural setting. The Cultural Heritage impact is assessed as Moderate Adverse and so does not change the overall score compared to Option C. For non-designated buried heritage assets, the 2019 OSR for Route Option C had moderate to high potential for previously unrecorded remains from prehistoric and Roman periods and potential impacts on a possible Roman field system and possible Iron Age/Roman field boundaries was identified. A moderate potential for possible palaeoenvironmental remains in the Wensum valley, which could be impacted, was identified. Option C would potentially impact later medieval/post-medieval field systems; field boundaries/trackways; Attlebridge Airfield; a military training site; and Honingham Park. The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, was considered to be low to medium. The environmental impact was assessed as moderate adverse. For non-designated buried heritage assets Option C Refined would not change the assessment of archaeological sensitivity or the assessment of environmental impact for Option C. In respect of adverse effects on known non-designated buried heritage assets, and the potential for possible, previously unrecorded remains, the 2019 OSR identified Route Option C as the option with least impacts. Option C Refined would not change this assessment.

Environmental Topic	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D (west and east)	Option C Refined	Comments on Option C Refined
Water Environment	This option has the least potential watercourse impacts, which include changes to one bank of the River Wensum and crossing of one ordinary watercourse.	This option has the second least potential watercourse impacts, which include widening an existing bridge across the River Wensum and crossing of one ordinary watercourse	This option has a medium potential watercourse impact, which includes a new viaduct across the River Wensum and crossing of one ordinary watercourse	This option has a medium potential watercourse impact, which includes a new viaduct across the River Wensum and crossing of one ordinary watercourse	This option has the greatest potential watercourse impacts, which includes a new viaduct across the River Wensum and crossing of the River Tud	This option has a medium potential watercourse impact, which includes a new viaduct across the River Wensum and crossing of one ordinary watercourse	This section considers the potential impacts of the alignment refinement on the water environment, specifically relating to flood risk, water quality, hydromorphology and aquatic and riparian biodiversity. Option C Refined retains a proposed viaduct structure that is perpendicular to the River Wensum, thereby minimising impacts to flood flows across the floodplain. In addition, perpendicular orientation of the piers reduces the risk of scour. The proposed viaduct is of a shorter span to that of Option C, therefore reducing overall impacts within the floodplain zone. In addition, the alignment refinement would require fewer piers for the original alignment; therefore further reducing potential impacts and reducing the extent of permanent structures within the floodplain. The Option C Refined would require two viaduct maintenance crossings of ditches. In addition, the access track for flood compensation measures would be approximately 20% shorter and with no additional ditch crossings compared to the Option C OSR Report. Potential impacts of Option C in the vicinity of the alignment refinement were impacts on flood flows and floodplain biodiversity for the permanent works and water quality and geomorphology for the temporary works. The impacts of the Option C Refined are marginally reduced but remain consistent with the impacts identified for Option C in the OSR.
Geology and Soils	This Option has the least exposure to the construction of embankments/ piled structures over Alluvium layer.	This Option has a limited exposure to construction of embankments and piled structures over Alluvium layer.	This Option has a considerable exposure to construction of embankments and piled structures over Alluvium layer.	This Option has a considerable exposure to construction of embankments and piled structures over Alluvium layer.	This Option has the greatest exposure to construction of embankments and piled structures over Alluvium layer.	This Option has a considerable exposure to construction of embankments and piled structures over Alluvium layer.	The alignment refinement is localised between Option C and the alignment refinement for Option C Refined and therefore the impact to geology and soils is similar. The viaduct would be broadly similar between Option C and Option C Refined, though Option C Refined would have a slightly shorter viaduct with fewer piers and so slightly less geology exposure.

1.8 Cost and Engineering Comparison

1.8.1 A review of Option C Refined as compared with the original Option C alignment has been carried out by the engineering specialists involved at the Option Selection Report stage of the project. It was concluded that, with the alignment refinement included, the overall principle of the Proposed Scheme (Option C Refined) remains unchanged in comparison with Option C, which was selected as the preferred option at the OSR stage in July 2019.

1.8.2 Option C Refined would still offer connectivity from the A47/B1535 Wood Lane junction to the A1270 Broadland Northway, with a short section of dualling on A1067. Despite a marginally longer section of new road construction, there is an opportunity to shorten the length of A1067 dualling by about 85m. This would enable Option C Refined to offer a similarly direct connectivity between the exiting Strategic Road Network and Major Road Network (A1270).

1.8.3 In comparison the refined route would be unlikely to result in a significant change in journey times and distances across the whole network from those assessed to occur for Option C, so the OSR conclusions are expected to remain unchanged. Based on this, and the traffic assumptions in Section 1.5, the economic benefits of the scheme would remain unchanged and the comparison of Option C Refined against other options considered at the time of the OSR would also remain valid.

1.8.4 Option C Refined would still cross the River Wensum on a perpendicular alignment, and due to the revised position, would require a shorter viaduct length to span over the floodplain. This would also reduce the number of piers within the floodplain from 12 piers to 9. This is a slight improvement in the OSR Geology and Soils appraisal.

1.8.5 In comparison the refined route would be unlikely to result in a significant change in journey times and distances across the whole network from those assessed to occur for Option C, so the OSR conclusions are expected to remain unchanged. Based on this, and the traffic assumptions in Section 1.5, the economic benefits of the scheme would remain unchanged and the

comparison of Option C Refined against other options considered at the time of the OSR would also remain valid.

1.8.6 In relation to other engineering aspects, the structural design principles have not changed for the construction of the viaduct in comparison with Option C as originally assessed. The topography is more undulating further to the east, but this does not change the principle of the design and the concept remains consistent with Option C. The impact on strategic utilities would remain unchanged overall, with no direct conflict with the Strategic High Pressure gas main and same consideration of overhead cable pylons. Option C Refined would also continue to cross the proposed wind farm cables for The Hornsea 3 Offshore Wind Farm (DCO granted) and Equinor Sheringham Shoal & Dudgeon Wind Farm Extension Project (DCO application on progress) in the same location as the section of route south of Ringland Lane.

1.8.7 Based on the above, it is expected that if Option C Refined was priced on an equivalent basis as Option C, with the same assumptions applied at the time of the OSR, there would most likely be a reduction in cost due to reduced extents of the viaduct and reduced length of A1067 dualling although a potentially increased cost for Option C Refined would be associated with an additional green bridge and retaining structure near Primrose Grove ancient woodland. These are additional engineering elements included as mitigation for Option C refined to avoid environmental constraints (such as the ancient woodland and Rose Carr woodland maternity bat roost) whilst ensuring highway standards are suitably achieved. These increases and decreases would most likely offer a balance of cost impacts and only negligible change in cost would be anticipated.

1.8.8 Based on the above, it is expected that if Option C Refined was priced on an equivalent basis as Option C, with the same assumptions applied at the time of the OSR, there would most likely be a reduction in cost due to reduced extents of the viaduct and reduced length of A1067 dualling although a potentially increased cost for Option C Refined would be associated with an additional green bridge and retaining structure near Primrose Grove ancient

woodland. These are additional engineering elements included as mitigation for Option C refined to avoid environmental constraints (such as the ancient woodland and Rose Carr woodland maternity bat roost) whilst ensuring highway standards are suitably achieved. These increases and decreases would most likely offer a balance of cost impacts and only negligible change in cost would be anticipated.

1.8.9 These conclusions were then considered against the other OSR options, as discussed below.

1.9 Option Discussion

1.9.1 The appraisal outlined in Section 1.6 to 1.8 demonstrates that Option C Refined and Option C in the OSR 2019 score similarly in most topics with the exception of bats, ancient woodland, Habitats of Principal Importance, and the historic environment. In summary:

- The score for Option C was upgraded to major adverse since the OSR as the surveys identified the barbastelle maternity roost at Rose Carr (the driver for the alignment refinement). The Option C Refined route avoided this roost resulting in a better score of moderate adverse.
- As a result of further assessment in the ES, Option C Refined scored a major adverse impact on ancient woodland as a result of air quality impacts. This was due to the alignment refinement bringing the route close to the ancient woodland. Option C being set further away, would result in a lower air quality impact on the ancient woodland.
- With the Option C Refined avoiding Rose Carr woodland, Option C Refined has a lower impact on Habitats of Principal Importance compared to Option C.

- For the Historic Environment, Option C Refined potentially reduces the overall impact to designated heritage assets at the Morton Hall Estate. However, Option C Refined brings the alignment and viaduct closer (approximately 45m away) to the Grade II listed Barn 50m north west of Low Farm House. However, this has not resulted in a change to the overall moderate adverse impact.

1.9.2 With the changes identified since the OSR 2019 Option C and Option C Refined, the selection process was then revisited. Consideration was given to Option A, B West, B East and D to re-confirm the previous judgements and reasons as to why they remain discounted as alternative options.

Option A

Bats

1.9.3 Option A was assessed to have a 'very large adverse' impact on biodiversity and ecological features in the OSR. This conclusion was in part underpinned by potential impacts upon bat species, including barbastelle, associated with nearby woodland habitat at Royal Norwich Golf Club and Roarr! Dinosaur Park. The baseline surveys undertaken to inform the project since the OSR have reaffirmed the presence of barbastelle maternity colonies associated with these woodlands and nearby habitats that would be directly impacted by Option A if progressed. The evidence available continues to show that Option A would have very large adverse impacts upon biodiversity and ecological features.

Biodiversity

1.9.4 Option A was assessed to have a 'very large adverse' impact on biodiversity and ecological features in the OSR. This conclusion was in part underpinned by potential impacts upon bat species, including barbastelle as outlined above. For other biodiversity features, Option A scored well with comparatively lesser impacts to the River Wensum SAC/SSSI, ancient woodland, Habitats of Principal Importance, County Wildlife Sites, and hedgerows.

1.9.5 No further evidence has been collected that would lead to a refinement of the OSR conclusions.

Environment

1.9.6 As outlined in **Table 2**, Option A scored well across a number of environmental areas including noise (least receptors impacted), air quality (least receptors impacted), landscape (slight adverse), water environment (fewer potential watercourses impacted) and Geology and Soils. Option A scored the best for greenhouse gas emissions for all options with a net present value $(CO_2)_e$ of £8,622,855 (based on the OSR 2019 calculation). However, as outlined below, it did result in a large adverse impact on the Historic Environment.

Historic Environment

1.9.7 The 2019 OSR report noted that this option would potentially result in physical impacts from a drainage feature associated with the Grade II listed Gates and Railings to Lenwade Lodge to Weston House, due to proximity of this feature to the gate piers. This would result in a major (or large) adverse impact to this asset. In addition, the asset would be impacted by visual and noise impacts from the option, as the asset is located approximately 10m from the current B1535 Weston Hall Road.

1.9.8 Option A would also potentially result in setting impacts to assets connected to Weston Hall. These are the Grade II listed Weston Hall, the Grade II listed Barn 50m west of Weston Hall, and Garden House 100m north-west of Weston Hall. Setting impacts are also likely to the Grade II listed Lenwade Mills, and potentially to other assets located in Lenwade.

Traffic and Transport

1.9.9 Option A offers an upgrade to the existing B1535 route, so does not offer much reduction in journey distance from A47 Wood Lane junction to A1270 Broadland Northway in comparison with Option C. The route via the village of Weston Longville remains a shorter route, so Option A would do little to mitigate existing traffic issues in comparison with Option C. It is also proposed

as a single carriageway, so does not offer as much capacity enhancement to the overall network and offers less opportunities for improving orbital movement around Norwich.

Engineering

1.9.10 The OSR applied 9 criteria used in the engineering option assessment (Horizonal alignment, junctions and links, topography and profile, structures/bridges, drainage, public utilities interaction, junction with A47 duelling scheme, departures from standards, buildability). Option A performed poorly in respect of impact on existing land use, interface with utilities, buildability, and the need for the introduction of new or amendment of existing junctions.

Cost

1.9.11 In the OSR Option A was the least expensive option due to the utilisation of an existing highway link and a single carriageway solution. However, Option A had the lowest adjusted Benefit Cost Ratio (BCR) of 1.42 (low value for money).

Consultation (OSR Stage)

1.9.12 The OSR consultation feedback in relation to Option A was particularly negative with almost 75% of respondents considering this option to be an ineffective solution.

Option A Summary

1.9.13 The revisiting of Option A illustrated that this option is still discounted as a feasible option as it would result in a very large risk to bats and biodiversity. There are also impacts to heritage assets with potential for physical impacts to a Grade II Listed Building. This option also had a low value for money and poor consultation feedback in 2019.

Option B West

Bats

1.9.14 Option B West was assessed to have a 'very large adverse' impact on biodiversity and ecological features in the OSR. Similar to Option A, this conclusion was in part underpinned by potential impacts to bat species, including barbastelle, associated with nearby woodland habitat at Royal Norwich Golf Club and Roarr! Dinosaur Park. Furthermore, Option B West would require a greater length of dualled road compared to the Proposed Scheme which would likely equate to greater impacts upon bat species populations, and more complex mitigation being required with respect to north-south habitat fragmentation.

1.9.15 The evidence available continues to show that Option B West would have very large adverse impacts upon biodiversity and ecological features.

Biodiversity

1.9.16 Option B West was assessed to have a 'very large adverse' impact on biodiversity and ecological features in the OSR. Similar to Option A, this conclusion was in part underpinned by potential impacts to bat species, including barbastelle. However, unlike Option A, Option B West was considered to have major (very large adverse) impacts on the River Wensum SAC and SSSI and moderate impacts on Habitats of Principal Importance, woodland, and hedgerows.

1.9.17 No further evidence has been collected that would lead to a refinement of the OSR conclusions.

Environment

1.9.18 As outlined in **Table 2**, Option B West scored well on some environmental topics such as greenhouse gas emissions which scored second best compared to all other options and better than Option C & Option C Refined with a net present value $(CO_2)_e$ of -£1,358,528 (based on the OSR 2019 calculation), landscape slight adverse and water environment (second lowest potential impact). The Option had a negative air quality impact and was the

worst scoring for noise with the most receptors impacted. As outlined below there was also a large adverse impact on the Historic Environment.

Historic Environment

1.9.19 As outlined in **Table 2**, Option B West scored well on some environmental topics such as greenhouse gas emissions which scored second best compared to all other options and better than Option C & Option C Refined with a net present value $(CO_2)_e$ of -£1,358,528 (based on the OSR 2019 calculation), landscape slight adverse and water environment (second lowest potential impact). The Option had a negative air quality impact and was the worst scoring for noise with the most receptors impacted. As outlined below there was also a large adverse impact on the Historic Environment.

1.9.20 From the additional survey work conducted, as with Option B East discussed below, this option scored poorly in terms of heritage in terms of both the numbers of assets that would be impacted, including the potential for physical impacts to one Grade II listed building. This option includes one major adverse impact to one Grade II listed building and five moderate adverse impacts to heritage assets including one Grade I, one Grade II* and three Grade II.

1.9.21 The dualling of the A1067 further west potentially results in physical impacts to the Grade II listed The Lodge, which is located less than 5m away from the current A1067. This would result in a major (or large) adverse impact.

1.9.22 The assets that would be impacted by Option B West through changes to setting would be:

- Church of St Margaret Listed Grade II* - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse.
- Garden Walls to West of Morton Hall Listed Grade II - Visually intrusive impact to the surrounding rural landscape, historically part of the

Morton Hall Estate, which forms part of the asset's setting. Impacts from traffic noise. Moderate adverse.

- Morton Hall Listed Grade II - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse.
- Garden Walls including Owl House at Home Farm, Morton Hall Estate Listed Grade II - Impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse.
- Church of All Saints including boundary wall to churchyard Listed Grade I - The proposed viaduct and new road bridge would impact the visual relationship between the Morton Hall Estate and the asset. The new built form would be visible in views out from the churchyard towards the site. Moderate adverse.
- Abattoir at the Old Butcher's Shop (listed Grade II) - Impact to landscape historically connected to the Morton Hall Estate, which forms part of the asset's setting. Minor adverse.
- Water Cistern at south east corner of St Margaret's Churchyard (listed Grade II) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Impacts from traffic noise. Minor adverse.
- Church of St Peter (listed Grade I) - Impact to the wider rural landscape which forms part of the asset's setting. Minor adverse.

1.9.23 Overall the score of large adverse did not change from that reported in the OSR 2019.

Traffic and Transport

1.9.24 Option B West joins A1067 further west than Option C so is less directly connected to A1270 Broadland Northway and requires more than double the

length of dualling of the existing road. It is a longer overall alignment and only marginally shorter than the existing route through Weston Longville. It is closer to residential receptors in the village of Weston Longville, so would offer less reduction in traffic-related effects on the local community than Option C which is equidistant between Weston Longville and Ringland.

Engineering

1.9.25 Against the 9 engineering criteria assessed in the OSR Option B West performed poorly due to the number of new structures/amendments to existing structures required, possible departures from standard and impact on land use.

Cost

1.9.26 In the OSR Option B West was the second least expensive option with no requirement to construct a new viaduct across the River Wensum. This Option was less costly that Option C in the OSR. This option had the highest adjusted BCR of 2.62 (high value for money).

Consultation (OSR Stage)

1.9.27 Options B West and B East received similar levels of support to a Do-Nothing option or other alternatives, so it was considered they would be less likely to receive public support if taken forward as the preferred option in 2019.

Option B West Summary

1.9.28 Of the two Option B variants, Option B West was the worst scoring variant and as such remained discounted. This included for heritage, bats, engineering and 2019 consultation response. Option B East is considered further below.

Option B East

Further consideration was given to Option B East. As outlined below some targeted surveys were undertaken on Option B East to support this appraisal.

Bats

1.9.29 The routes for both Option B East and Option C Refined lie in proximity to confirmed barbastelle roosts and bisect foraging and commuting habitat. Considering the nature conservation importance of barbastelle bats and requirement for an objective assessment of reasonable alternatives, further survey was completed for Option B East during the winter period 2021-22. The surveys included ground level tree assessments and aerial inspections of trees within 100m of route Option B East (where this lay beyond the Proposed Scheme survey extents). This data and bat survey data collected to inform the Proposed Scheme informs the assessment in this appendix (see Appendix 4.3a **Winter 2021-22 Bat Survey Report** (Including Option B East Survey Area (Document Reference: 3.04.03a)).

1.9.30 Whilst Option B East would likely require less woodland loss than Option C Refined (approximately 8ha compared to 16ha), both options impact the roost resource either known or likely to be used by species including barbastelle. The northern, divergent, section of Option B East and Option C Refined have 10 or 14 trees considered highly suitable to support a bat roost ('high suitability trees'), 36 or 35 moderate suitability trees and 62 or 47 low suitability trees respectively within a 100m buffer from the centre-line. Twenty-nine bat roosts are known within 100m of the centre-line of Option C Refined; however, in part this is likely to reflect increased survey effort in comparison to other route options and it is reasonable to expect bat roosts to be present in association with a proportion of trees impacted by Option B East.

1.9.31 Option B East would require an increased length of the Fakenham Road to be dualled, and that would require mitigation to reduce potential habitat fragmentation effects (2021 radio-tracking data shows bat movements north-south across this road). The greater length of dualled road compared Option C Refined is likely to equate to greater impacts upon bat species populations, and more complex mitigation being required for Option B East with respect to north-south habitat fragmentation. Mitigation for Option B East, if progressed, would likely include retrofitting green bridge features to the dualled Fakenham

Road. This would require substantial engineering consideration given the topography and increase overall land take for the scheme.

1.9.32 For both options, mitigation to reduce impacts associated with habitat fragmentation would be required. For Option C Refined, this includes mitigation to retain habitat connectivity, specifically at The Nursery. For Option B East this would likely include mitigation to avoid fragmentation of hedgerows bisected by the alignment known to be used by commuting bats (see Appendix 4.3a **Winter 2021-22 Bat Survey Report** (Including Option B East Survey Area (Document Reference: 3.04.03a)), and features to avoid increased fragmentation resulting from the dualling of Fakenham Road.

1.9.33 In summary, whilst there is greater certainty of the impacts Option C Refined will have upon barbastelle and other bat species, the data collected does not indicate that this will necessarily be greater or lesser than the impact of Option B East.

Biodiversity

1.9.34 Option B East was assessed to have a 'very large adverse' impact on biodiversity and ecological features in the OSR. This conclusion was underpinned by potential impacts to bat species, including barbastelle as outlined above. Option B East was considered to have moderate impacts on the River Wensum SAC and SSSI in addition to Habitats of Principal Importance, woodland, and hedgerows.

1.9.35 No further evidence has been collected that would lead to a refinement of the OSR conclusions.

Environment

1.9.36 As outlined in **Table 2**, this option scored moderate adverse for a number of topics such as noise (third best scoring option), landscape, historic environment and water environment and also has negative impacts for air quality and notes risk related to geology and soils. As previously mentioned further consideration was given in relation to the Historic Environment as outlined below. Greenhouse gas emissions scored similar to Option C &

Option C Refined with a net present value $(CO_2)_e$ of -£4,900,284 (based on the OSR 2019 calculation) compared to -£4,149,699 for Option C and Option C Refined.

1.9.37 Taken overall, Option C Refined would result in less than substantial harm to the Grade II listed Barn 50m north west of Low Farm House (as well as to the dairy barn and Low Farm House which are presumed to be curtilage listed to the barn) in NPPF terms. This is considered to result in a moderate adverse magnitude of impact, resulting in a moderate adverse significance of effect.

Historic Environment

1.9.38 With the alignment refinement bringing Option C Refined closer to the Grade II listed Barn 50m north west of Low Farm House an updated heritage site assessment was undertaken in February 2023 to better understand the setting of the barn and its curtilage buildings in the context of the new alignment.

1.9.39 After the site visit for Low Farm Barn Grade II and the consideration of the Option C Refinement alignment, the assessment outlined in **Chapter 8: Cultural Heritage** (Document Reference 3.08.00) concluded that Option C Refined would introduce a new and visually intrusive built element into the isolated rural location of Barn 50m north west of Low Farm House.

1.9.40 Option C Refined would not impact on the Grade II listed barn's key visual and historic relationships, including to the wider farm complex, notably to the dairy barn, or to the farmhouse.

1.9.41 Taken overall, Option C Refined would result in less than substantial harm to the Grade II listed Barn 50m north west of Low Farm House (as well as to the dairy barn and Low Farm House which are presumed to be curtilage listed to the barn) in NPPF terms. This is considered to result in a moderate adverse magnitude of impact, resulting in a moderate adverse significance of effect.

1.9.42 Further consideration was given to the heritage assets along Option B East. These are summarised below. This includes six moderate adverse impacts to

heritage assets including one Grade I, one Grade II* and four Grade II. These impacts are notable in terms of the numbers of assets affected and their significance (including Grade I and Grade II* assets). The heritage assets that would be impacted by Option B East would be;

- The Lodge (listed Grade II) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse
- Church of St Margaret (listed Grade II*) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse
- Garden Walls to West of Morton Hall (listed Grade II) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Impacts from traffic noise. Moderate adverse
- Morton Hall (listed Grade II) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse
- Garden Walls including Owl House at Home Farm, Morton Hall Estate (listed Grade II) - Impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Moderate adverse
- Church of All Saints including boundary wall to churchyard (listed Grade I) - The proposed viaduct and new road bridge would impact the visual relationship between the Morton Hall Estate and the asset. The new built form would be visible in views out from the churchyard towards the site. Moderate adverse
- Abattoir at the Old Butcher's Shop (listed Grade II) - Impact to landscape historically connected to the Morton Hall Estate, which forms part of the asset's setting. Minor adverse

- Water Cistern at south east corner of St Margaret's Churchyard (listed Grade II) - Visually intrusive impact to the surrounding rural landscape, historically part of the Morton Hall Estate, which forms part of the asset's setting. Impacts from traffic noise. Minor adverse
- Church of St Peter (listed Grade I) - Impact to the wider rural landscape which forms part of the asset's setting. Minor adverse

1.9.43 Overall the score of moderate adverse did not change from that reported in the OSR 2019.

Ancient Woodland and Ancient and Veteran Trees

1.9.44 Further consideration was given to ancient and veteran trees for Option B East for comparison with Option C Refined. As depicted in **Chapter 10: Biodiversity Appendix 35 Arboricultural Impact Assessment** (Document Reference 3.10.35) there are 7 veteran trees that would require removal for Option C Refined in total.

1.9.45 Between the proposed A47 junction at the southern end of the Proposed Scheme and Breck Lane the alignments of the Proposed Scheme and Option B East are the same and so the same veteran trees would be impacted with both these options (namely trees T20, T49, T77 and T82 – See ES Appendix 10.35). Between Breck Lane and the A1067 the assessment of Option C Refined has identified a further 3 veteran or ancient trees that will need to be felled (LG138, LG141 and T220). A walkover of Option B east was undertaken in 2022 and looked at veteran and ancient trees along the option route and identified 2 that would likely be removed (in the section north of Breck Lane) if Option B East was taken forward. It was noted however, given there were more trees in close proximity, further tree losses associated with Option B East could arise with further development of a design and ultimate footprint. In a comparison of Option B East and Option C, it was concluded that these options would have similar impacts on ancient and veteran trees.

1.9.46 As outlined in **Chapter 10: Biodiversity** (Document Reference 3.10.00) and **Chapter 4: Reasonable Alternatives Considered** (Document Reference

3.04.00), Option C Refined would result in a large adverse impacts on Primrose Grove ancient woodland as a result of air quality changes from the new road. Option B East is located further away from the ancient woodland and is not likely to result in a large adverse impact on the ancient woodland. Option C Refined therefore is a worse option in regard to ancient woodland.

Traffic and Transport

1.9.47 Both options take access from the Wood Lane junction and have a consistent southern alignment south of Ringland Lane. However, Option B East has a longer section of dualling on A1067 which would increase the extent of dualling works required during construction. The B East scheme is positioned further east and has less direct connectivity with the A1270 Broadland Northway.

1.9.48 Creating this linkage between A47 and A1270 with a continuous dual carriageway was a key requirement for enhancing orbital movement around Norwich, so the Option C Refined route is preferable in terms of achieving this goal. Option B East has a longer overall scheme length from the A47/Wood Lane junction to A1270 in comparison with the Option C Refined.

1.9.49 Therefore, Option C Refined offers a more efficient solution for vehicle movement and offers shorter distances for journeys in comparison with Option B East, so it can be seen to offer improved opportunities for orbital movement around the city. Option B East is also closer to the local community of Weston Longville than the Option C Refined. One of the key benefits of the scheme is to remove inappropriate through traffic from minor rural roads through the villages of Ringland and Weston Longville. Whilst both Options offer a more suitable highway design, Option B East would still place the traffic on the new road close to the sensitive receptors in the village of Weston Longville. Option C Refined offers greater separation of traffic from both villages in comparison with Option B East.

1.9.50 It is therefore concluded that Option C Refined is preferable in terms of traffic and transport.

Engineering

1.9.51 Against the 9 engineering criteria assessed in the OSR Option B-East was the second best ranked option. Compared to Option C (the highest ranked performing) Option B East did not perform as well under the assessment due to a poorer fit with existing topography (potential increase in volume of earthworks), the need to dual a greater length of the A1067 carriageway and possible departures from DMRB standards in respect of the design of the scheme. Paragraph 1.8.1 of this appendix concluded that, the overall principle of Option C Refined remains unchanged in comparison with Option C, which was selected as the preferred option at the OSR stage in July 2019. Therefore, the engineering conclusions for Option C applies to Option C Refined.

1.9.52 Further consideration was given to ancient and veteran trees for Option B East for comparison with Option C Refined. As depicted in **Chapter 10: Biodiversity Appendix 35 Arboricultural Impact Assessment** (Document Reference 3.10.35) there are 7 veteran trees that would require removal for Option C Refined in total.

Traffic and Transport

1.9.53 Creating this linkage between A47 and A1270 with a continuous dual carriageway was a key requirement for enhancing orbital movement around Norwich, so the Option C Refined route is preferable in terms of achieving this goal. Option B East has a longer overall scheme length from the A47/Wood Lane junction to A1270 in comparison with the Option C Refined.

1.9.54 Against the 9 engineering criteria assessed in the OSR Option B-East was the second best ranked option. Compared to Option C (the highest ranked performing) Option B East did not perform as well under the assessment due to a poorer fit with existing topography (potential increase in volume of earthworks), the need to dual a greater length of the A1067 carriageway and possible departures from DMRB standards in respect of the design of the scheme. Paragraph 1.8.1 of this appendix concluded that, the overall principle

of Option C Refined remains unchanged in comparison with Option C, which was selected as the preferred option at the OSR stage in July 2019. Therefore, the engineering conclusions for Option C applies to Option C Refined.

Cost

1.9.55 In the OSR, Option B East was estimated to be slightly more expensive than OSR Option C due to the requirement to upgrade a greater length of the A1067 from single to dual carriageway. This option had an adjusted BCR of 2.21 (high value for money).

1.9.56 In 2022, a scheme economic assessment was undertaken, using the Department for Transport (DfT) approved TUBA (Transport Users Benefit Appraisal) software program for Option B East. This showed transport benefits of £181m for Option B East which compares to Option C Refined transport benefits of £231m. These are based on an Opening Year of 2026 and a Design Year of 2041.

Consultation (OSR Stage)

Options B West and B East received similar levels of support to a Do-Nothing option or other alternatives, so it was considered they would be less likely to receive public support if taken forward as the preferred option in 2019.

Option B East Summary

1.9.57 Option B East impacts (moderate adverse) a greater number of heritage assets than Option C Refined including some with a higher Grade I and Grade II* listing, with Option B East impacting 6 assets compared to 1 for Option C Refined.

1.9.58 In terms of Biodiversity, Option B East would have a lower impact on ancient woodland (as a result of air quality impacts) than Option C Refined given the greater distance between Option B East and the ancient woodland.

1.9.59 Option C Refined provides a more efficient route than Option B East in traffic and transport terms. Option C Refined offers greater separation of traffic from

the villages of Ringland and Weston Longville in comparison with Option B East.

1.9.60 The Option B variants received lower consultation support in 2019 compared to Option C.

Option D (both variants)

Bats

1.9.61 As outlined in **Table 1** above, Option D scores major adverse in relation to bats.

Biodiversity

1.9.62 Across the subtopics of Biodiversity Option D scored potentially major adverse for the Habitats of Principal Importance (including reduction in quality), woodland, County Wildlife Sites, watercourses (other than the River Wensum) and habitat fragmentation. For other subtopics a moderate adverse impact was identified with the exception of ponds which where 'not applicable'.

1.9.63 No further evidence has been collected that would lead to a refinement of the OSR conclusions.

Environment

1.9.64 Both option D variants scored worse for greenhouse gas emissions for all options with a Net present value $(CO_2)_e$ of -£10,575,555 (based on the OSR 2019 calculation). Option D both variants also scored worse overall for air quality and second worst for noise (after Option B West). It was also noted that this option would have the greatest potential impact on watercourses.

Historic Environment

1.9.65 In terms of heritage, the 2019 OSR noted that Option D (both options) required the construction of a viaduct across the River Wensum, which would introduce a new built form into the landscape. This would be visually intrusive in the immediate setting of the Grade II listed Barn 50m north west of Low

Farm House. This would result in a moderate adverse impact (as per Option C).

1.9.66 Option D (both options) would also impact on how assets in Ringland are currently experienced, including the Grade I listed Church of St Peter, the Grade II listed Ringland School and Attached Schoolmasters House and the Grade II listed Pond Farm Barn. It was noted that Option D East would take the route further east from the Grade II* listed Church of St Andrew, located off the A47 in Honingham, and further east from the Grade II listed Church Farm House and the Grade II listed Barn at Church Farm, located off Taverham Road in Honingham.

Traffic and Transport

1.9.67 Option D is located closer to Ringland than Option C, so would offer less reduction in traffic-related effects on the village. It offers a longer route from A47 Wood Lane junction to A1270 Broadland Northway in comparison with Option C and offers poorer connectivity to villages south of A47.

Engineering

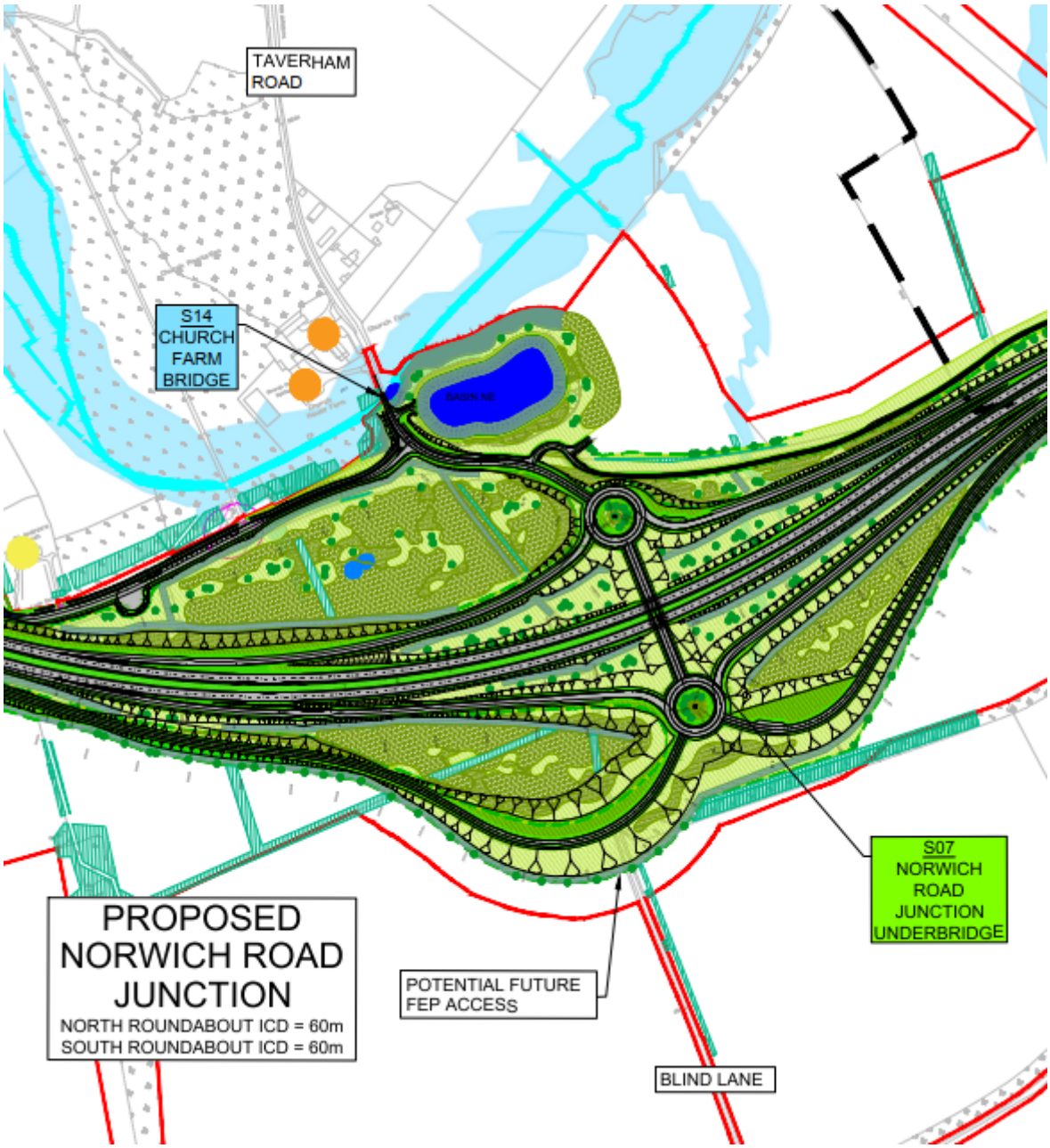
1.9.68 Against the 9 engineering criteria assessed in the OSR Both variants of Option D ranked lowest for engineering criteria due to complexity of the junction tie in requirements with the A47, a poor fit with existing topography (potential increase in volume of earthworks), the greatest number of new/amendment to existing structures and being the most complex to construct (with the inclusion of an additional structure over the River Tud).

1.9.69 Since the selection of the preferred route (Option C) at OSR stage, National Highways has been granted a Development Consent Order (DCO) for the dualling of the A47 between North Tuddenham and Easton (August 2022). At OSR stage Option D presented two options to connect into the A47. In August 2022 National Highways received DCO (Development Consent Order) approval from the Secretary of State for Transport to dual the A47 between North Tuddenham and Easton, replacing the existing single carriageway link. This DCO approval was subsequently subject to an appeal. The appeal was

dismissed further to a hearing in the Court of Appeal in January 2024. Following the grant of the DCO, the location and form of junction layout available for tie in has been fixed. This is located at the Taverham Road/Blind Lane junction with the junction plan presented in **Plate 4** below.

1.9.70 Since the selection of the preferred route (Option C) at OSR stage, National Highways has been granted a Development Consent Order (DCO) for the dualling of the A47 between North Tuddenham and Easton (August 2022). At OSR stage Option D presented two options to connect into the A47. In August 2022 National Highways received DCO (Development Consent Order) approval from the Secretary of State for Transport to dual the A47 between North Tuddenham and Easton, replacing the existing single carriageway link. This DCO approval was subsequently subject to an appeal. The appeal was dismissed further to a hearing in the Court of Appeal in January 2024. Following the grant of the DCO, the location and form of junction layout available for tie in has been fixed. This is located at the Taverham Road/Blind Lane junction with the junction plan presented in **Plate 4** below.

Plate 4 Extract from National Highways' North Tuddenham to Easton Scheme Plan showing Taverham Road/Blind Lane Junction proposal



1.9.71 Due to the location of where Taverham Road crosses the River Tud at the Church Farm Bridge a connection would need a significant buildability review to determine how best to negotiate all of the complex physical constraints in the area.

1.9.72 In order for the volume of traffic predicted to access this scheme option, the proposed National Highways' dumb bell junction arrangement would need an increase in capacity. Grade separation is likely to be the most effective solution. Any option would involve significant additional cost to what was considered in 2019.

Cost

1.9.73 In the OSR both variants of option D were the most expensive, linked to the overall complexity of construction and tie in with the A47, the number of new structures and earthworks requirements. Option D West had an adjusted BCR of 1.87 (medium value for money) and Option D East 2.00 (high value for money).

Consultation (OSR Stage)

1.9.74 The feedback from the OSR public consultation indicates that Option D, along with Option C, were well supported with both of these being considered to offer a fairly or very effective solution to the key transport issues in the study area.

1.9.75 In the OSR both variants of option D were the most expensive, linked to the overall complexity of construction and tie in with the A47, the number of new structures and earthworks requirements. Option D West had an adjusted BCR of 1.87 (medium value for money) and Option D East 2.00 (high value for money).

1.9.76 The feedback from the OSR public consultation indicates that Option D, along with Option C, were well supported with both of these being considered to offer a fairly or very effective solution to the key transport issues in the study area.

Option D (both variants) Summary

1.9.77 Option D would result in ecological impacts on Habitats of Principal Importance (HPI), woodland, County Wildlife Sites, watercourses (excluding the River Wensum), habitat fragmentation loss and a reduction in HPI quality. It scored poorly for greenhouse gases, noise, and air quality in comparison to moderate impacts of Option C and B East. It scored poorly for greenhouse gases, noise, and air quality in comparison to moderate impacts of Option C

and B East. In addition the proximity to Ringland, engineering challenges due to topography and the need for a bridge crossing over the River Tud the options results in engineering challenges. Given all these reason Option D remains discounted.

1.10 Conclusion

1.10.1 With the alignment refinement of Option C to Option C Refined as the preferred route, there were some changes to the impacts of the option with Option C Refined scoring worse for ancient woodland but better for bats and Habitats of Principal Importance when compared to Option C.

1.10.2 As outlined above, on reconsideration of Option A this option remained discounted due to its impacts on bats and the historic environment. Option A had the lowest adjusted BCR and low value for money and received negative feedback from the 2019 OSR feedback.

1.10.3 Option B West remained discounted due to the impacts on the historic environment and engineering. Option B West is closer to residential receptors in the village of Weston Longville, so would offer less reduction in traffic-related effects on the local community than Option C which is equidistant between Weston Longville and Ringland.

1.10.4 Option B East remained discounted as it impacts (moderate adverse) a greater number of heritage assets than Option C Refined including some with a higher Grade I and Grade II* listing, with Option B East impacting 6 assets compared to 1 for Option C Refined. However, in terms of Biodiversity, Option B East would have a lower impact on ancient woodland (as a result of air quality impacts) than Option C Refined given the greater distance between Option B East and the ancient woodland. Impacts on Biodiversity, Bats and Ancient and Veteran trees are similar for Option B East and Option C Refined.

1.10.5 Option C Refined provides a more efficient route than Option B East in traffic and transport terms. Option C Refined offers greater separation of traffic from the villages of Ringland and Weston Longville in comparison with Option B

East. The Option B variants received lower consultation support in 2019 compared to Option C. Option B East would require a greater length of dualling of the A1067.

1.10.6 Option D remained discounted with reasons including its impacts on engineering, biodiversity air quality, noise, and greenhouse gases.

1.10.7 Option C Refined is therefore still considered to present the better alignment option overall. Option D remained discounted with reasons including its impacts on engineering, biodiversity air quality, noise, and greenhouse gases.