A595 Grizebeck transport improvement

Scheme development report

March 2019
## Report details

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## Revision history

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Executive Summary

i. Cumbria County Council is undertaking study work to develop a highway improvement scheme for the A595 at Grizebeck. The council has appointed engineering consultants AECOM to assist with the technical work.

ii. This report details the technical work that has been undertaken by AECOM to support the identification of options, and the development of options. This technical work will be used as evidence alongside the consultation feedback to select a preferred route.

iii. A range of infrastructure options were identified that could address and remove the constraints and meet the scheme objectives.

iv. Two options were developed further and presented at a public consultation: the red route (online widening and new link to west of A595/A5092), and the blue route (new link to east of farm and new link to west of A595/A5092).

v. The results of the public consultation identified that there was a public desire for different options to be considered. This included an option to the east following the alignment of Buckhorn Lane, and a new route to the west of Bank End. These options have also been developed to the same level as the red and blue routes.

vi. The scheme development included the production of a highway alignment, an assessment of traffic impacts and initial economic appraisal, an assessment of environmental impacts, and an assessment of geotechnical impacts.

vii. The red route is estimated to be the cheapest option, and could demonstrate medium value for money. The main constraint of this option relate to the northern section of the route, where it passes through poor ground conditions and a flood zone. The route would also be difficult to construct. The route was opposed at public consultation.

viii. The blue route is estimated to be more expensive than the red route, due to an increased length and requirement for more land. It could demonstrate medium value for money. The main constraints relate to the ground conditions and flood zone at the north of the option, and the rocky outcrop at the southern end. The route was supported at public consultation.

ix. The Buckhorn Lane route is estimated to be more expensive than the blue route, due to an increased length and topographical issues. It would not meet the scheme objectives for connectivity, and could not demonstrate value for money. The main constraint relates to gradients due to the topography of the land. The route was not consulted on, but a number of consultation responses identified that the option should be considered.
x. The western route is estimated to be the most expensive route, more than twice as expensive as the other options. This is due to the increased length and significant earthworks required to the north. Despite providing transport benefit, it could not demonstrate value for money due to the scheme cost. It has severe delivery concerns due to the large area of poor ground conditions and flood zone that it crosses. The route was not consulted on, but a number of consultation responses identified that the option should be considered.

xi. The Buckhorn Lane and western routes cannot be considered further as viable options as part of this study. The routes do not meet the scheme objectives, would not be able to demonstrate value for money, and have significant deliverability issues.

xii. The red and blue routes were presented at public consultation to allow the public and other stakeholders to provide feedback.

xiii. The evidence produced during scheme development will be used alongside the consultation feedback to select a preferred route option.
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1 Introduction

1.1 Background

1.1.1 Cumbria County Council is undertaking study work to develop a highway improvement scheme for the A595 at Grizebeck. The council has appointed engineering consultants AECOM to assist with the technical work.

1.1.2 This report provides details of the scheme development and option appraisal undertaken as part of the A595 Grizebeck project. This work includes understanding the scheme context, setting of objectives, technical work to identify and develop scheme options, and the assessment of these options.

1.1.3 This technical work will be used as evidence alongside the consultation feedback to select a preferred route.

1.2 Existing issues

1.2.1 The A595 is a primary route in Cumbria between Carlisle in the north and Dalton-in-Furness in the south, and it forms the key link between Barrow-in-Furness and West Cumbria.

1.2.2 The West of M6 Strategic Connectivity Study identified a number of constraints on the key highway corridors of the A595, A66 and A590. The constraints related to capacity, connectivity, safety and resilience issues. Interventions were developed and assessed to remove these constraints and support plans for economic growth in Cumbria. The A595 at Grizebeck was one of the sections identified that required improvement.

1.2.3 Following this study, a strategic outline business case was developed for the A595/A66 corridor. The business case brought together all the interventions identified on these corridors in the West of M6 study, and prioritised the interventions. The scheme on the A595 at Grizebeck was identified as a prioritised scheme in the business case, and the economic appraisal of the schemes demonstrated the programme could achieve high value for money.

1.2.4 The A595 in and near Grizebeck has a number of existing issues. These primarily relate to road width and visibility, and the road is not wide enough to support two-way traffic in a number of places. At its narrowest point, the A595 passes very close to buildings associated with Dove Ford Farm, but the carriageway is also very narrow near to Dove Bank, the community hall and in the village itself. These issues are shown on Figure 1.1.
1.3 Scheme objectives

1.3.1 The scheme objectives are:

- Support economic growth in Cumbria by improving journey times on the A595
- Improve the A595 to make it suitable for freight traffic accessing existing and proposed major developments
- Improve resilience and journey time reliability, particularly when the road is used as a diversion route
- Improve road safety by reducing the number and seriousness of incidents
- Minimise adverse impacts on the environmental and reduce carbon emissions
- Reduce the impact of the A595 on severance in Grizebeck

1.4 Public consultation

1.4.1 A public consultation was undertaken from 19 October to 16 November 2018. The consultation includes two drop-in events at Grizebeck Community Hall, where members of the project team were available to provide information and answer questions. A consultation document was also produced, and feedback was sought via a feedback form which was available on the project website and in a freepost hard-copy.
1.4.2 The drop-in events were well attended, with 312 people signing-in across both events. 258 feedback forms were received.

1.4.3 Further details on the public consultation are provided in the *Consultation feedback report*. 
2 Option long list

2.1 Potential options

2.1.1 A range of infrastructure options were identified that could address and remove the constraints and meet the scheme objectives.

2.1.2 The following options were identified:

1. Traffic lights in the vicinity of the farm for shuttle working, and localised road widening between Dove Bank and the Mousetrap

1a. Traffic lights in the vicinity of the farm for shuttle working, localised widening, and a new link from the north of the farm to the A595, joining the existing A595 to the west of the existing A595/A5092 junction

2. Road widening to create a 7.3 metre wide carriageway between Dove Bank and the Mousetrap, impacting on buildings in the vicinity of the farm

2a. Road widening to create a 7.3 metre wide carriageway between Dove Bank and the Mousetrap, and a new link from the north of the farm to the A595, joining the existing A595 to the west of the existing A595/A5092 junction

3. New link from Chapels to the A595/Mousetrap junction, to the east of the farm

3a. New link from Chapels to the A595/Mousetrap junction, to the west of the farm

4. New link from Chapels to the A595/Mousetrap junction, to the east of the farm, and a new link from the north of the farm to the A595, joining the existing A595 to the west of the existing A595/A5092 junction

4a. New link from Chapels to the A595/Mousetrap junction, to the west of the farm, and a new link from the north of the farm to the A595, joining the existing A595 to the west of the existing A595/A5092 junction

5. Widening on existing Buckhorn Lane from Chapels to the A5092 east of Grizebeck

6. Full bypass of Grizebeck to the west, joining the A595 to the west of Bank End

7. Full bypass of Grizebeck to the east, joining the A5092 to the east of Grizebeck

8. One-way gyratory using two one-way roads, based around the existing highway and a new link
2.1.3 Three options were not taken forward for initial assessment. This was because the options were deemed as not suitable for further development. The three options were:

- Option 6, a bypass to the west: topography to the west of Grizebeck means that the route would have to raise significantly to join the A595, and the northern section would run directly through a Flood Zone 3
- Option 7, a bypass to the east: topography to the east of Grizebeck means the A5092 is on a steep gradient, and it would be difficult to accommodate a junction designed to standard
- Option 8, a one-way gyratory: constructing a new one-way link would be a similar cost to a new two-way link, and would still leave substandard sections of highway in the area

2.2 Assessment of options

2.2.1 The remaining options were prioritised to identify the options that had the most potential to meet the scheme objectives and provide benefit.

2.2.2 The assessment criteria was based on the Department for Transport’s Early Assessment and Sifting Tool (EAST). EAST is a decision support tool which can summarise and present evidence on different options in a clear and concise format.

2.2.3 The options were assessed based on four criteria: strategic, economic, value for money, and feasibility. The scoring was based on the subjective decision of the design team at AECOM.

2.2.4 A summary of the assessment is provided in Table 2.1 and Table 2.2. Further details on the assessment is provided in Appendix A and Appendix B.

2.3 Schemes for further development

2.3.1 The scheme assessment identified three schemes for further development:

- Option 2a, the red route: online widening and new link to west of A595/A5092
- Option 4, the blue route: new link to east of farm and new link to west of A595/A5092
- Option 5: widening of Buckhorn Lane

2.3.2 The further development of the Buckhorn Lane option identified that the option could not meet the scheme objectives, and would not provide benefit in the economic appraisal. The scheme was therefore not considered further and not taken to public consultation as a business case could not be made for investment in this option.
2.3.3 However, the results of the public consultation identified that there was a public desire for different options to be considered. This included both the Buckhorn Lane option, as identified above, and a new route to the west of Bank End, as initially considered but not assessed. Therefore, the western route was developed to the same level as the red route and blue route.

2.3.4 The results of the development work undertaken for the red route, blue route, Buckhorn Lane route and western route are presented in this report.

2.3.5 Route plans of all four options are provided in Appendix C.
### Table 2.1: Scheme prioritisation: scored criteria

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<th>Description</th>
<th>Strategic</th>
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<td>3</td>
<td>24</td>
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<td>Option 2</td>
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<td>6</td>
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<td>New link between Chapels and Mousetrap to east</td>
<td>7</td>
<td>16</td>
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<td>4</td>
<td>29</td>
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### Table 2.2: Scheme prioritisation: unscored criteria

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<td>£2.5–5.0m</td>
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<td>2</td>
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<td>Option 4</td>
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<tr>
<td>Option 4a</td>
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<td>3</td>
<td>£15.0–20.0m</td>
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<td>£10.0–15.0m</td>
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3 Scheme development

3.1 Summary

3.1.1 The four identified schemes were developed further to inform the selection of a preferred route, and to support the business case for the preferred route.

3.1.2 The scheme development included the production of a highway alignment, an assessment of traffic impacts and initial economic appraisal, an assessment of environmental impacts, and an assessment of geotechnical impacts. A summary of the work undertaken for each part of the scheme development work is provided below.

3.2 Traffic assessment

3.2.1 The traffic assessment is based on a transport model of the local area. The transport model is used to forecast the changes in traffic flow and journey time as a result of the scheme, compared to the existing (do minimum) scenario.

3.2.2 A microsimulation transport model was developed using the Paramics Discovery software. The model considered car, light goods vehicle (van) and heavy goods vehicle (lorry) trips. Three time periods were considered: a morning peak of 8–9am, an average hourly period within the inter peak of 10am–4pm, and the evening peak of 5–6pm.

3.2.3 The traffic demand was obtained from Automatic Number Plate Recognition (ANPR) cameras placed at key locations on the highway network in June 2018. The model outputs were validated against traffic flow and journey time data also collected in June 2018 to ensure the model was suitable and appropriate to assess the impact of the scheme options. The model was concluded to validate well, with very good traffic flow validation (more than 90 per cent of all flows with a GEH\(^1\) criteria of less than five), and very good journey time validation (all modelled journey times within 15 per cent or one minute of the observed times).

3.2.4 Transport forecasts were produced to estimate the traffic flow and journey times in the future. The results of the transport forecasts are used as the basis for an economic appraisal. This estimates the transport user benefits by monetising the journey time benefits, vehicle operating benefits, greenhouse gas emissions benefits, and indirect tax impacts, of the scheme.

3.2.5 The traffic assessment was undertaken with consideration of best-practice guidance set out in the Department for Transport's Transport Analysis Guidance\(^2\) (TAG).

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\(^1\) GEH is a formula, similar to the chi-squared statistic, that compares two sets out traffic volumes, typically observed and modelled flows; a GEH less than five is typically considered as an acceptable match between the modelled and observed hourly traffic flows

\(^2\) https://www.gov.uk/guidance/transport-analysis-guidance-webtag
3.3  Environmental assessment

3.3.1  The environmental assessment is a desk-based assessment of a variety of environmental factors, including:

- Air quality
- Noise
- Cultural heritage
- Ecology and nature conservation
- Landscape
- Land use
- Pedestrians, cyclists, equestrians and community
- Road drainage and water environment
- Policies and plans

3.3.2  The assessment identified existing environmental sensitivities in the vicinity of the options which have the potential to be impacted as a result of the option.

3.3.3  A summary of the environmental assessment is provided in Appendix D.

3.3.4  The environmental assessment was undertaken with consideration to the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3\(^3\) Environmental topics.

3.4  Geotechnical assessment

3.4.1  The geotechnical and soils assessment is based on a review of available information on geology and ground conditions. It considers the proximity of the schemes to designated sites, and reviews the following data:

- Superficial and bedrock geology
- Aquifer designations, groundwater, agricultural land classification
- Historical mapping
- Waste and minerals
- Soils

3.4.2  A summary of the geotechnical and soils assessment is provided in Appendix E.

\(^3\) http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm
3.5 Engineering assessment

3.5.1 The engineering assessment focused on developing an outline design of the vertical and horizontal alignment of each option, based on topographical data.

3.5.2 The improvement options have been designed to DMRB standards with a design speed of 100 kph (60 mph).

3.5.3 The outline design, environmental and geotechnical assessments were used to derive cost estimates for each option. The cost estimates are based on rates from the SPONS Price Book 2018. A number of assumptions were made during the pricing exercise, reflecting the level of data available.

3.5.4 The cost estimate does not reflect the precise cost of construction of the scheme, as it includes high-level assumptions for various factors which are unknown at this stage. However, it provides a consistent base for cost comparison between options to allow the selection of a preferred option.

3.5.5 The works cost estimate included estimates of the following factors:

- Preliminaries
- Site clearance
- Fencing
- Road restraint systems
- Drainage and service ducts
- Earthworks
- Pavements
- Kerbs, footways and paved areas
- Traffic signs and road markings
- Road lighting
- Structural concrete
- Landscaping and ecology

3.5.6 The following uplifts were then applied to the works cost:

- Additional earthworks (20 per cent for Buckhorn Lane, 30 per cent for other routes)
- Overheads (30 per cent)
- Out of hours working (20 per cent)
- Risk (20 per cent)
- Statutory undertaker costs (10 per cent)
- Land purchase (scheme footprint plus 10 per cent for earthworks)
- Project management, design and supervision (10 per cent)
• Client supervision (2.5 per cent)

3.5.7 Finally, an optimism bias uplift was applied to the total cost:

• Optimism bias (44 per cent)

3.6 Economic appraisal

3.6.1 The traffic appraisal and cost estimate were used to estimate the potential value for money of the scheme.

3.6.2 The cost estimate was converted from 2018 prices to 2010 real prices for the purposes of the economic appraisal. This process involves changing the price base, discounting, and converting to market prices.

3.6.3 The economic appraisal was undertaken in line with TAG. This involved calculating an indicative benefit to cost ratio for the scheme. This compares the monetised benefits against the scheme cost.

3.6.4 If the scheme benefits are greater than the costs, the scheme has a benefit to cost ratio greater than one. A scheme with a benefit to cost ratio less than one provides poor value for money, and is extremely unlikely to secure delivery funding unless it offered significant non-monetisable benefits.

3.6.5 The value for money assessment was made in line with the Department for Transport’s Value for money framework.

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4 Red route

4.1 Introduction

4.1.1 The red route (Option 2a in the previous section of this report, Option 1 in the consultation document) comprises online widening and new link to west of A595/A5092.

4.1.2 A plan showing an indicative alignment of the red route is provided in Appendix C.

4.2 Traffic

4.2.1 The traffic forecasting results show journey time savings of the order of 60–80 seconds for the predominant south-to-west and west-to-south traffic movements. Journey time savings are also present for the east-to-south and south-to-east movements at similar magnitudes.

4.2.2 There is little change in journey time for west-to-east or east-to-west movements. The journey time savings are generally consistent between time periods.

4.2.3 The transport user benefits were monetised across a 60-year appraisal period. The present value of benefits was estimated as £18.5m in 2010 real prices.

4.3 Environment

4.3.1 This option would require new crossing of Grize Beck, resulting in a new structure within the landscape. The crossing would also necessitate development within an area of flood risk, and a potential direct impact on the important habitat feature of the river corridor.

4.3.2 The option would require the removal of existing hedgerows and drystone dykes along the entire length of the option.

4.3.3 The disturbance of greenfield land presents the risk of uncovering previously recorded archaeological assets.

4.3.4 The option would improve the safety of the route, and the new link would reduce traffic through the east of Grizebeck village.

4.4 Geotechnical

4.4.1 The geology and soils data shows a number of features that would require further assessment in the next phase of scheme development. This option crosses watercourses and adjacent superficial alluvium soil deposits. Alluvial deposits are likely to be of low strength, compressible and consist of a variable material. The deposits are also of an unknown depth.

4.4.2 It is recommended that a Preliminary Sources Study Report is undertaken, including an Envirocheck Report, prior to any planning application.
4.5 **Highways**

4.5.1 In order for the option to comply with the minimum horizontal alignments, the option diverges from a strict online widening. The alignment initially diverges to the west at the south, before rejoining the existing alignment and travelling through the farm buildings.

4.5.2 To achieve an adequate width of the carriageway, this option would require the demolition of some farm buildings. It is not yet clear which specific buildings would be affected. Ground conditions in this area are uncertain.

4.5.3 Construction of the online sections will be complex and challenging due to the need to maintain vehicle movements during construction.

4.5.4 The alignment crosses the existing A595 between the farm and the community hall, before following a direct alignment towards the A595 to the west of the existing A595/A5092 junction. The location of the junction provides the best visibility in both directions.

4.5.5 It has been assumed that the junction at the north would comprise a ghost island priority junction. This matches the existing provision, but the addition of a ghost island provides space for traffic waiting to turn right, and does not obstruct traffic travelling ahead towards the A5092. However, the precise nature of this junction and the other junctions in the vicinity is still subject to further consideration at the preliminary design stage.

4.5.6 The environmental and geotechnical assessments identify that the route crosses a flood zone and an area of alluvial or peat soils. The presence of compressible ground conditions mean that the ground would need to be replaced or preloaded to avoid failure of the road when constructed.

4.5.7 In addition, the road would need to be designed on an embankment to account for flood levels in the area; building in a flood zone would also require the creation of compensatory storage to replace the volume removed by the embankment. Ground conditions in the vicinity of Grize Beck will make construction challenging; it is expected that the existing ground will need to be removed and stabilised to ensure it is suitable for load bearing.

4.5.8 The estimated scheme cost at this stage of development is £11.5m in 2018 prices. This does not reflect the precise cost of construction of the scheme, as it includes high-level percentage uplifts for various factors. However, it provides a consistent base for cost comparison between options.

4.5.9 For the value for money appraisal, the scheme cost is £10.1m in 2010 real prices.

4.6 **Economics**

4.6.1 The economic appraisal shows that this route achieves a benefit to cost ratio of 1.8. This equates to medium value for money.
5 Blue route

5.1 Introduction

5.1.1 The blue route (Option 4 in the previous section of this report, Option 2 in the consultation document) comprises a new link to the east of the farm, continuing to the existing A595 to the west of A595/A5092.

5.1.2 A plan showing an indicative alignment of the blue route is provided in Appendix C.

5.2 Traffic

5.2.1 The traffic forecasting results show journey time savings of the order of 70–80 seconds for the predominant south-to-west and west-to-south traffic movements in the year of opening. Journey time savings are also present for the east-to-south and south-to-east movements at similar magnitudes.

5.2.2 There is little change in journey time for west-to-east or east-to-west movements. The journey time savings are generally consistent between time periods.

5.2.3 The transport user benefits were monetised across a 60-year appraisal period. The present value of benefits were estimated as £18.3m in 2010 real prices.

5.3 Environment

5.3.1 This option would require new crossing of Grize Beck, resulting in a new structure within the landscape. The crossing would also necessitate development within an area of flood risk, and a potential direct impact on the important habitat feature of the river corridor.

5.3.2 The option would require the removal or severance of existing hedgerows and drystone dykes to accommodate the new route.

5.3.3 The route is close to a known heritage asset (post-medieval malt kiln). The disturbance of greenfield land presents the risk of uncovering previously recorded archaeological assets.

5.3.4 The option would improve the safety of the route, and the new link would reduce traffic through the east of Grizebeck village.

5.4 Geotechnical

5.4.1 The geology and soils data shows a number of features that would require further assessment in the next phase of scheme development. This option crosses watercourses and adjacent superficial alluvium soil deposits. Alluvial deposits are likely to be of low strength, compressible and consist of a variable material. The deposits are also of an unknown depth.
5.4.2 It is recommended that a Preliminary Sources Study Report is undertaken, including an Envirocheck Report, prior to any planning application.

5.5 **Highways**

5.5.1 The alignment of this option is heavily influenced by the vertical profile of the land to the east of the existing road. There is a rocky outcrop at this location so the alignment has been designed to sit on top of this as closely as possible to minimise difficult construction through the rock.

5.5.2 The grading of the embankment slope to the west of the route has been reduced from a standard one in three to a one in two slope. This is to minimise the impact of earthworks on the cottages beside the existing A595. Given the rocky outcrop, it is likely the slope could be reduced further but this requires further investigation.

5.5.3 The route then follows the land profile before crossing the existing A595 between the Mousetrap and the community hall. The alignment is to the east of the red route, but the northern junction is in the same location. The alignment means the route should have a slightly lower impact on the flood zone.

5.5.4 The route at the north will be raised on an embankment to account for flood levels, along with associated compensatory flood storage. Ground conditions in the vicinity of Grize Beck will make construction challenging; it is expected that the existing ground will need to be removed and stabilised to ensure it is suitable for load bearing.

5.5.5 The route climbs above existing properties across exposed bedrock. While providing a solid foundation for the road, it will require difficult excavation and earthworks to minimise the impact on properties to the west. The offline nature of the route would otherwise allow for a simple construction method and programme.

5.5.6 The estimated scheme cost at this stage of development is £14.1m in 2018 prices. This does not reflect the precise cost of construction of the scheme, as it includes high-level percentage uplifts for various factors. However, it provides a consistent base for cost comparison between options.

5.5.7 For the value for money appraisal, the scheme cost is £12.4m in 2010 real prices.

5.6 **Economics**

5.6.1 The economic appraisal shows that this route achieves a benefit to cost ratio of 1.5. This equates to medium value for money.
6 Buckhorn Lane route

6.1 Introduction

6.1.1 The Buckhorn Lane route (Option 5 in the previous section of this report) comprises online widening and offline sections along the broad alignment of the existing Buckhorn Lane.

6.1.2 A plan showing an indicative alignment of the Buckhorn Lane route is provided in Appendix C.

6.2 Traffic

6.2.1 The traffic forecasting results show journey time savings of the order of 110 seconds for the east-to-south and south-to-east movements in the year of opening. However, for the predominant south-to-west and west-to-south traffic movements, there is little change in journey time, with the impacts ranging from a reduction of 10 seconds to an increase of 10 seconds.

6.2.2 Journey time increases of around 20 seconds are also present for the east-to-west and west-to-east movements due to the introduction of a new junction. The journey time changes are consistent between time periods.

6.2.3 The transport user benefits were monetised across a 60-year appraisal period. The present value of benefits were estimated as £5.8m in 2010 real prices.

6.3 Environment

6.3.1 The disturbance of greenfield land presents the risk of uncovering previously recorded archaeological assets.

6.3.2 The option would require the removal of existing hedgerows and drystone dykes to accommodate the new route.

6.3.3 The option would improve the safety of the route, and the new link would reduce traffic through the east of Grizebeck village; however, the route crosses an existing public right of way.

6.4 Geotechnical

6.4.1 The geology and soils data shows that this option passes over groundwater aquifers, which will require aquifer protection measures.

6.4.2 It is recommended that a Preliminary Sources Study Report is undertaken, including an Envirocheck Report, prior to any planning application.
6.5 Highways

6.5.1 This option upgrades the existing Buckhorn Lane between Chapels and the A5092. However, the proposed option diverges from the existing highway to achieve minimum horizontal and vertical design standards for a design speed of 100 kph (60 mph).

6.5.2 There are four properties on the southern section of the route, and the option is designed to avoid these. Connection to these properties would be via the existing highway and new access onto the new route.

6.5.3 The new alignment meets the A5092 in an area which is relatively flat, at the top of the climb from Grizebeck. As a result, an at-grade roundabout may be an appropriate junction type.

6.5.4 The route is mostly online, but it is a quiet route so construction phasing would be relatively straightforward. The route is on the side of a slope and meeting the horizontal and vertical design limits does require significant earthworks. The route does not cross any water courses or encounter poor soil conditions.

6.5.5 The estimated scheme cost at this stage of development is £15.3m in 2018 prices. This does not reflect the precise cost of construction of the scheme, as it includes high-level percentage uplifts for various factors. However, it provides a consistent base for cost comparison between options.

6.5.6 For the value for money appraisal, the scheme cost is £13.5m in 2010 real prices.

6.6 Economics

6.6.1 The economic appraisal shows that this route achieves a benefit to cost ratio of 0.4. This equates to poor value for money.
7 West route

7.1 Introduction

7.1.1 The west route (Option 6 in the previous section of this report, occasionally referred to as the ‘purple’ route) comprises a new offline link to the west of the farm, meeting the A595 to the west of Bank End.

7.1.2 A plan showing an indicative alignment of the west route is provided in Appendix C.

7.2 Traffic

7.2.1 The traffic forecasting results show journey time savings of the order of 130 seconds for the predominant south-to-west and west-to-south traffic movements in the year of opening. However, for the predominant south-to-west and west-to-south traffic movements, changes in journey time range from a reduction of 10 seconds to an increase of 10 seconds.

7.2.2 Journey time increases are also present for the east-to-west and west-to-east movements at similar magnitudes due to the introduction of a new junction. The journey time savings are generally consistent between time periods.

7.2.3 The transport user benefits were monetised across a 60-year appraisal period. The present value of benefits were estimated as £24.3m in 2010 real prices.

7.3 Environment

7.3.1 This option would require new crossings of Press Beck and its tributary may result in direct impacts to the local water quality, and may deteriorate or remove habitat for protected species in the area, such as otter and bats. The crossing would also necessitate development within an area of flood risk, and a potential direct impact on the important habitat feature of the river corridor.

7.3.2 The option would require the removal or severance of existing hedgerows and drystone dykes to accommodate the new route.

7.3.3 The option would result in a new prominent visual structure through the landscape in low-lying land. Large areas of cut-and-fill are likely to be required, resulting in a change to the local landscape. The removal and segregation of hedgerows and drystone dykes would also exacerbate changes to the local landscape.

7.3.4 The option would improve the safety of the route, and the new link would reduce traffic through the east of Grizebeck village.
7.4 Geotechnical

7.4.1 The geology and soils data shows a number of features that would require further assessment in the next phase of scheme development. This option crosses watercourses and adjacent superficial alluvium soil deposits. Alluvial deposits are likely to be of low strength, compressible and consist of a variable material. The deposits are also of an unknown depth.

7.4.2 There is the potential presence of artificial ground, associated with the infilling/backfilling of a form quarry, at the northern end of the route. Potential made ground, if present, is most likely to be highly variable in both composition and geotechnical characteristics, and may also be contaminated.

7.4.3 It is recommended that a Preliminary Sources Study Report is undertaken, including an Envirocheck Report, prior to any planning application.

7.5 Highways

7.5.1 This option diverges from the A595 prior to Dove Ford Farm and passes to the west towards the A595 to the west of Bank End. The alignment is reasonably straight and a design speed of 100 kph (60 mph) is achievable. The vertical alignment is dictated by existing topography, except where the route crosses flood zones, where it is raised on an embankment to prevent flooding.

7.5.2 At the northern end of the route, the alignment raises steeply to join the existing A595, with a maximum gradient of eight per cent. This is above the desirable maximum gradient, but it would be acceptable given the prevailing terrain and is preferable to increasing the extent of earthworks.

7.5.3 The existing A595 in the vicinity of the village would become an extension to the A5092. Priority at the northern junction would be given to the north-south A595, with the A5092 giving way. A ghost island would be provided for right-turning south-to-east traffic. The steep terrain would preclude a different junction type without a significant increase in earthworks.

7.5.4 The village would maintain access to the A5092 but a connection to the new link is not proposed. This is because any connection would add to the scheme cost and provide a through route for south-to-east and east-to-south traffic.

7.5.5 The estimated scheme cost at this stage of development is £39.3m in 2018 prices. This does not reflect the precise cost of construction of the scheme, as it includes high-level percentage uplifts for various factors. However, it provides a consistent base for cost comparison between options.

7.5.6 The cost estimate for this option is significantly greater than the other three options considered; the key reasons are the increase in earthworks, the risks associated with poor ground conditions, and the increase in length of the route.

7.5.7 For the value for money appraisal, the scheme cost is £32.9m in 2010 real prices.
7.6 Economics

7.6.1 The economic appraisal shows that this route achieves a benefit to cost ratio of 0.7. This equates to poor value for money.
8 Conclusions

8.1 Summary

8.1.1 A summary of the scheme development undertaken on the four options is provided in Table 8.1.

8.1.2 The summary shows that the red route is estimated to be the cheapest option, and could demonstrate medium value for money. The main constraint of this option relate to the northern section of the route, where it passes through poor ground conditions and a flood zone. The route would also be difficult to construct whilst keeping the existing A595 open for traffic. The route was opposed at public consultation.

8.1.3 The blue route is estimated to be more expensive than the red route, due to an increased length and requirement for more land. It could demonstrate medium value for money. The main constraints relate to the ground conditions and flood zone at the north of the option, and the rocky outcrop at the southern end. The route was supported at public consultation.

8.1.4 The Buckhorn Lane route is estimated to be more expensive than the blue route, due to an increased length and topographical issues. It would not meet the scheme objectives for connectivity, and could not demonstrate value for money. The main constraint relates to gradients due to the topography of the land. The route was not consulted on, but a number of consultation responses identified that the option should be considered.

8.1.5 The western route is estimated to be the most expensive route, more than twice as expensive as the other options. This is due to the increased length and significant earthworks required to the north. Despite providing transport benefit, it could not demonstrate value for money due to the scheme cost. It has severe delivery concerns due to the large area of poor ground conditions and flood zone that it crosses. The route was not consulted on, but a number of consultation responses identified that the option should be considered.
### Table 8.1: Option assessment

<table>
<thead>
<tr>
<th></th>
<th>Red route</th>
<th>Blue route</th>
<th>Buckhorn route</th>
<th>West route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Does not improve connectivity between South and West Cumbria</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>Impact on Grize Beck, and flood storage zone</td>
<td>Impact on Grize Beck, and flood storage zone</td>
<td>No significant concerns</td>
<td>Impact on Grize Beck and Press Beck, and flood storage zone</td>
</tr>
<tr>
<td><strong>Geotechnical</strong></td>
<td>Northern section passes through flood zone and area of poor soil conditions</td>
<td>Northern section passes through flood zone and area of poor soil conditions</td>
<td>No significant issues</td>
<td>Spans large section of flood zone and at least three watercourses – significant intervention required</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Yes</td>
<td>Yes, but steep gradients through rock outcrop</td>
<td>Yes, but high maximum gradient due to topography</td>
<td>Yes</td>
</tr>
<tr>
<td>Buildability</td>
<td>Red route</td>
<td>Blue route</td>
<td>Buckhorn route</td>
<td>West route</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>----------------</td>
<td>------------</td>
</tr>
<tr>
<td>Yes, but through flood zone; requires significant traffic management</td>
<td></td>
<td>Yes, but through flood zone</td>
<td>Yes</td>
<td>Yes, but through large area of flood zone; northern end tie-in will create significant challenges due to level differences</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benefits (2010 prices)</th>
<th>£18.5m</th>
<th>£18.3m</th>
<th>£5.8m</th>
<th>£24.3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicative cost (2018 prices)</td>
<td>£11.5m</td>
<td>£14.0m</td>
<td>£15.3m</td>
<td>£39.3m</td>
</tr>
<tr>
<td>Benefit to Cost Ratio / value for money</td>
<td>1.8 / medium value for money</td>
<td>1.5 / medium value for money</td>
<td>0.4 / poor value for money</td>
<td>0.7 / poor value for money</td>
</tr>
<tr>
<td>Consultation</td>
<td>Majority oppose</td>
<td>Majority support</td>
<td>Not consulted – identified through feedback</td>
<td>Not consulted – identified through feedback</td>
</tr>
</tbody>
</table>
8.2 Conclusions

8.2.1 Four scheme options have been developed: the red route, the blue route, the Buckhorn Lane route, and the western route.

8.2.2 The economic appraisal of the Buckhorn Lane route and the western route show that they could be expected to achieve only poor value for money, with an indicative benefit to cost ratio less than one.

8.2.3 The Buckhorn Lane route provides poor value for money due to the low level of transport user benefits. This is because the route does not provide journey time savings for the predominant traffic flow between South and West Cumbria.

8.2.4 The western route provides poor value for money due to the significant scheme costs. The scheme cost estimate is very high, due to the extent of earthworks and geotechnical interventions required as the scheme crosses a large area of flood plain and is elevated to join the existing A595. These earthworks and geotechnical issues also introduce a large amount of risk to the project, causing significant delivery concerns.

8.2.5 Due to these reasons, the Buckhorn Lane and western routes cannot be considered further as viable options as part of this study. The routes do not meet the scheme objectives, would not be able to demonstrate value for money, or have significant deliverability issues.

8.2.6 The red and blue routes were presented at public consultation to allow the public and other stakeholders to provide feedback.

8.2.7 The evidence produced during scheme development will be used alongside the consultation feedback to select a preferred route option.
Appendix A:  Option long-list: scheme prioritisation

Source: AECOM
Buckhorn Lane Upgrade
Grizebeck, stopping up small junction to east of Grizebeck
Full bypass East of Farm - New connection to A595 east of Grizebeck, stepping up small junction to east of Grizebeck
Offline by-pass of the farm (to the east)
Offline by-pass of the farm (to the west)
Buckhorn Lane Widening
Buckhorn Lane Widening
Full bypass East of Farm - New connection to A595 east of Grizebeck, stepping up small junction to east of Grizebeck

Strategic
- Economic Score > 12 (max 25)
- Strategic Score > 9 (max 15)
Scheme prioritised if all following criteria are met:
Prioritised scheme definition (default):

Scoring Categories

<table>
<thead>
<tr>
<th>Description</th>
<th>Strategic</th>
<th>Economic</th>
<th>VfM</th>
<th>Feasibility</th>
<th>Total</th>
<th>Prioritised</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-line widening and traffic signals past the farm.</td>
<td>6</td>
<td>12</td>
<td>1</td>
<td>5</td>
<td>24</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>Partial on-line widening with traffic signals and by-pass Grizebeck from northern bend</td>
<td>6</td>
<td>14</td>
<td>1</td>
<td>3</td>
<td>24</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>On-line widening, demolishing farm buildings, widening existing road to 7.3 m and realigning northern bend</td>
<td>6</td>
<td>16</td>
<td>2</td>
<td>4</td>
<td>28</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>Offline by-pass of the farm (to the east)</td>
<td>7</td>
<td>16</td>
<td>2</td>
<td>4</td>
<td>29</td>
<td>X</td>
<td>5</td>
</tr>
<tr>
<td>Offline by-pass of the farm (to the west)</td>
<td>7</td>
<td>15</td>
<td>2</td>
<td>3</td>
<td>27</td>
<td>X</td>
<td>7</td>
</tr>
</tbody>
</table>

Mitigation Measure

<table>
<thead>
<tr>
<th>Description</th>
<th>Strategic</th>
<th>Economic</th>
<th>VfM</th>
<th>Feasibility</th>
<th>Total</th>
<th>Prioritised</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure 1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Measure 1a</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Measure 2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Measure 5</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Prioritised scheme definition (default): Scheme prioritised if all following criteria are met:
- Strategic Score > 9 (max 15)
- Economic Score > 12 (max 25)
Appendix B: Option long-list: assessment commentary

Source: AECOM
<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Scale of Impact</th>
<th>Fit with wider objectives</th>
<th>Consensus over outcome</th>
<th>Economic Growth</th>
<th>Connectivity</th>
<th>Network Performance</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure 1</td>
<td>On-line widening and traffic signals past the farm.</td>
<td>- Conflict is removed by widening the route and only allowing one way traffic where sufficient width is not possible</td>
<td>Improved Safety on the route</td>
<td>Still not improved capacity and route reliability</td>
<td>Capacity is not improved and may be reduced by limiting flow to one direction. Traffic still passes through Grizebeck.</td>
<td>The measure reduces traffic capacity.</td>
<td>Traffic held at lights and possibility of stationary traffic.</td>
<td></td>
</tr>
<tr>
<td>Measure 1a</td>
<td>Partial on-line widening with traffic signals and by-pass Grizebeck from northern bend</td>
<td>- Still limited</td>
<td>Improved Safety on the route</td>
<td>Improved Safety and Capacity on the route</td>
<td>Improved capacity and route reliability</td>
<td>Capacity is not improved and may be reduced by limiting flow to one direction. Traffic still passes through Grizebeck.</td>
<td>The measure reduces traffic capacity at the farm pinch point. Bypass provides little benefit as an accident point.</td>
<td>Traffic held at lights and possibility of increased traffic flow. Bypass of Grizebeck will improve air quality in the village.</td>
</tr>
<tr>
<td>Measure 2</td>
<td>On-line widening, demolishing farm buildings, widening existing road to 7.3 m and realigning northern bend</td>
<td>- Improved safety, due to alignment improvement</td>
<td>Improved Safety and Capacity on the route</td>
<td>High monetary and political cost to demolish the farm with limited benefits and will generate more traffic through (no Suggestions)</td>
<td>This route only provides a partial improvement to the route and the pinch point at Grizebeck remains.</td>
<td>Both pinch points are improved and may be reduced by limiting flow to one direction. Traffic still passes through Grizebeck.</td>
<td>The measure improves capacity through the pinch point of the farm but traffic flow is still restricted at the village.</td>
<td>Reduced congestion around the farm but increase congestion in the village.</td>
</tr>
<tr>
<td>Measure 3a</td>
<td>Offline by-pass of the farm (to the east)</td>
<td>- Improved safety, due to alignment improvement</td>
<td>Improved Safety and Capacity on the route</td>
<td>Improves capacity and route reliability</td>
<td>This route provides a reliable route for traffic and will provide an economic benefit. Traffic removed from Grizebeck.</td>
<td>Traffic removed from Grizebeck.</td>
<td>Traffic removed from Grizebeck.</td>
<td>Reduced congestion around the farm but increase congestion in the village.</td>
</tr>
<tr>
<td>Measure 3b</td>
<td>Offline by-pass of the farm (to the west)</td>
<td>- Improved capacity</td>
<td>Improved Safety and Capacity on the route</td>
<td>Removes the pinch point and bypasses the village but improves the complete road network.</td>
<td>This route only provides a partial improvement to the route and the pinch point at Grizebeck remains.</td>
<td>Traffic held at lights and possibility of stationary traffic.</td>
<td>Traffic removed from Grizebeck.</td>
<td>Increased flow through the village will impact on air quality.</td>
</tr>
<tr>
<td>Measure 4</td>
<td>Full Bypass East of Farm - New connection to A595 east of Grizebeck, stopping up small junction to west of Grizebeck</td>
<td>- Improves safety</td>
<td>Improved Safety and Capacity on the route</td>
<td>Removes the pinch point and bypasses the village.</td>
<td>This route provides a reliable route for traffic and will provide an economic benefit.</td>
<td>Traffic held at lights and possibility of stationary traffic.</td>
<td>Traffic removed from Grizebeck.</td>
<td>Increased traffic levels away from receptors.</td>
</tr>
<tr>
<td>Measure 4a</td>
<td>Full Bypass - West of farm</td>
<td>- Improved capacity</td>
<td>Improved Safety and Capacity on the route</td>
<td>Removes the pinch point and bypasses the village.</td>
<td>This route provides a reliable route for traffic and will provide an economic benefit. Both pinch points are removed.</td>
<td>Traffic held at lights and possibility of stationary traffic.</td>
<td>Traffic removed from Grizebeck.</td>
<td>Increased traffic levels away from receptors.</td>
</tr>
<tr>
<td>Measure 5</td>
<td>Buckhorn Lane Route</td>
<td>- Improved capacity</td>
<td>Improved Safety and Capacity on the route</td>
<td>The preferred route for traffic is west and this moves traffic further away. Involves adjusting a small pinch lane.</td>
<td>This route provides a reliable route for traffic and will provide an economic benefit.</td>
<td>Both pinch points are removed.</td>
<td>Traffic held at lights and possibility of stationary traffic.</td>
<td>Increased traffic levels away from receptors.</td>
</tr>
<tr>
<td>Measure</td>
<td>Description</td>
<td>Economic Growth</td>
<td>Carbon Emissions</td>
<td>SDI &amp; the Regions</td>
<td>Local Environment</td>
<td>Well being</td>
<td>Expected VfM</td>
<td>Category</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
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<td>------------------</td>
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<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Measure 1</td>
<td>On-line widening and traffic signals past the farm.</td>
<td>- Capacity is not improved by limiting flow to one direction.</td>
<td>Traffic held at lights and possibility of stationary traffic</td>
<td>- Issue of farm access to address</td>
<td>No impact on flood zones, minimal additional impermeable area.</td>
<td>Neutral</td>
<td>Scheme provides little benefit. There is no significant accident trend to justify this measure.</td>
<td></td>
</tr>
<tr>
<td>Measure 1a</td>
<td>Partial on-line widening with traffic signals and by-pass Grizebeck from northern bend</td>
<td>Capacity is not improved through the farm and may be reduced by limiting flow to one direction.</td>
<td>Traffic held at lights and possibility of increased traffic flow. By pass of Grizebeck</td>
<td>+ Removes traffic from Grizebeck</td>
<td>Northern link passes through Flood Zone 2 and close to Flood Zone 3 area</td>
<td>Removal of traffic from Grizebeck Improves conditions for residents</td>
<td>Scheme provides little benefit. There is no significant accident trend to justify this measure.</td>
<td></td>
</tr>
<tr>
<td>Measure 2</td>
<td>On-line widening, demolishing farm buildings, widening existing road to 7.3 m and realigning northern bend</td>
<td>+ Improved capacity but still restricted by village.</td>
<td>Reduced congestion around the farm but increase congestion in the village.</td>
<td>- Still goes through Grizebeck</td>
<td>Low amount of additional impermeable area. No conflict with flood zone</td>
<td>Neutral</td>
<td>Some benefit but limited by restrictions in Grizebeck</td>
<td></td>
</tr>
<tr>
<td>Measure 2a</td>
<td>Off-line by-pass of the farm to the east</td>
<td>+ Improved capacity but still restricted by village.</td>
<td>Increased flow through the village will impact on air quality</td>
<td>- Still goes through Grizebeck</td>
<td>Land access required</td>
<td>Away from Flood Zones, large area of additional surfacing created</td>
<td>Creates improved connectivity and reliability</td>
<td></td>
</tr>
<tr>
<td>Measure 3</td>
<td>Off-line by-pass of the farm to the west</td>
<td>+ Improved capacity but still restricted by village.</td>
<td>Increased flow through the village will impact on air quality</td>
<td></td>
<td></td>
<td>Neutral</td>
<td>Some benefit but limited by restrictions in Grizebeck. More costly</td>
<td></td>
</tr>
<tr>
<td>Measure 4</td>
<td>Full bypass East of Farm - New connection to A595 east of Grizebeck, stopping up small junction to east of Grizebeck</td>
<td>+ Improves capacity</td>
<td>Increased traffic levels but away from receptors</td>
<td>+ Improved junction with A595</td>
<td>Route passes through Flood Zone 2, large area of additional surfacing created.</td>
<td>Removal of traffic from Grizebeck Improves conditions for residents</td>
<td>Provides all required benefits but most expensive of schemes.</td>
<td></td>
</tr>
<tr>
<td>Measure 4a</td>
<td>Full bypass - West of farm</td>
<td>+ Improved capacity</td>
<td>Increased traffic levels but away from receptors</td>
<td>+ Removes traffic from Grizebeck</td>
<td>Route passes through a open swale area and close to Flood Zone 3. Also passes through flood zone 2 around Grize Beck</td>
<td>Removal of traffic from Grizebeck Improves conditions for residents</td>
<td>Provides all required benefits but most expensive of schemes.</td>
<td></td>
</tr>
<tr>
<td>Measure 5</td>
<td>Buckhorn Lane Route</td>
<td>+ Improved capacity</td>
<td>Increased traffic levels but away from receptors</td>
<td></td>
<td>Route is away from flood zones but passes through existing farmland.</td>
<td>Removal of traffic from Grizebeck Improves conditions for residents. New route impacts dwellings that are currently not on the main road.</td>
<td>Benefits may be limited by extending the journey length. Costs of impact on dwellings to be considered and remedial to existing road.</td>
<td></td>
</tr>
<tr>
<td>Measure</td>
<td>Description</td>
<td>Implementation Timetable</td>
<td>Practical Feasibility</td>
<td>Financial</td>
<td>Commercial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
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<td>-----------------------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure 1</td>
<td>On-line widening and traffic signals past the farm.</td>
<td>- On-line widening required either side: difficult TM</td>
<td></td>
<td>Capital costs (£)</td>
<td>Revenue Costs (£)</td>
<td>Cost Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- On-line widening required either side: difficult TM</td>
<td></td>
<td>0 - 100k</td>
<td>0 - 100k</td>
<td>Land take required either side of the road</td>
<td>Low risk to scheme costs as online construction with limited land purchase.</td>
<td></td>
</tr>
<tr>
<td>Measure 1a</td>
<td>Partial on-line widening with traffic signals and by-pass Grizebeck from northern bend</td>
<td>- On-line widening required either side: difficult TM</td>
<td></td>
<td>2.5m - 5.0m</td>
<td>0 - 100k</td>
<td>Land take required either side of the road</td>
<td>Low risk to scheme costs as online construction with limited land purchase.</td>
<td></td>
</tr>
<tr>
<td>Measure 2</td>
<td>On-line widening, demolishing farm buildings, widening existing road to 7.3 m and realigning northern bend</td>
<td>- Difficult Construction (adjacent to already narrow road)</td>
<td></td>
<td>1.0m - 2.5m</td>
<td>500k - 1.0m</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Construction of Grizebeck bypass over Grize Beck creates largest area of uncertainty with possible flood measures.</td>
<td></td>
</tr>
<tr>
<td>Measure 2a</td>
<td>On-line widening, demolishing farm buildings, widening existing road to 7.3 m and by-pass Grizebeck from northern bend</td>
<td>- Difficult Construction (adjacent to already narrow road)</td>
<td></td>
<td>2.5m - 5.0m</td>
<td>500k - 1.0m</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Construction of Grizebeck bypass over Grize Beck creates largest area of uncertainty with possible flood measures.</td>
<td></td>
</tr>
<tr>
<td>Measure 3</td>
<td>Offline by-pass of the farm (to the east)</td>
<td>+ Ease of construction</td>
<td></td>
<td>5.0m - 10.0m</td>
<td>250k - 500k</td>
<td>Purchase of multiple packets of land required.</td>
<td>Measure is designed for single purpose, unlikely to require significant repurposing</td>
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<tr>
<td>Measure 3a</td>
<td>Offline by-pass of the farm (to the west)</td>
<td>- Closer to farm</td>
<td></td>
<td>5.0m - 10.0m</td>
<td>250k - 500k</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Measure is designed for single purpose, unlikely to require significant repurposing</td>
<td></td>
</tr>
<tr>
<td>Measure 4</td>
<td>Full bypass East of Farm - New connection to A595 east of Grizebeck, stopping up small junction to east of Grizebeck</td>
<td></td>
<td></td>
<td>15m - £20m</td>
<td>500k - 1.0m</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Large amounts of land purchase and construction required increases uncertainty. Especially over Grizebeck and new connection to A595 west of Grizebeck</td>
<td></td>
</tr>
<tr>
<td>Measure 4a</td>
<td>Full bypass - West of farm</td>
<td></td>
<td></td>
<td>15m - £20m</td>
<td>500k - 1.0m</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Large amounts of land purchase and construction required increases uncertainty. Especially over Grizebeck and new connection to A595 west of Grizebeck</td>
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<tr>
<td>Measure 5</td>
<td>Buckhorn Lane Route</td>
<td></td>
<td></td>
<td>15m - £20m</td>
<td>500k - 1.0m</td>
<td>Purchase of multiple packets of land would be required.</td>
<td>Large amounts of land purchase and construction required increases uncertainty. Especially over Grizebeck and new connection to A595 west of Grizebeck</td>
<td></td>
</tr>
</tbody>
</table>

**Managerial**

- Ease of construction
- Closer to farm

**Financial**

- Large amounts of land purchase and construction required increases uncertainty. Especially over Grizebeck and new connection to A595 west of Grizebeck
- Land take required either side of the road
- Purchase of multiple packets of land required

**Commercial**

- Measure is designed for single purpose, unlikely to require significant repurposing
Appendix C: Scheme plans

Source: AECOM
Appendix D: Environmental assessment

Source: AECOM
<table>
<thead>
<tr>
<th>Table 1: Evaluation of scheme options for A595</th>
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<td><strong>Option</strong>: <strong>2</strong></td>
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<td><strong>Rating</strong>: 1</td>
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<td><strong>Assessment Criteria</strong>: Environmental</td>
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<tr>
<td><strong>Commentary Notes</strong>:</td>
</tr>
<tr>
<td><strong>Commentary Notes</strong>:</td>
</tr>
<tr>
<td><strong>Environment</strong>:</td>
</tr>
<tr>
<td><strong>Option</strong>: <strong>3</strong></td>
</tr>
<tr>
<td><strong>Rating</strong>: 1</td>
</tr>
<tr>
<td><strong>Option</strong>: <strong>4</strong></td>
</tr>
<tr>
<td><strong>Rating</strong>: 2</td>
</tr>
<tr>
<td><strong>Option</strong>: <strong>5</strong></td>
</tr>
</tbody>
</table>
### Road Drainage & Water Environment

This Option would require the development of a new watercourse crossing over the Grize Beck. Whilst relatively short (~400m), the structure will require some form of footing for support which will need to be placed within an area of flood risk. The development of a new impermeable surface and the displacement of flood storage will likely further impact flood risk downstream of the area.

There is a minor stream located south of the property at the proposed offline section of new carriageway - this would require some crossing/ culverting. However otherwise the increases of impermeable surface area are minor.

The development of an entirely new structure through the landscape would change hydrological flow of the area. This includes the development of significant impermeable surface and reduces rainfall storage capacity. The development of the flood storage will be required as well as development within the flood plain. The development of an entirely new structure through the landscape would change hydrological flow of the area. This includes the development of significant impermeable surface and reduces rainfall storage capacity. The development of the flood storage will be required as well as development within the flood plain. The development of an entirely new structure through the landscape would change hydrological flow of the area. This includes the development of significant impermeable surface and reduces rainfall storage capacity. The development of the flood storage will be required as well as development within the flood plain.

### Policies & Plans

Core Policy CS8.1 (Green Infrastructure) specifically notes that watercourses and wetlands should be protected; CS8.2 notes the importance of hedgerows and walls as features of the landscape and also as corridors and habitats for wildlife; Policies CS8.4, CS8.8, CS8.10, CS9.1, CS10.2 will require further consideration within the development of the design.

Core Policy CS8.1 (Green Infrastructure) specifically notes that watercourses and wetlands should be protected; CS8.2 notes the importance of hedgerows and walls as features of the landscape and also as corridors and habitats for wildlife; Policies CS8.4, CS8.8, CS8.10, CS9.1, CS10.2 will require further consideration within the development of the design.

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### Notes:

- **OPTION 2a**
- **OPTION 4**
- **OPTION 5**
- **OPTION 6**

**Notes:**

Core Policy CS8.1 (Green Infrastructure) specifically notes that watercourses and wetlands should be protected; CS8.2 notes the importance of hedgerows and walls as features of the landscape and also as corridors and habitats for wildlife; Policies CS8.4, CS8.8, CS8.10, CS9.1, CS10.2 will require further consideration within the development of the design.
Appendix E: Geotechnical assessment

Source: AECOM
FIGURE 5.1a
GEOLOGY MAP

Client: CUMBRIA COUNTY COUNCIL

Project: GRIZEBECK BYPASS

KEY:
- Indicative Route
- Option 2a
- Option 4
- Option 5
- Option 6

Geological Map Sheet 48 - Ulverstone (Solid & Drift) Presented.
Associated geology key on Figure 5.1b.
FIGURE 5.1b
GEOLOGY KEY

**SOLID INTRUSIVE IGNEOUS ROCKS**

- Microgranite (early - Devonian)
- Basaltic rocks unclassed
- Basaltic Andesite
- Andesitic rocks unclassed
- Dacitic rocks unclassed
- Rhyolitic rocks unclassed

**GEOLOGY KEY**

- Inclined strata, dip in degrees
- Inclined, overturned strata, dip in degrees
- Inclined strata measured underground, dip in degrees
- Inclined, first deformation phase cleavage, dip in degrees
- Inclined, main early Devonian second deformation phase slaty cleavage, dip in degrees
- Inclined, third deformation phase cleavage, dip in degrees
- Inclined, flow-foliation in igneous rocks, dip in degrees
- Inclined welding foliation in pyroclastic rocks, dip in degrees
- Axial plane trace of antcline
- Axial plane trace of syncline

**Key**

- Algal band
- Geological boundary, Solid
- Geological boundary, Drift
- Base of lava flow

- Margin of Eskdale Granodiorite contact metamorphic aureole, towards Intrusion
- Limit of metamorphic alteration, towards metasomatism
- Fault; crossmark on downthrow side
- Fault, arrows indicate relative slip slip movement
- Thrust; barbs on hanging-wall side, circle denotes tip-point where known
- Hematite vein

**Mineral vein**

- Arsenic (As)
- Boron (Bo)
- Copper (Cu)
- Iron (Fe)
- Tungsten (W)
- Borehole

**Mine shaft, abandoned**

**Adit, abandoned**

*Only a selection of shafts and adits are shown on the map for reasons of clarity. Parts of the district contain concentrations of abandoned mine shafts and adits, these are shown component 1:10 000 scale maps.*
This document has been prepared by AECOM for the sole use of our Client (the "Client") and in accordance with generally accepted consultancy principles, the budget for fees and terms of reference agreed between AECOM and the Client.

Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

CUMBRIA COUNTY COUNCIL

FIGURE 5.2
SOIL MAP

KEY:
- Indicative Route
- Option 2a
- Option 4
- Option 5
- Option 6

Soil Type
- 851b, Downholland 2
- 541j, Denbigh 1
- 611c, Manod

Scale at A3: 1:10,000

## Table 4.2 Assessment Information

<table>
<thead>
<tr>
<th>Preferred Option</th>
<th>Geological Mapping</th>
<th>Agricultural Soil Classification</th>
<th>Aquifer Designation</th>
<th>Agricultural Land Classification</th>
<th>Groundwater Source Protection Zones</th>
<th>Minerals</th>
<th>Waste</th>
<th>Flood Zone</th>
<th>SSSI/ SAC/ NNR/ LNR</th>
<th>SSSI Impact Risk Zone</th>
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<tbody>
<tr>
<td></td>
<td>Superficial Bedrock Mass movement Linear Features Artificial Ground Superficial Bedrock</td>
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<tr>
<td>2a Glacial Till</td>
<td>Poolscar Formation - sandstone and argillaceous rocks, interbedded</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Donbigh 1 Downholland 2 Manod</td>
<td>Secondary Undifferentiated Secondary A Unproductive</td>
<td>Secondary B Grades 4 and 5</td>
<td>No</td>
<td>In minerals consultation area and sandstone safeguarding area</td>
<td>Outside waste development area</td>
</tr>
<tr>
<td>4 Glacial Till</td>
<td>Poolscar Formation - sandstone and argillaceous rocks, interbedded</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Donbigh 1 Downholland 2 Manod</td>
<td>Secondary Undifferentiated Secondary A Unproductive</td>
<td>Secondary B Grades 4 and 5</td>
<td>No</td>
<td>In minerals consultation area and sandstone safeguarding area</td>
<td>Outside waste development area</td>
</tr>
<tr>
<td>5 Glacial Till</td>
<td>Poolscar Formation - sandstone and argillaceous rocks, interbedded</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Donbigh 1</td>
<td>Secondary Undifferentiated Unproductive</td>
<td>Secondary B Grades 4 and 5</td>
<td>No</td>
<td>In minerals consultation area and sandstone safeguarding area</td>
<td>Outside waste development area</td>
</tr>
</tbody>
</table>

Note: Data highlighted in **bold** above are discussed further in Section 5.

The Environment Agency (EA) website *What's In Your Back Yard (WIYBY)* map service has closed; and Historic and Authorised Landfill sites data is no longer presented. This data should be purchased as part of an Envirocheck Report (or similar) for the proposed Preliminary Sources Study Report (PSSR) for the preferred option.

The EA has confirmed that there are no licensed groundwater abstractions in the vicinity of the scheme. Private water supplies may be present in the area; Cumbria County Council and South Lakeland District Council will be contacted in the next phase of works (PSSR) for the preferred option to see if either of them hold any information regarding private water supplies.
### Table 4-2. Assessment Information

<table>
<thead>
<tr>
<th>Preferred Option</th>
<th>Geological Mapping</th>
<th>Aquifer Designation</th>
<th>Agricultural Land Classification</th>
<th>Groundwater Source Protection Zones</th>
<th>Minerals</th>
<th>Waste</th>
<th>Flood Zone</th>
<th>SSSI/ SAC/ NNR</th>
<th>SSSI Impact Risk Zone</th>
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<td></td>
<td>Superficial</td>
<td>Bedrock</td>
<td>Mass movement (Landslip)</td>
<td>Linear Features (faults)</td>
<td>Artificial Ground</td>
<td>Superficial</td>
<td>Bedrock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Glacial Till</td>
<td>Yes</td>
<td>No</td>
<td>Postiscar Formation – sandstone and argillaceous rocks, interbedded. Lake District Devonian Minor Intrusion Suite (Microgranite)</td>
<td>No</td>
<td>Yes – a former quarry is shown below the northern section of the proposed road. Artificial ground may be present if the quarry has been filled.</td>
<td>Denbigh 1 Downholland 2 Manod</td>
<td>Secondary</td>
<td>Secondary B</td>
<td>Grades 3 and 4</td>
</tr>
</tbody>
</table>

Note: Data highlighted in **bold** above are discussed further in Section 5.

The Environment Agency (EA) website What’s in Your Back Yard (WIYBY) map service has closed; and Historic and Authorised Landfill sites data is no longer presented. This data should be purchased as part of an Envirocheck Report (or similar) for the proposed Preliminary Sources Study Report (PSSR) for the preferred option.

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