

Carlisle Southern Link Road

TAG Part 1 / DMRB Stage 1 Report
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1. Executive summary

- 1.1.1 Carlisle City Council is developing their Local Plan for the Carlisle district. The Local Plan details the necessary development in the Carlisle district for the period from 2015 to 2030. To meet its longer term requirements, the Local Plan identifies the need for a major mixed-use development area in South Carlisle. This area would provide a supply of development land beyond the end of the plan period and could accommodate as many as 10,000 new homes alongside new community facilities, schools and strategic employment opportunities.
- 1.1.2 To accommodate forecast levels of trip demand from South Carlisle and to improve strategic east to west connectivity, a transport infrastructure intervention will be necessary.
- 1.1.3 The methodology agreed with the Client in relation to this study combines the processes of Stage 1 Transport Analysis Guidance (TAG) and study specific activities identified in the Client's Brief. The basic process follows closely the TAG recommendations and considers current and future contexts, the need for intervention, confirms the intervention objectives, generates and sifts potential options to produce a preferred option, and provides an assessment of options for the delivery of the preferred option.
- 1.1.4 The key need for intervention is the need to consider additional transport infrastructure to support the emerging and substantial growth proposals to the south of the current urban boundary.
- 1.1.5 The existing and future contexts of travel in Carlisle have been reviewed. The existing transport network in Carlisle shows some evidence of operating close to or over capacity at a number of locations, and there are a number of air quality issues at various locations on the highway network. Future demand for travel will be driven by proposals in the Carlisle Local Plan and major proposed infrastructure schemes in West Cumbria.
- 1.1.6 The key intervention objectives are:
- Enable development at Carlisle South
 - Reduce congestion on southern radial routes and in the city centre
 - Assist east/west movement
- 1.1.7 A number of schemes which could meet the intervention objectives have been considered in recent history in Carlisle. Potential intervention options were produced by reviewing previous studies and proposed schemes. The following options were proposed:
- Carlisle Southern Link Road
 - On-line highway improvements on radial routes and in the city centre
 - Sustainable transport improvements
 - Park and ride
 - Light rail

- 1.1.8 A sifting exercise was undertaken to assess the generated scheme options. The schemes were assessed using the Department for Transport's Early Assessment and Sifting Tool (EAST). The sifting exercise identified the Carlisle Southern Link Road as the preferred option as it would meet all of the scheme objectives and would most successfully support development at south Carlisle.
- 1.1.9 After the southern link road was identified as the preferred option, a range of possible route corridors which are likely to achieve the scheme objectives were developed. These included historical options previously developed by the then Highways Agency.
- 1.1.10 A second sifting exercise was then undertaken using EAST to identify any 'showstoppers' which are likely to prevent an option progressing at a subsequent stage in the process. The workshop identified three potential routes for further development and assessment, and indicative route plans are included in Appendix A. These routes are identified by the following names:
- Green route
 - Blue route
 - Pink route
- 1.1.11 The three potential routes were subjected to an engineering assessment. This considered factors including potential design standards, junctions, topography, geology and ground conditions, hydrology, utilities, structures and indicative route design. A number of constraints for each route were identified, mainly related to the crossing of the railways and rivers.
- 1.1.12 The three potential routes were also subjected to an environmental assessment. This considered factors including noise, air quality, landscape and visual, the historic environment, nature conservation, the water environment and outdoor access and recreation. A number of adverse impacts were identified for each route, with the crossing of the Caldew valley likely to have the largest environmental impact which would need to be mitigated.
- 1.1.13 The traffic impacts of the southern link road were assessed. This considered the results of an indicative modelling study of one route, and an indicative economic assessment of the scheme. The results of this assessment concluded that the scheme could achieve good value for money.
- 1.1.14 The planning impacts of the preferred option were also considered. This considered relevant national, regional and local planning policies and the key planning issues to be considered when assessing the choice of route.
- 1.1.15 The deliverability of the potential route options were also considered. This considered indicative costs, risks and delivery options, including a delivery programme, for the scheme.
- 1.1.16 The appraisal of the above impacts for all three route options is then summarised. All three options have different impacts, strengths and weaknesses and no single option can be considered to be preferred at this stage.

- 1.1.17 Given the limited nature of this assessment, the unknown outcome of the ongoing South Carlisle masterplanning exercise and limited modelling proportionate to the stage of preparation of Carlisle South and exploration of a link road has taken place it is recommended that all three potential route options are taken forward for consideration at Stage 2. The routes identified should be considered at this stage as route corridors and as such should be seen as being flexible in their horizontal alignment except at tie-ins to existing infrastructure and pinch points.
- 1.1.18 A TAG Stage 2 and DMRB Stage 2 appraisal should commence following the acceptance of this Stage 1 report by Cumbria County Council and Carlisle City Council. This should be aligned as far as is possible with the ongoing masterplanning work for Carlisle South and would enable the progression of the design and delivery of the scheme.
- 1.1.19 An Appraisal Specification Report has also been produced, which includes a proposed methodology for the transport modelling to support the appraisal, as well as the methodologies for appraising the economic, environmental and social impacts of the scheme. The acceptance and agreement of the methodologies in this report by key stakeholders and potential scheme funders is key to ensuring the scheme appraisal is appropriate. The report contains recommendations for ensuring the transport modelling to support the appraisal of the scheme is fit for purpose.

2. Study background and objectives

2.1 Study background

- 2.1.1 Carlisle City Council is in the process of developing their Local Plan for the Carlisle district. The Local Plan details the sites which will deliver the necessary housing, employment, retail and leisure development in the Carlisle district for the period from 2015 to 2030.
- 2.1.2 To meet its longer term requirements, the Local Plan identifies the need for a major mixed-use development area in South Carlisle, the delivery of which would commence following the production of a Development Plan Document including an infrastructure delivery strategy. Delivery of development in this area would extend beyond the end of the plan period of 2030 and would provide longer term continuity in the supply of development land to enable the growth of Carlisle. When completed it is anticipated that this major mixed-use development could accommodate as many as 10,000 new homes alongside new community facilities, schools and strategic employment opportunities.
- 2.1.3 This scale of development will have significant infrastructure implications, including increased pressure on the existing road network. In particular, the existing southern radial routes are forecast to suffer from congestion in the future. These routes are constrained, preventing further improvements above what has been identified within the Carlisle Transport Improvements study (Parsons Brinckerhoff, February 2015) without significant investment. In addition, the only existing routes for traffic travelling between south Carlisle and the west are via the congested city centre, or a long poor-quality rural route through Dalston. Access to the east and the motorway is also constrained by poor quality junctions on Newbiggin Road which are unsuitable for significant levels of development traffic. Providing improvements for travel between the south of Carlisle and the city centre, as well as reducing forecast congestion on radial routes and in the city centre will require further intervention. Appropriate mitigation is therefore required to support the full realisation of development at Carlisle South.
- 2.1.4 Carlisle also fulfils an important role as a strategic transport hub for the wider sub-region. The provision of a quality link between the east and west is important given the scale of the nationally significant energy and employment proposals along the west coast of Cumbria. There is a need to link these with the labour pool and supply chain, to support delivery of the proposals and to ensure wider economic benefits are maximised.
- 2.1.5 To accommodate forecast levels of trip demand from South Carlisle and to improve strategic east to west connectivity, a transport infrastructure intervention will be necessary.

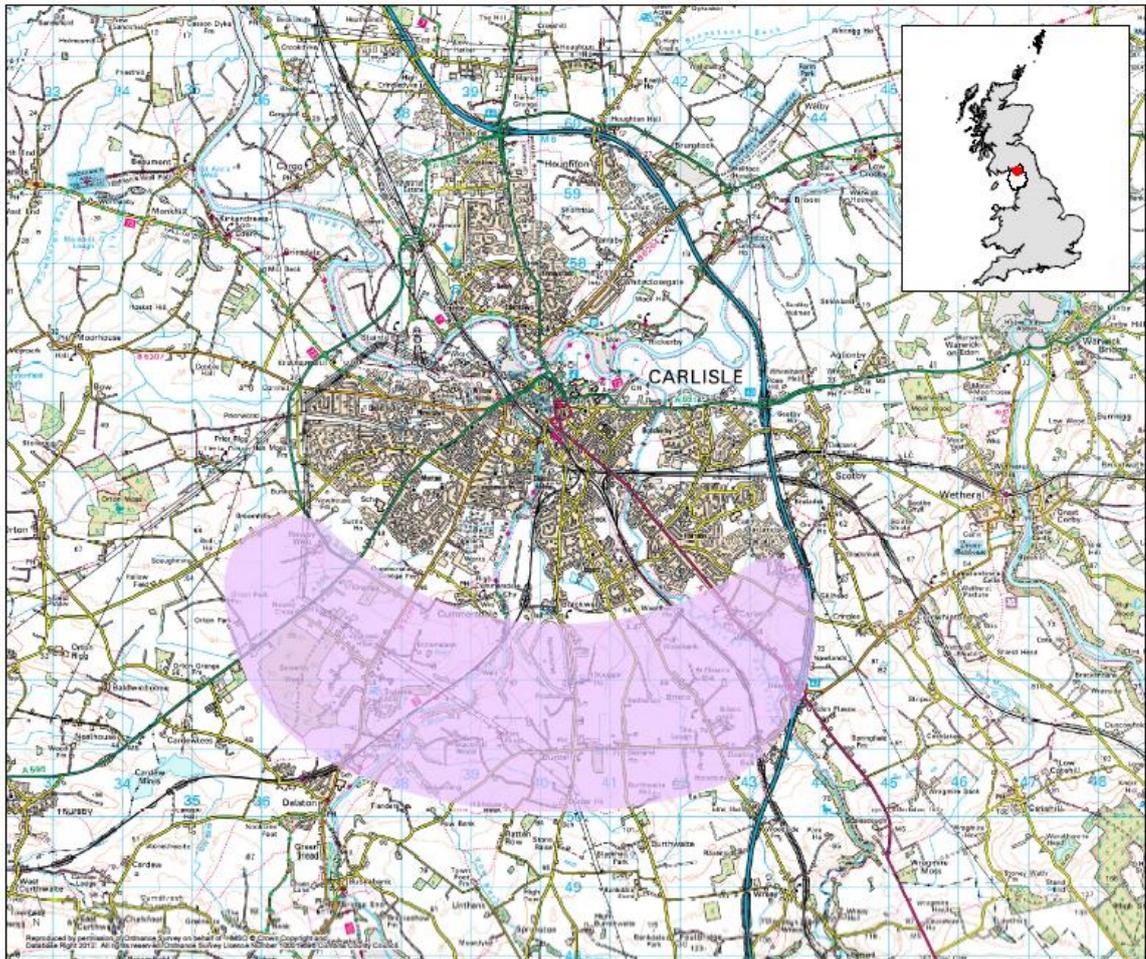
2.2 Objectives

2.2.1 The intervention specific objectives are discussed further in the body of the report. However, those initially provided by the Client are:

- Enable development at Carlisle South;
- Reduce congestion on southern radial routes and in the city centre; and
- Assist east/west movement.

2.2.2 The broad area of Carlisle South that could accommodate a major mixed-use development is shown in Figure 2.1.

Figure 2.1 Location plan



3. Methodology

3.1 Introduction

3.1.1 The methodology agreed with the Client in relation to this study combines the processes of Stage 1 Transport Analysis Guidance (TAG) and study specific activities identified in the Client's Brief.

3.1.2 The basic process follows closely the TAG recommendations and is set out below:

- 1) Understand current and interim contexts
- 2) Understand future context
- 3) Establish need for intervention
- 4) Confirm intervention specific objective
- 5) Confirm geographical location
- 6) Option generation
- 7) Initial option sift
- 8) Preferred option – potential solutions assessment including:
 - a. Generation of feasible options and solutions
 - b. Deliverability of scheme
 - c. Impacts
 - d. Delivery options
 - e. Potential funding sources
 - f. Land ownership patterns

3.1.3 Stage 1 Option Development involves identifying the need for intervention and developing options to address a clear set of locally developed objectives which express desired outcomes. These are then sifted for the better performing options to be taken on to further detailed appraisal in Stage 2.

3.1.4 The methodology and scope of the appraisal to be undertaken in Stage 2 is outlined in the accompanying draft Appraisal Specification Report (ASR) which is included as Appendix J to this report. It is recommended that the ASR is reviewed and updated once further information is available on the masterplan for Carlisle South.

4. Stakeholder consultation

- 4.1.1 At the request of the Client limited engagement with stakeholders took place during this study. During the initial option generation process this involved Officers from Cumbria County Council and Carlisle City Council.
- 4.1.2 During the preferred option assessment process engagement took three forms:
- Information provision, which involved the collection of data from key stakeholders including the Environment Agency, Natural England and Historic England;
 - Consultation, where the views of Officers from the County and City Council were sought on existing highway infrastructure and planning policy; and
 - Participation, through workshops where Local Area Committee Members and Officers from the County Council and Officers from the City Council were invited to have a direct influence on the outcome of the study.
- 4.1.3 The outcomes of this preliminary stakeholder engagement were used to help define the spatial extents of possible routes and intervention specific objectives.

5. Context and need for intervention

5.1 Introduction

- 5.1.1 As discussed in Section 1, consideration of the need for additional transport improvements in the city has stemmed from the emerging and substantial growth proposals to the south of the current urban boundary. This major mixed-use development will form the basis of the next phase of Carlisle's growth opportunities beyond the site specific allocations provided within the emerging new Local Plan. Whilst this is the future context of any intervention, it is also important that the existing context is also considered in the appraisal process insofar as it will influence any future proposals.

5.2 Existing and interim context

- 5.2.1 The emerging Carlisle District Local Plan, 2015–2030 excluding the strategic growth area in Carlisle South, contains allocations designed to continue the managed growth of the city in a sustainable manner. In order to facilitate the delivery of these allocations and move towards the aspiration of a modal shift in travel modes away from the private car, additional transport and movement improvements have been proposed. These are set out in the Carlisle Transport Improvement Study 2015 and, in summary, comprise a suite of sustainable transport improvements plus a number of improvements to highways and junctions which will improve the traffic capacity of the existing network.

Existing policies

- 5.2.2 Cumbria County Council are the local highway authority for Cumbria. The aims of Cumbria County Council are contained within the Council Plan, which sets out the council's priorities. A key priority of the council is to provide safe and well maintained roads and an effective transport network by maximising new investment and working to improve infrastructure.
- 5.2.3 The Cumbria Local Transport Plan is the statutory document that sets out how travel within Cumbria is to be managed. A key part of the current plan is the strategy for each area of Cumbria for the period 2011 to 2026. For Carlisle, the key priority is to encourage development that supports the city's economy, including its role as a housing growth point and a key employment area. Key transport outcomes detailed in the plan include reducing traffic congestion and improving journey time reliability.
- 5.2.4 The Cumbria Local Enterprise Partnership (LEP) is a voluntary partnership between Cumbria's local authorities and businesses. The Cumbria LEP provides a strategic lead in all activities contributing to the growth and vibrancy of Cumbria's economy.

- 5.2.5 As part of this, the Cumbria LEP launched its strategic economic plan, the *Four pronged attack*, on how the county's economy can deliver jobs, business growth, improved skills and infrastructure, homes and other economic benefits over the next 10 years. One of the four 'prongs' recognises the strategic connectivity of the M6 corridor as key to securing economic growth, with excellent transport links and key settlements, including Carlisle, along its length. It highlights that the emerging Carlisle Local Plan could deliver 6,300 new homes in the district.
- 5.2.6 The strategic economic plan also identifies the key drivers which require investment to secure economic growth across the region. One of these drivers is infrastructure improvements, a key part of which is transport infrastructure improvements. The strategic economic plan therefore details some of the transport infrastructure improvements required in the short term to secure new housing and jobs in Carlisle.
- 5.2.7 The Cumbria LEP and Cumbria County Council have also produced the Cumbria Infrastructure Plan. This plan is essential in identifying and prioritising major investment across the county, and will help form the evidence base of required infrastructure to support and grow the Cumbrian economy over the short, medium and long term. The plan identified the Carlisle Southern Link Road as a medium term priority for delivery.
- 5.2.8 Carlisle City Council are responsible for air quality monitoring and pollution control within the Carlisle district. Within the city of Carlisle, there are six Air Quality Management Areas (AQMAs).
- 5.2.9 In the context of this study, the relevant AQMAs include:
- Currock Street, between the Rome Street and Crown Street junctions
 - Bridge Street, between Bridge Lane and Melbourne Street
 - London Road, between the Close Street and Grey Street junctions
 - Dalston Road, between John Roberts Gardens and the old Thomas Armstrong access
 - Wigton Road, between Crummock Street and Ashley Street and Caldcoates between Church Street and Port Road Industrial Estate
- 5.2.10 The 2014 progress report is the most recent report and provides updates on air quality monitoring in Carlisle. The results in the report for nitrogen dioxide show that the Currock Road site adjusted annual mean concentration results for 2012 and 2013 are just below the objective level of 40 µg/m³. The results for the Dalston Road site show the site remaining over the objective level from 2006–2013. The results for London Road also show levels just below the objective for 2013, having previously exceeded it in 2012. There are various sites on Wigton Road which show improved results, although still just below the objective level, in 2013. Results for Bridge Street show exceedances of the objective level since 2006, although these have shown a general decline. Recent improvements in air quality are almost certainly linked to the opening of the Carlisle Northern Development Route (CNDR) in 2012, which has resulted in reductions in traffic flow on Scotland Road and Wigton Road.

Existing transport network

- 5.2.11 The city of Carlisle is Cumbria's only city and is the region's largest urban settlement as well as an important employment centre. The city centre is a key attractor in retail and leisure terms, and its regional catchment caters for almost half a million people.
- 5.2.12 The city has excellent strategic transport links, being located on the M6 motorway and A69 trunk road, as well as the West Coast Main Line and additional rail links to Edinburgh, Newcastle, west Cumbria, Leeds and southwest Scotland.
- 5.2.13 The key radial route to the city centre from the south is along London Road. London Road is a single carriageway road with one lane in each direction for the majority of its length. There are a number of signalised junctions along London Road, and these are anecdotally known to be operating close to capacity in the peak periods towards the city centre, causing queuing and delays.
- 5.2.14 Currock and Upperby link to city centre along Currock Road and Blackwell Road. Currock Road is a single carriageway road with on-street parking along both sides at its southern end. A major constraint along this route is the railway bridge, which has a 90-degree turn immediately to its north. Blackwell Road is also a single carriageway road with on-street parking along both sides.
- 5.2.15 Whilst there are no known capacity issues along most of these of these routes at present, the on-street parking restricts traffic flow with traffic operating in informal priority arrangements. Towards the northern end of these routes, at the Currock Road/Crown Street and London Road/St Nicholas Street junctions, traffic flows become heavier and delays increase.
- 5.2.16 Travel between east and west, particularly for long-distance trips from the north and east, has been greatly enhanced following the opening of the CNDR to the northwest of Carlisle. However, within the city, travel between the east and west is greatly constrained by a limited number of crossings of the river Caldew. The only existing crossings of this river within the Carlisle urban area are on Bridge Street and Nelson Bridge.
- 5.2.17 Bridge Street is an urban dual carriageway running between the Hardwicke Circus signalised roundabout and the large signalised junction with Shaddongate and Sainsbury's supermarket, and a roundabout with Wigton Road. Nelson Bridge is a single carriageway road with two lanes in each direction. It provides a critical highway link between west Carlisle and the city centre and south Carlisle. It has signalised junctions at either end, both of which are constrained by steep uphill gradients and large traffic flows. The bridge was widened in 2005 to provide an additional inbound lane of traffic.
- 5.2.18 There is one further crossing of the Caldew, via a rural route linking Durdar to Dalston to the south of Carlisle. This rural route is inappropriate for significant volumes of traffic, has a weight limit of 7.5 tonnes and the eastern junction with Durdar Road has very poor visibility for traffic turning from the minor road.

- 5.2.19 A number of bus routes run within Carlisle, with the majority of services provided by Stagecoach. A summary of the main urban services is provided below in Table 5.1. The key services between the city centre and south Carlisle are the 60/60A, 61/61A and 67.

Table 5.1 Key Carlisle urban bus services

Service	Route	Frequency
60	Sandsfield Park – Harraby	Every 20 mins
61/61A	Morton West – Harraby East	Every 8 mins
62	Morton Park – Kingmoor Park	Every 15 mins
67	Belle Vue – Upperby	Every 10 mins
76	St Anns Hill - Durranhill	Every 15 mins

(source: Stagecoach)

- 5.2.20 Bus priority measures have been implemented in the inbound direction between the Eastern Way and London Road Retail Park. These take the form of a dedicated bus lane, and a signalised junction with bus priority at the retail park access.

Existing travel patterns

- 5.2.21 Data from the 2011 census illustrates the existing mode split for journeys to work in the Carlisle district and is shown in Table 5.2. The results show that Carlisle has a high proportion of walking trips compared to the English average, which is probably due to its relatively compact geographic size. Rail usage is below average, and car use is around the average.

Table 5.2 2011 census journey to work data

Mode of travel	Carlisle urban	Carlisle district	England
Work at home	7%	10%	5%
Metro / light rail	0%	0%	4%
Train	1%	1%	5%
Bus	8%	7%	7%
Taxi	0%	0%	1%
Motorcycle	1%	1%	1%
Car driver	54%	57%	57%
Car passenger	7%	6%	5%
Bicycle	3%	3%	3%
On foot	19%	15%	11%
Other	0%	0%	1%

(source: Nomis)

- 5.2.22 Traffic data used in the validation of the Carlisle transport model is presented in tables to provide a summary of peak hour traffic flows on key links to the south of Carlisle.

Table 5.3 Botchergate traffic flows

Time	Northbound	Southbound
Morning peak (08:00–09:00)	667	663
Evening peak (17:00–18:00)	605	935

(source: Carlisle transport model LMVR)

- 5.2.23 The results for Botchergate highlight that this is a busy radial route. The southbound flow in the evening peak is of the same order as the expected link capacity for a single carriageway urban road.

Table 5.4 James Street traffic flows

Time	Northbound	Southbound
Morning peak (08:00–09:00)	813	804
Evening peak (17:00–18:00)	820	858

(source: Carlisle transport model LMVR)

- 5.2.24 The results for James Street highlight that this is a busy radial route. The traffic flow in both peak periods is approaching the expected link capacity for a single carriageway urban road, and highlights why there is an air quality management area in this location.

Table 5.5 Currock Road traffic flows

Time	Northbound	Southbound
Morning peak (08:00–09:00)	364	552
Evening peak (17:00–18:00)	626	443

(source: Carlisle transport model LMVR)

- 5.2.25 The results for Currock Road show it is a relatively busy road. The flows are approaching the expected capacity of the Currock Road/Crown Street mini-roundabout at its northern end.

Table 5.6 Upperby Road traffic flows

Time	Northbound	Southbound
Morning peak (08:00–09:00)	312	250
Evening peak (17:00–18:00)	269	436

(source: Carlisle transport model LMVR)

- 5.2.26 The results for Upperby Road show that whilst the road is busy for a residential area, the route is typically operating under capacity.
- 5.2.27 Trafficmaster data provides historical journey time data collected via a fleet of compatible GPS-enabled vehicles. Trafficmaster data was used in the production of the Carlisle transport model and summary journey times for key routes was provided in the associated Local Model Validation Report. These results are summarised below in Table 5.7.

Table 5.7 Trafficmaster journey time results

Route	Length (km)	Morning peak (08:00–09:00)		Evening peak (17:00–18:00)	
		Time (s)	Speed (kph)	Time (s)	Speed (kph)
CNDR northbound	8.38	562	53.7	507	59.5
CNDR southbound	7.95	491	58.3	503	56.9
Wigton Rd eastbound	3.97	471	30.3	451	31.7
Wigton Rd westbound	4.00	367	39.3	418	34.5
Scotland Rd northbound	3.55	413	30.9	381	33.6
Scotland Rd southbound	3.54	433	29.4	410	31.1

Route	Length (km)	Morning peak (08:00–09:00)		Evening peak (17:00–18:00)	
		Time (s)	Speed (kph)	Time (s)	Speed (kph)
Warwick Rd eastbound	2.88	348	29.8	463	22.4
Warwick Rd westbound	2.88	525	19.8	412	25.2
London Rd northbound	5.15	610	30.4	665	27.9
London Rd southbound	5.17	604	30.8	702	26.5

Source: Carlisle Transport Model LMVR, Cumbria County Council, February 2015

- 5.2.28 The journey times in Table 5.7 show that there is considerable delay on Warwick Road and London Road, with peak hour speeds below 30 kph. The speeds on Wigton Road and Scotland Road are higher, reflecting the impact of the opening of the CNDR.

5.3 Future context

Carlisle District Local Plan

- 5.3.1 The Carlisle District Local Plan 2001-2016 is the current adopted local plan for Carlisle. However, the proposed delivery timetable for the major mixed use development and associated supporting elements are beyond the life of this document and it is therefore the emerging Carlisle District Local Plan 2015-2030 that will guide the consideration of the proposal. This Plan has been submitted to the Government for Examination in Public and, at the time of writing, this process is still ongoing. Through this process the broad policy basis of the proposal will be tested as the Plan contains policies that support its development.
- 5.3.2 Strategic Policy SP3 within the draft plan gives a clear way forward in determining the scale and content of the mixed use development and the supporting infrastructure required to deliver it. It specifically refers to the need for “*infrastructure including highways and transportation*”. The Policy, as it currently stands, contains few details and rather places emphasis on the production of a comprehensive masterplan for the area which will include an infrastructure delivery plan.
- 5.3.3 The masterplan, in guiding the scale and content of the mixed use development, will determine the type and number of new homes, the type and size of the employment land and need for other uses. It will also determine the timing and phasing of all elements including the transport infrastructure. The Local Plan is scheduled for adoption in autumn 2016 and the preparation of the masterplan is anticipated to start early in 2017. Full consideration of the transport implications and required improvements, as a fundamental element within the masterplan, will need to inform and run in parallel with this process.
- 5.3.4 Therefore, the consideration of the major mixed use development and preparation of the masterplan will be fundamental drivers in justifying the need for, and assessing the delivery timescale of, any associated transport infrastructure changes and/or improvements.

Proposed major developments in West Cumbria

- 5.3.5 There are a number of significant current and proposed developments in West Cumbria. The major current employer is Sellafield, a nuclear fuel reprocessing and nuclear decommissioning site, which employs over 10,000 people. There are a number of ongoing projects in Sellafield and the nearby Low Level Waste Repository in Drigg.
- 5.3.6 The largest proposed development in west Cumbria is the proposed new 3.4 GW nuclear power station at the Moorside site, located to the north of Sellafield, which could generate seven per cent of the UK's future electricity requirements. The Moorside project is a nationally significant infrastructure project and is expected to cost around £16bn. Nugen is currently working on the Moorside project for a new nuclear power station, along with associated development such as transport infrastructure improvements, logistic facilities and worker accommodation. Project construction is anticipated to generate up to 21,000 jobs in the UK, with up to 6,000 people employed on site. Operation of the power station could employ over 1,000 people for around 60 years. The increase in local expenditure will also benefit the local and Cumbrian economy.
- 5.3.7 Linked to the Moorside project is National Grid's proposed upgrade of the west Cumbria high voltage lines, which is also a nationally significant infrastructure project. This will link the Moorside power station to the wider grid, provide additional capacity of other energy generating projects in Cumbria, and ensure a resilient electricity distribution network.
- 5.3.8 West Cumbria Mining is also currently exploring opportunities and investing in development plans for the creation of a coking coal mine off the coast near Whitehaven in west Cumbria.

Future transport network

- 5.3.9 As part of the Carlisle Local Plan process, Cumbria County Council considered the transport impacts of the local plan in a transport modelling study using the Carlisle transport model. The study assesses the cumulative impacts of local plan development by considering the changes to traffic flows, delays and congestion via the ratio of flow to capacity.
- 5.3.10 The study results show that the Carlisle Local Plan proposals would increase congestion in Carlisle when compared to the existing operation of the network, with journey times increasing on key routes in the city. Development at south Carlisle towards the end of the plan period was forecast to further increase congestion and journey times, particularly on London Road.
- 5.3.11 As a follow on to the local plan modelling, a study was undertaken to identify necessary infrastructure improvements to support the Carlisle Local Plan. The Carlisle Transport Improvements study was based on output from the modelling study completed and forms a key part of the local plan evidence base.

- 5.3.12 The improvements study identified a package of sustainable transport and highway improvements which would support the delivery of local plan development and mitigate the transport impact of this development. The sustainable transport improvements include new cycling routes linking development sites to the existing cycle network, and public transport improvements to upgrade bus stops and service frequencies. The highway improvements focussed on capacity upgrades at key junctions throughout the network to reduce congestion and delay.
- 5.3.13 It is intended that the improvements package would be implemented over the course of the plan period, with a number of prioritised improvements delivered sooner to encourage development. The improvements would be funded through a combination of developer contributions and the Cumbria LEP's growth fund. The potential for investment in the improvements package is clearly stated in the LEP's strategic economic plan.
- 5.3.14 Cumbria County Council are currently progressing a number of major transport schemes throughout the county through devolved major scheme funding provided by the Department for Transport to the Cumbria Local Transport Body. One of these schemes is Currock Bridge in Carlisle, which links the wards of Currock and Upperby to Denton Holme across the Cumbrian Coast railway line. The bridge will replace an existing footbridge with an enhanced environment for both pedestrians and cyclists and will link into the Caldew cycleway. This scheme will also increase the sustainability of development at south Carlisle.

Future travel patterns

- 5.3.15 The TEMPRO software with the National Trip End Model (NTEM) dataset 6.2 (released 2011) contains forecasts on changes in population, households and employment. The dataset has been interrogated to determine reference case forecasts in the Carlisle district from 2015 to 2030 and is presented in Table 5.8 and Table 5.9.

Table 5.8 Carlisle district 2015 data

Name	Population				HHs	Jobs	Workers
	< 16	16–64	65+	Total			
Carlisle	17811	67355	20941	106107	50079	62002	5632
rural (Carlisle)	4929	18830	5832	29591	13041	11529	1602
Carlisle	12106	45794	14078	71979	34829	48979	38025
Brampton nr Carlisle	776	2731	1031	4538	2209	1494	2276

Source: TEMPRO version 6, National Trip End Model version 6.2

Table 5.9 Carlisle district changes from 2015–2030

Name	Population				HHs	Jobs	Workers
	< 16	16–64	65+	Total			
Carlisle	1038	599	7290	8926	7450	-1030	972
rural (Carlisle)	1076	2609	2779	6464	3778	-100	2220
Carlisle	-152	-2315	4058	1591	3098	-930	-1525
Brampton nr Carlisle	113	304	453	871	574	0	277

Source: TEMPRO version 6, National Trip End Model version 6.2

- 5.3.16 The data shows that there is a forecast increase in population across the Carlisle district, although this is mainly due to an increase in the elderly population. There is a forecast decrease in the working age population within Carlisle, but a significant increase in the rural Carlisle area. There is also a corresponding forecast increase in the number of households across the district.
- 5.3.17 It should be noted that the Carlisle urban boundary in the NTEM dataset tightly follows the existing urban boundary, and hence there are existing sites with planning permission, such as South Morton, which would be classed as residing in the 'rural' area in the NTEM dataset. Similarly, the whole of the South Carlisle area is also considered as 'rural'.
- 5.3.18 The data shows that there is a forecast decrease in jobs across the Carlisle district, with the majority of this decrease in Carlisle city itself. However, there is a forecast increase in workers across the district, showing an increase in commuting trips outside of the district boundary.
- 5.3.19 It should be noted that the current NTEM dataset is old, having been released in 2011. The population estimates are based on those made in 2008, and the distribution of employment and workers has a base year of 2001. A new NTEM dataset is proposed to be released by the Department for Transport in 2016, and the updated results from the new dataset should be considered when it is released.
- 5.3.20 The sites identified in the local plan provide the potential for growth which is higher than anticipated in the NTEM data forecasts. The local plan identifies a housing requirement of 565 dwellings per annum, based on the findings of the Carlisle Strategic Housing Market Assessment.
- 5.3.21 The local plan has identified a number of sites in and around the south of Carlisle which are anticipated to be completed by around 2025. A summary of these sites and an estimate of their expected peak traffic generation is provided overleaf.

Table 5.10 Carlisle Local Plan development sites in south of Carlisle

Ref	Site	Size	Approx. peak hour traffic
U3	Site of Pennine Way primary school	112 dwellings	70
U4	Land north of Moorside Drive/Valley Drive	140 dwellings	90
U5	Land between Carleton Road and Cumwhinton Road	204 dwellings	130
U13	Land east of Beverley Rise	30 dwellings	20
U14	Land north of Carleton Clinic	189 dwellings	120
Total		675 dwellings	430

Source: Carlisle Local Plan transport modelling report

- 5.3.22 The figures above show the forecast traffic generation from residential sites identified in the plan to the south of Carlisle. The schemes identified in the improvements study should help to mitigate the impact of this traffic, but the radial routes into the city from the south and east will still remain constrained and congested.
- 5.3.23 In addition to these sites, a major mixed-use development is anticipated in south Carlisle. The local plan identifies that delivery of this development could start following the adoption of a Development Plan Document including a comprehensive infrastructure delivery strategy. For the purposes of the preliminary transport modelling, development in south Carlisle was assumed from 2025 at a rate of around 565 dwellings and 8,000 square metres of employment per annum. This assumption will be further refined as the masterplanning process is completed.
- 5.3.24 It should be noted that not all of the trips detailed below will be new trips to the network, but it gives an indication of the scale of development proposed at south Carlisle in traffic terms.

Table 5.11 Carlisle Local Plan south Carlisle development

Ref	Site	Size	Approx. peak hour traffic
S1	South Carlisle 2025–2030 residential	2,825 dwellings	1,775
S2	South Carlisle 2025–2030 employment	40,000 sqm	275
S3	South Carlisle 2030–2040 residential	5,650 dwellings	3,550
S4	South Carlisle 2030–2040 employment	80,000 sqm	550
Total		8,475 dwellings 120,000 sqm	6,150

Source: Carlisle Local Plan transport modelling report

5.4 Identified need for intervention

- 5.4.1 The review of the existing transport network and travel patterns show that there are a number of constraints on the southern radial routes and in particular on London Road, with traffic flows at levels around the usual link capacity and slow average speeds. In addition to this, there are a number of AQMAs where air quality is poor due to traffic emissions.

- 5.4.2 Travel between the east and west of the city is constrained by the river Caldew as there are only two crossings of the river, on Bridge Street and Nelson Bridge. This means traffic has to travel through congested junctions in and around the city centre. It also causes significant resilience issues as the closure of one of the bridges would lead to severe impedances to travel. The impact of such resilience issues was particularly evident after the significant flooding in December 2015, where the closure of Eden Bridge due to safety concerns resulted in significant diversions and delays and cut off pedestrian access between the north and the city centre.
- 5.4.3 The Carlisle Local Plan identifies a number of development sites to the south of Carlisle, as well as a broad location of growth for a major mixed-use development towards the end of the plan period. Study work has shown that congestion is likely to increase as a result of the local plan development, and whilst transport improvements have been identified to support this development, there are still numerous constraints on routes from the south of the city.
- 5.4.4 The development of south Carlisle is to be guided by a Development Plan Document, which would contain a site masterplan and infrastructure delivery strategy. A key part of the masterplan will be ensuring the development is sustainable, for example by linking into existing sustainable transport infrastructure like the Currock Bridge major scheme. However, development would generate a significant amount of traffic and place significant pressures on the already constrained southern radial routes.
- 5.4.5 If Carlisle wishes to see continued growth ambitions which ultimately lead towards the major mixed-use development at south Carlisle, there is a need to provide the transport infrastructure to deliver this development. This infrastructure should achieve this objective by alleviating the congestion and improving both journey times and reliability on the southern radial routes and in and around the city centre. The provision of improved links for east/west travel will also help Carlisle take full advantage of the wider economic benefits that the proposed major infrastructure projects in west Cumbria will bring to the rest of the county.

6. Intervention objectives

6.1 Objectives

- 6.1.1 In order to begin the option generation process a set of strategic objectives, along with their associated predicted outcomes, were defined based on the Client's brief and preceding analysis. These are set out in Table 6.1 below.

Table 6.1 South Carlisle intervention objectives

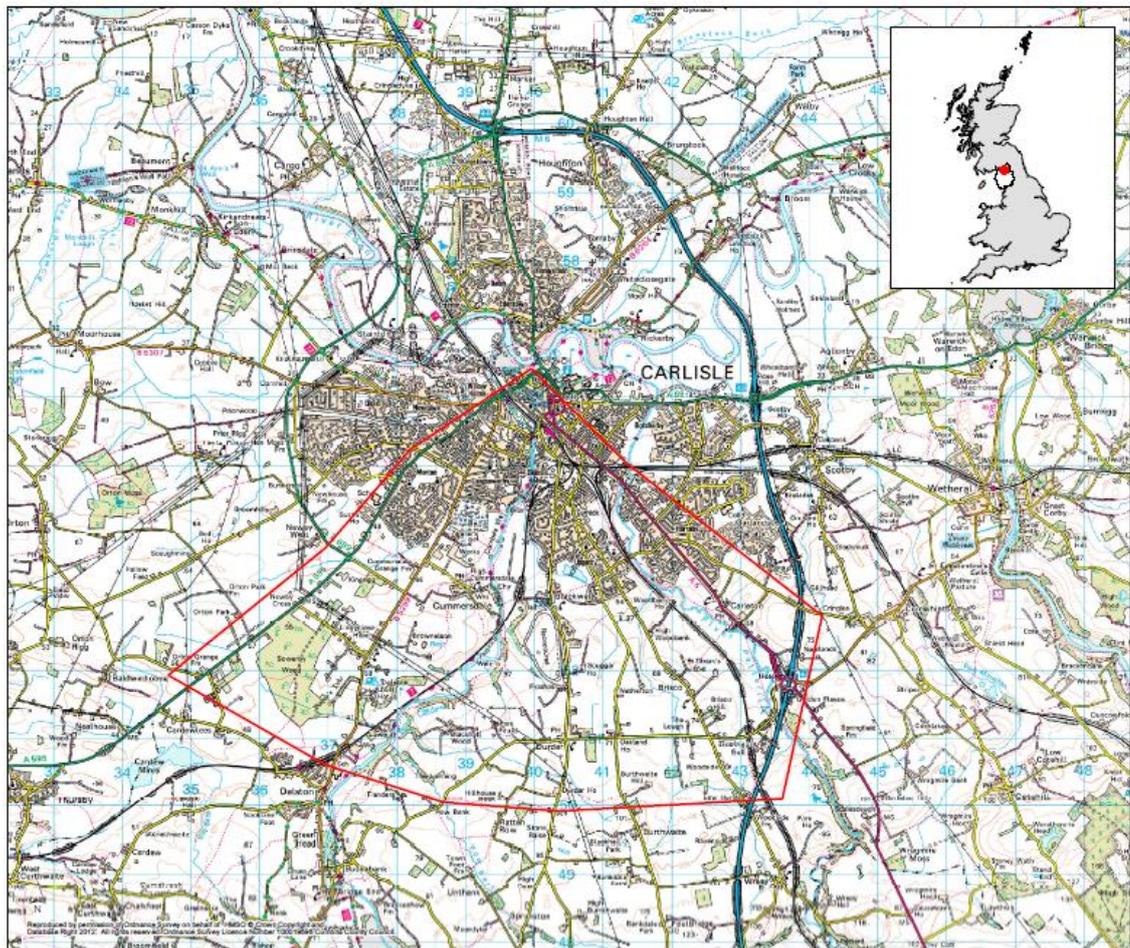
Strategic Objective	Strategic Outcomes
Delivery of major mixed-use development at Carlisle South	Facilitate delivery of up to 10,000 homes Facilitate development of strategic employment site Reduce travel to work journey times Encourage more sustainable transport use Create a sustainable community
Reduce congestion on southern radial routes and in city centre	Increase use of more sustainable travel modes Reduce all journey times Improve air quality Improve health and wellbeing
Assist east/west movement in Cumbria	Improve journey times for people and freight

- 6.1.2 The first objective to support development at South Carlisle recognises the strategic importance of this broad location for growth. There are few opportunities for new development in Carlisle outside of the identified sites in the Local Plan, as land is constrained by the M6 motorway and flood plains around the river Eden. Carefully planning for large mixed-use sustainable development in South Carlisle therefore represents the best way to deliver the housing needed for Carlisle in the long-term and to secure Carlisle's economic prosperity.
- 6.1.3 The second objective to reduce congestion on southern radial routes and in the city centre recognise that these routes are constrained and suffer from poor air quality in places. The local plan study work has identified various junctions forecast to suffer with congestion. Whilst improvements have been identified, there are a number of locations where further capacity improvements are not possible within the existing highway boundary.
- 6.1.4 The third objective to support east-west movements recognises the constraints to travel by the limited crossings of the river Caldew. Development at South Carlisle will increase the demand for travel from east to west, particular to existing and proposed employment sites at Kingmoor Park and Morton South, as well as to employment and other opportunities in West Cumbria. This objective also recognises the need to improve the resilience of the transport network in Carlisle, which was recently highlighted after the severe flooding in December 2015 which resulted in the closure of a bridge and significant disruption to travel.

6.2 Location

- 6.2.1 Identifying the strategic objectives led to the definition of the geographical area for intervention. It is bounded by the broad area south of and including the city centre and the existing urban boundary of Carlisle to between Junction 42 of the M6 and the A595. The area is illustrated in Figure 6.1.

Figure 6.1 Area of intervention plan



7. Option generation

7.1 Potential options

- 7.1.1 A number of schemes which could meet the intervention objectives have been considered in recent history in Carlisle. Potential intervention options have therefore been produced by reviewing previous studies and proposed schemes. A brief summary of the options considered and their relevant history is provided below.
- 7.1.2 The concept of a southern bypass of Carlisle has a long history of feasibility considerations reflecting the ongoing problems associated with the existing road network in Carlisle. A Carlisle Southern Bypass was considered in the early 1990s by the Department for Transport and the Highways Agency. At this time, the trunk road network was discontinuous across Carlisle, with no direct link between the M6/A74/A69 and the A595. At the time, it was identified that nearly 25 per cent of traffic on the A595 was through traffic, so a bypass was proposed to remove this traffic from the city centre and provide journey time benefits.
- 7.1.3 Route consultations were undertaken, and a preferred route was announced in 1994. The preferred route was 9.4 km long and linked the M6 Junction 42 to the A595 north of Caldewlees, around three kilometres southwest of Carlisle. It was noted at the time that the county council preference was to have the junction with the A595 closer to Carlisle to provide more benefits for local traffic. At the time, the scheme was considered to provide good value for money. The scheme was withdrawn from the trunk road programme in 1995, and the A595 near Carlisle was subsequently detrunked in 1998.
- 7.1.4 The Carlisle Local Plan Transport Modelling study and the Carlisle Transport Improvements study considered the impact of the Carlisle Local Plan on the existing highway network, and identified potential improvements to support local plan development. The improvements study noted that a number of junctions where capacity issues are forecast were constrained, which limited or prevented the scale of improvements.
- 7.1.5 Other highway improvements in and around the city centre have also been considered in recent study work. These include access proposals for the Caldew Riverside and Carlisle Station Hub sites around James Street, which would create new accesses for these junctions or increase the capacity of the Victoria Viaduct/Nelson Bridge junction.

- 7.1.6 The potential for park and ride in Carlisle has also been considered in the recent past. Three park and ride schemes were listed as Priority Transport Improvement Schemes in the first Local Transport Plan, involving public transport interchanges and bus priority measures. Cumbria County Council cabinet resolved to remove park and ride schemes from the Local Transport Plan in 2007. This reflected the fact that park and ride was no longer part of the council's immediate priorities due to uncertainty over their potential for success, although the council stated they were still generally supportive of the concepts. Following this, two of the sites previously reserved for park and ride sites were allocated for different purposes in the Carlisle Local Plan; a residential development at Greymoorhill, which has received planning permission for part of the site, and a food retail development at Morton.
- 7.1.7 London Road has a number of bus priority measures along its length, and is probably the route with the best bus priority infrastructure provision in Carlisle. The road has an inbound bus lane between Eastern Way and the London Road retail park, and bus priority signals are present at the retail park site access. However, provision stops north of the retail park, as the existing highway boundary is not wide enough to accommodate a continuous bus lane to the city centre, and in particular along Botchergate.
- 7.1.8 Walking and cycling into the city centre from south Carlisle in general represents an attractive proposition, due to the compact geographic nature of the city and the generally good infrastructure provision. However, there exists a number of constraints along these routes which may deter walking and cycling trips from south Carlisle. These constraints are mainly inadequate provision over and around existing structures, and particularly across the railways. For example, this has been recognised with the Currock Bridge scheme, which aims to replace a substandard bridge over the Cumbrian Coast Line. Both walking and cycling trips will benefit from the completion of this scheme which will provide a direct traffic-free route to the city centre.
- 7.1.9 The concept of utilising existing rail infrastructure to provide public transport services linking south Carlisle to the city centre was briefly explored at a high-level in a visioning workshop for south Carlisle. This existing rail infrastructure provides the opportunity to provide a quick, reliable and high-quality rail/light rail service into the city centre from the south Carlisle catchment, reducing the need to drive into the city and encouraging mode shift.
- 7.1.10 Two railway lines cross the broad search area for south Carlisle: the West Coast Main Line between Brisco and the A6 Carleton Road, and the Cumbria Coast Line between the river Caldew and Upperby. The West Coast Main Line is a major inter-city railway route for both passengers and freight, linking the cities of London, Birmingham, Glasgow and Edinburgh, and is double-tracked in this area. The Cumbria Coast Line is the only rail connection to West Cumbria, linking Carlisle to Workington, Whitehaven and Sellafield, and onwards towards Barrow-in-Furness and Ulverston, and is also double-tracked in this area.

7.2 Option assumptions

- 7.2.1 All of the options considered have been chosen based on the assumed ability to meet the majority of the defined objectives for intervention in south Carlisle.

- 7.2.2 The options detailed are considered at a high-level only, based on a combination of available information, previous studies and local knowledge. No assumptions have been made regarding fine details such as design standards and the options represent concept ideas.
- 7.2.3 No detail has been assumed regarding route corridors or the specific location of infrastructure; rather, broad areas of intervention are considered which link in to existing infrastructure at approximate locations where required.
- 7.2.4 Outline constraints for each scheme are noted where appropriate, but these are by no mean exhaustive.
- 7.2.5 Approximate costs have been derived based on similar recent schemes either in Cumbria or elsewhere in the country.

7.3 Option description

Carlisle Southern Link Road

- 7.3.1 It is proposed that this scheme would form a link between the M6 J42 and the A595/A689. This is roughly in line with the previous preferred route option from the 1990s, with the A595 junction moved closer to Carlisle.
- 7.3.2 The route would involve two river crossings, of the Petteril to the east and the Caldew to the west, and two rail crossings, of the West Coast Main Line to the east and the Cumbria Coast Line to the west. The route is approximately eight kilometres in length.
- 7.3.3 It is assumed the route would link in to the wider highway network via the existing roads of Durdar Road, Sclegate Road, Brisco Road and Dalston Road. No detail is currently known on the potential masterplan layouts for development but it is also assumed that development would be adequately linked to the new link road either via existing roads or site-specific junctions.
- 7.3.4 The cost estimate of this scheme is around £100m. The schemes costs are based on the known construction costs of the 8.25 km Carlisle Northern Development Route, which included a new rail and river crossing was recently constructed with a total cost of £158m¹.

On-line highway improvements on radial routes and in the city centre

- 7.3.5 It is proposed that this scheme would involve on-line link and junction improvements on the southern radial routes and in the city centre. The improvements would be over and above those proposed in the Carlisle Transport Improvements study.

¹ This scheme was funded through a Private Finance Initiative scheme, and the costs include an additional contract for the operation and maintenance of a further 150 km of roads in north Cumbria.

- 7.3.6 The Carlisle Transport Improvement study identified a number of junctions along the London Road corridor where it was concluded that significant capacity improvements would not be possible within the existing highway boundary. Capacity improvements may therefore require the purchase and demolition of some roadside properties, although there are a number of listed buildings along London Road which would restrict road widening. Ideally, capacity improvements would be provided at the following locations:
- Botchergate/Crown Street/Tait Street
 - London Road/St Nicholas Street
 - London Road/St Nicholas Retail Park
 - Victoria Viaduct/James Street/Nelson Bridge
 - Upperby Road/St Ninian's Road
 - Durdar Road/Newbiggin Road
- 7.3.7 Whilst there are few existing capacity issues on Currock Road and Blackwell Road outside of the junctions previously identified, the on-street parking on these roads has the potential to cause more significant delays when south Carlisle is developed. It is therefore proposed that this scheme would consider reviewing the suitability of this on-street parking with consideration to the potential future traffic flow on these routes, and identifying areas away from the radial routes where cars could safely park.
- 7.3.8 Cumbria County Council has also undertaken study work which considers improvements at the Victoria Viaduct/James Street/Nelson Bridge junction to increase vehicle capacity and improve air quality on James Street. One potential improvement considered closing the Viaduct Estate Road arm of this junction. A new route for traffic from this arm would be provided underneath the Viaduct, via the rear of the current Pools site and joining James Street via Water Street. This major improvement is also included in this scheme.
- 7.3.9 The cost estimate of this scheme is £25m. This is based on costs for recent major junction improvements in Cumbria such as the Gilwilly pinch point scheme, and assumes a rough cost of £2m per junction, plus costs of around £5m for various link improvements and traffic management measures and £10m for major improvements the James Street junction.
- Sustainable transport improvements*
- 7.3.10 It is proposed that this scheme would involve improvements to the existing walking, cycling and public transport networks to link south Carlisle to the city centre. These improvements would take advantage of the compact nature of the city and encourage mode shift, reducing congestion on radial routes.
- 7.3.11 For pedestrians and cyclists, new walking and cycling routes would be built to link in to existing routes in the south of the city, and in particular the Currock bridge major scheme.

- 7.3.12 Previous work on the potential for bus priority infrastructure improvements have been considered. It is generally assumed that the radial routes in the south of the city lack the available space to implement priority measures; measures on London Road have already been implemented where space permits. However, vehicle detection technology would be implemented by upgrading signalised junctions and installing transceivers within the buses. The signal controller would then detect when a bus is queuing at the junction and prioritise that green movement to minimise delay.
- 7.3.13 Infrastructure improvements to bus stops on London Road, Currock Road and Blackwell Road would be implemented to improve the passenger experience, providing sheltered waiting areas. Real-time bus information measures should also be provided at existing and new bus stops.
- 7.3.14 However, there is the potential to provide significant bus service improvements as part of development at south Carlisle. The Carlisle Transport Improvements study considered various infrastructure improvements, such as waiting facilities, along existing radial routes, and these should be extended to Blackwell Road and Currock Road to link to south Carlisle. Service frequency would also be improved, partially funded through developer contributions. It is proposed to provide significant bus service frequency improvements as part of this scheme. However, the timing of introducing bus frequency improvements is critical. The services should only be provided when there is a large enough population available to make the services viable, but the services should also be available before people get into the habit of driving by car.
- 7.3.15 The cost estimate of this scheme is £15m. The infrastructure costs are roughly based on those provided in the Carlisle Transport Improvements study.

Park and ride

- 7.3.16 It is proposed that this scheme would involve the creation of up to three park and ride sites in south Carlisle. The sites would be located around Wigton Road, Durdar Road and Carleton Road, and would also provide a high-frequency bus link to the city centre. It is proposed the sites would be located in the following areas:
- The Wigton Road site would be located in the vicinity of the previous Wigton Road site
 - The Brisco Road site would be located around the southern edge of the existing Upperby urban boundary
 - The Carleton Road site would be located around the southern end of the existing Harraby urban boundary
- 7.3.17 The car parks would provide ample parking in a secure, well-lit and staffed environment.
- 7.3.18 It may be possible for the sites to link into the existing 62, 67 and 60 respectively, although the routes would probably still require additional buses to provide a high-frequency service, and to account for the longer route. It is assumed that up to an additional ten services would be required.

7.3.19 Alongside the park and ride sites themselves, additional or upgrades bus infrastructure would also be provided to improve journey quality, reduce journey times and improve journey reliability. These improvement would include:

- Real-time bus information
- Bus priority measures
- Upgraded bus stops and waiting facilities

7.3.20 As part of the introduction of park and ride, a detailed study on revenue costs would need to be undertaken. This would include estimates of income from car parking and bus tickets, staff costs and other maintenance costs. There would also be a need to review the existing car parking changes in the city centre, and consider whether these charges need to be altered to discourage driving into the centre and to encourage bus use.

7.3.21 The cost estimate of this scheme is around £45m. The site cost for three sites is based on estimate costs for the St Erth park and ride scheme near Penzance, which included a 700 space car park for a cost of around £10m. The bus service and infrastructure costs are assumed to be around £15m. It is assumed the ongoing revenue costs would be around £1m per annum.

Light rail

7.3.22 This scheme proposes two new stations would be constructed; one on the West Coast Main Line around the Brisco area, and one on the Cumbria Coast Line around the Cummersdale area, to provide a modern public transport service between these stations and the Carlisle Citadel station in the city centre. The route from Brisco would be around 3.5 km in length, and the route from Blackwell would be around 2.5 km in length.

7.3.23 It is proposed to re-use the existing track infrastructure where possible, to save costs. However, it may be necessary to upgrade this infrastructure, particularly on the West Coast Main Line, where additional track may be required to prevent delays to the inter-city route. New signalling and points may also be required.

7.3.24 The stations themselves would take the form of mini-transport hubs where people can change between travel modes. The hubs would include long-stay car parking, car drop-off facilities, bus laybys and secure cycle parking. The stations would also provide automatic ticketing facilities, sheltered waiting and suitable lighting to provide a safe, secure high-quality environment. It would also be advantageous if the ticketing system could provide for the freedom to change between light rail and bus services.

- 7.3.25 New rolling stock would be required to provide a high-frequency shuttle service to the existing Carlisle Citadel station. The Cumbria Coast Line operates on a roughly hourly service during weekdays and Saturday, and a reduced Sunday service; this is unlikely to provide the service frequency required to encourage mode shift. Whilst the West Coast Main Line has higher frequency services, it is considered highly inappropriate for inter-city services to also serve a station in this location, as an additional stop would add considerable delays. It is assumed that four light rail vehicles would be required for this service.
- 7.3.26 The proposals would also need to consider line capacity details. No such details are readily available, although it is considered that capacity issues should not exist on the Cumbrian Coast Line. Issues are more likely to exist on the West Coast Main Line, where local services have the potential to delay inter-city services. The capacity of the Carlisle Citadel station to support new services is also unknown.
- 7.3.27 These proposals would also require associated works such as a new vehicle depot for the rolling stock, potential upgrades to the Carlisle Citadel station and additional track where required. A detailed look at revenue costs would also be required, including parking charges at the hubs, staff and maintenance costs and a review of parking charges at car parks in and around the city centre.
- 7.3.28 The estimated scheme costs are £100m. This estimate is based on research by UKTram on the costs of light rail systems. This research gives costs of around £15m per km, although £12m per km has been assumed for this scheme due to the potential to reuse existing infrastructure, plus £20m for a new depot and £8m for rolling stock. It is assumed the ongoing revenue costs would be around £6m per annum.

8. Initial option sift

8.1 Introduction

8.1.1 A sifting exercise was undertaken to assess the generated scheme options. The schemes were assessed using the Department for Transport's Early Assessment and Sifting Tool (EAST). EAST is a decision support tool to quickly summarise and present evidence on options in a clear and consistent format. It does not make recommendations on preferred schemes, but helps to refine options by highlighting the relative strengths and weaknesses of schemes, such as how they meet objectives or inherent assumptions or uncertainties.

8.1.2 A copy of the output from the initial option sift EAST assessment is provided in **Appendix B**.

8.2 Discarded options

8.2.1 The on-line capacity improvements scheme has been discarded following the sifting process. This is mainly due to deliverability concerns at certain junctions and because capacity improvements could increase traffic flow to the city centre which would have negative impacts for residents along this route. In addition, the scheme would not meet all of the objectives. However, parts of the scheme could still be progressed independently to still provide benefits or improved access in specific areas.

8.2.2 The sustainable improvements scheme has been discarded following the sifting process. This is mainly due to the expected modest benefits of the scheme which would not support development at south Carlisle without further intervention. In addition, the scheme would not meet all of the objectives. However, it is recognised that the scheme would encourage sustainable transport and has the potential to reduce congestion on the radial routes.

8.2.3 The park and ride scheme has been discarded following the sifting process. This is mainly due to the uncertainty surrounding the potential effectiveness and commercial viability of the scheme. In addition, the scheme would not meet all of the objectives. It is recognised that the scheme would encourage sustainable transport and has the potential to reduce congestion on the radial routes.

8.2.4 The light rail scheme has been discarded following the sifting process. This is mainly due to the overwhelming uncertainty surrounding the scheme and the fact the scheme would not meet all of the objectives. It is recognised that the scheme would encourage sustainable transport and has the potential to reduce congestion on the radial routes. However, there is no available evidence to support the effectiveness of the scheme, whether it would be affordable or deliverable given the constraints of the existing rail infrastructure.

8.3 Preferred option

- 8.3.1 The sifting exercise has identified the Carlisle Southern Link Road as the preferred option. This option meets all of the scheme objectives and would most successfully support development at south Carlisle.
- 8.3.2 However, it is recommended that the potential to implement some or all of the sustainable improvements option should also be investigated to improve the sustainability and accessibility of the development of south Carlisle. This scheme is very flexible, and could be implemented in part or wholly through other funding sources. These improvements could therefore be funded through developer contributions obtained through the planning process as well as maximising the use of other funding sources such as those from the Cumbria LEP, growth deals or central government funding opportunities.
- 8.3.3 It is also recommended that the potential for on-line capacity improvements in Carlisle is investigated further. Whilst there is a large element of uncertainty regarding this scheme as a whole, individual elements can and should be progressed independently of each other. For example, improvements to the Victoria Viaduct/James Street junction would greatly benefit the AQMA on James Street as well as providing access and capacity improvements for development proposals in and around the Caldew Riverside and Water Street area.

9. Southern link road potential interventions

9.1 Introduction and context

- 9.1.1 The southern link road has been identified as the preferred option to provide a basis to achieve the scheme objectives. The purpose of option generation in this section is to develop a range of possible route corridors which are likely to achieve the objectives. In a similar way to the preceding exercise the process of considering and, if appropriate, eliminating proposed route options has to be carried out in a logical, transparent and auditable manner.
- 9.1.2 During this study, both historical and new proposed routes were considered. A Carlisle southern bypass has a long history of feasibility considerations reflecting the ongoing problems associated with the existing road network south of the city. This historical work was given due consideration, but without prejudice for any particular option, alongside any new route options generated. All route options considered were assessed having both motorized and non-motorised users in mind and includes a consideration of different link/junction standards.
- 9.1.3 The development of route options was focused on the 'local study area', as shown on **Plan CSDR-CAP-EGN-00-DR-V-0025** in **Appendix A**.

9.2 Approach to option generation

- 9.2.1 The generation of possible route options began with an internal team workshop. Although promoting a 'clean sheet' open minded approach, without any preconceived solutions, the starting point of the discussions was the recognition of previous feasibility work and therefore the presentation and consideration of the historical routes from the 1990s developed by the then Highways Agency as shown on **Plan CSDR-CAP-EGN-00-DR-V-0026** in **Appendix A**.
- 9.2.2 These historical routes were carefully considered within the context of the current Objectives, and in addition to these, the following route options were generated during the workshop taking into account the constraints identified on the various environmental plans in **Appendix E** of this report:
- Green/Red route
 - Green route
 - Blue route
 - Orange route
 - Pink route
- 9.2.3 All routes, with the exception of the pink route, originated from Junction 42 of the M6, and extend west to the junction of the CNDR with the A595. Further details in respect of each of the above route options are provided below.

9.3 Green/Red route

- 9.3.1 This route generally follows the line of the preferred route of the historical Carlisle Southern Bypass over its first 4.8 kms. Leaving the M6 at Junction 42 it runs on a new alignment across the river Petteril and towards the crossing of the West Coast Railway via the existing structure (New Brisco Railway Bridge). The route then runs through open countryside parallel to Newbiggin Road and offset to the south by approximately 300m. At a point 1.2km west of Durdar the route turns sharply right passing just to the west of Blackhall Wood before crossing the River Caldew and the West Cumbrian Railway on a single crossing some 280m in span. The route then continues in a north westerly direction over the remaining 2.3km to join the A595.
- 9.3.2 This route was developed to revisit as much of the alignment from the preferred route of the Carlisle Southern Bypass.
- 9.3.3 At 8.5 km it is the longest of the identified routes.

9.4 Green route

- 9.4.1 This route is identical to the above Green/Red route over its first 3.6 kms. Once the route reaches Durdar Road it utilises a proposed roundabout to allow it to change direction and run through open countryside to the most optimum crossing point of the River Caldew. At the point selected the river and the railway run directly alongside each other allowing for a single crossing some 218m in span. The route then continues in a north westerly direction over the remaining 2.3km to join the A595.
- 9.4.2 This route was developed to reduce the environmental impact of the Green/Red route over its westerly section by avoiding the deep cuttings required by the latter as it crosses the high ground at Blackhall Wood and High Brownelson.
- 9.4.3 This route is 7.9 km long.

9.5 Blue route

- 9.5.1 This route leaves the M6 at Junction 42 and will utilise as much of the existing Newbiggin Road corridor as possible until it reaches the eastern outskirts of Durdar. The route then runs to the south of Durdar to allow the construction of a new roundabout on the Durdar Road without the need to demolish any properties. The roundabout will allow a change of direction with the route joining the same alignment as the Green route above as it runs through open countryside to the optimum crossing point of the River Caldew. The route then diverges from the Green route and connects directly to a proposed roundabout at the junction of Dalston Road and Peter Lane. Over the remaining kilometre the route runs along Peter Lane and terminates at the existing roundabout on the A595.

9.5.2 This route was developed to maximise the reuse of existing infrastructure as specifically requested in the Client's Brief.

9.5.3 This route is 7.8 km long of which 3km and 0.8 km run along Newbiggin Road and Peter Lane respectively.

9.6 Orange route

9.6.1 This route also leaves the M6 at Junction 42 but on a completely new westerly alignment with new crossings of the River Petteril, span 200m, and then the West Coast Railway, span 50m. The route then runs immediately south of Brisco before crossing Durdar Road at Holly House. It passes south of the Carlisle Racecourse as it runs through open countryside to cross the River Caldew slightly further downstream than the Green and Blue routes. At the point selected this will require a single crossing some 250m in span. The route then follows the Green route over its remaining 1.9km to join the A595.

9.6.2 This route was developed to connect the M6 at Junction 42 to the CNDR using the most direct alignment possible without crossing the Carlisle Racecourse. It is 7 km long.

9.7 Pink route

9.7.1 This route leaves the A6 at a proposed new junction 0.5km to the west of Junction 42. Initially the route runs roughly westerly with new crossings of the River Petteril, span 200m, and then the West Coast Railway, span 50m, before skirting the northern side of Brisco village. The route then runs in a south westerly direction through open countryside before crossing Durdar Road at Holly House, i.e. at the same location as the Orange route. It passes south of the Carlisle Racecourse as it runs through open countryside to cross the River Caldew slightly further downstream than the Green and Blue routes. At the point selected this will require a single crossing some 165m in span. It then follows a left hand curve through open countryside passing just south of High Cummersdale and connects directly to a proposed roundabout at the junction of Dalston Road and Peter Lane. The route then follows the Blue route over its remaining 1km to join the A595.

9.7.2 This alignment was developed to provide a route which passed through the area of likely development on the south east side of the city.

9.7.3 This route is 6.9 km long.

10. Southern link road sifting exercise

10.1 Introduction

10.1.1 At the end of the preferred options generation process a sifting workshop was held. This initial sift was undertaken to identify any 'showstoppers' which are likely to prevent an option progressing at a subsequent stage in the process.

10.2 Sifting workshop

10.2.1 The workshop involved the application of EAST to assist the identification of discarding options that:

- would clearly fail to meet the key objectives identified for intervention;
- did not fit with existing local, regional and national programmes and strategies, and do not fit with wider government priorities; and
- would be unlikely to pass key viability and acceptability criteria (or represent significant risk) in that they are unlikely to be:
 - deliverable in a particular economic, environmental, geographical or social context e.g. options which would result in severe adverse environmental impacts which cannot be mitigated against or where the cost of doing so is too high;
 - technically sound;
 - financially affordable; and
 - acceptable to stakeholders and the public.

10.2.2 During the workshop the views from the engineering, environmental, transport and planning professionals were also sought to support or challenge the EAST assessment.

10.2.3 At the end of the Workshop the following unpromising options were discarded:

- The nineties northern route;
- The nineties southern route;
- Green/Red route; and
- Orange route.

10.2.4 With the following feasible (or potential) options identified for further development and assessment:

- Green route;
- Blue route; and
- Pink route.

10.2.5 A copy of the output from the EAST assessment is provided in **Appendix C**.

11. Southern link road discarded routes

11.1 Introduction

11.1.1 Route options discarded during the sifting process, and reasons for dismissing an option, are outlined below.

11.2 Nineties northern route

11.2.1 The main reasons for discarding this option, having carried out limited cost, environmental or engineering assessments of the proposal ahead of the workshop, were noted as:

- Significant conflict with the client's objectives;
- Negative environmental impact on the adjacent urban environment e.g. increased noise and air pollution;
- Perceived excessive land and compensation costs associated with acquiring properties developed along the route since the 1990s; and
- Likely low public acceptability.

11.3 Nineties southern route

11.3.1 The main reasons for discarding this option, having carried out limited cost, environmental or engineering assessments of the proposal ahead of the workshop, were noted as:

- Conflict with the client's objectives; and
- Inflexibility of the option i.e. the option is essentially a southern bypass of Carlisle for trunk road traffic.

11.4 Green/Red route

11.4.1 The main reasons for discarding this option, having carried out limited cost, environmental or engineering assessments of the proposal ahead of the workshop, were noted as the negative environmental impact on the natural environment:

- Visually intrusive crossing of Caldew Valley (proposal would not provide any benefits over more northern route proposals with shorter crossings of the valley);
- Excessive excavation in the vicinity of Blackhall Wood and High Brownleson; and
- Damage to Brownleson Wood (designated County Wildlife site and Ancient Woodland).

11.5 Orange route

11.5.1 The main reasons for discarding this option, having carried out limited cost, environmental or engineering assessments of the proposal ahead of the workshop, were noted as:

- Negative environmental impact on the adjacent communities of Brisco and Durdar e.g. increased noise and air pollution and severance;
- Inflexibility of the option as the route must pass through pinch point on Brisco Road and Durdar Road; and
- Likely low public acceptability.

12. Southern link road engineering assessment

12.1 Routes taken to further appraisal

12.1.1 The following remaining routes were then taken forward for further appraisal:

- Green route;
- Blue route; and
- Pink route.

12.2 Design standards

12.2.1 Roads in the UK are designed to the requirements set out in the Design Manual for Roads and Bridges (DMRB). These requirements include desirable minimum requirements and absolute requirements. Designs can be below the desirable minimum requirements at the discretion of the Designer, this is known as a Relaxation. If a design does not meet the absolute requirements, a Departure from Standard is required and this must be approved by the Overseeing Organisation, in this case, Cumbria County Council.

12.2.2 Road geometry is designed in accordance with DMRB Volume 6, Section 1, Part 1, TD 9/93 'Highway Link Design', which details the standards for horizontal and vertical geometry dependant on the design speed of a road. Following discussion at the Progress Meeting held on the 4th August it was agreed for the purposes of the study that the preliminary route options would aim to have geometry appropriate for a design speed of 70 kph (around 44 mph). Due to this relatively low design speed the only relaxations/departures in both the horizontal and vertical geometry that are required occur on the existing section of Newbiggin Road between Junction 42 and New Brisco Railway Bridge. At this preliminary stage stopping sight distance, transitions and superelevation have not been assessed for the route option alignments. The proposed design speed should be reviewed as study and design work progresses, and will be dependent on factors such as the proximity of development and proposed accesses.

12.2.3 The desirable maximum gradient for an All Purpose Single Carriageway is 6% with a maximum of 5% adopted for the route option alignments. However, in hilly terrain steeper gradients are permitted, particularly where traffic volumes are at the lower end of the range. In such cases the adoption of gradients steeper than the desirable maximum can make significant savings in construction or environmental costs, but can also result in higher user costs, i.e. by delays, increased fuel consumption and accidents. An economic assessment of the effects of adopting a steeper gradient should be carried out during Stage 2 to determine the economic trade-off between construction/environmental cost savings and disbenefits to traffic. However there is a progressive decrease in safety with increasingly steeper gradients, and gradients steeper than 8% are considered as Departures from Standards.

- 12.2.4 Three dimensional outline designs have been developed for the options undergoing Stage 1 Assessment using Civils 3D computer software. It should be noted that the alignments are appropriate to the level of design development that has been undertaken at this stage.
- 12.2.5 During TAG Stage 2 the Preferred Route Corridor options will be developed and assessed in more detail towards recommending a Preferred Route Option. At Stage 3 the Preferred Route Option will undergo detailed design, and applications for any Departures from Standard will be sought from the relevant Overseeing Organisation.

12.3 Road cross section

- 12.3.1 Reference to TD 27/05 (Cross Sections and Headrooms) and TA46/97 (Traffic Flow Ranges for use in the assessment of new rural roads) indicates:
- An all purpose single carriageway is a 7.3m wide carriageway (2 x 3.65m lanes) with 1.0m hard strips and 2.5m verges. A single carriageway is permitted where the opening year flow is 13,000 AADT or less;
 - An all purpose dual carriageway comprises of two 7.3m wide carriageways (2 x 3.65m lanes) with 1.0m hard strips, 2.5m central reserve and 2.5m verges. A dual carriageway is permitted where the opening year flow is between 11,000 and 39,000 AADT.
- 12.3.2 Following discussion at the Workshop held on the 14th August it was agreed that for the purposes of this assessment the proposed road cross section should be a single carriageway consisting of two 3.65m lanes, two 1m hard strips and 3m combined cycleway/footway. The typical cross section is detailed in **Appendix A**.

12.4 Junctions and side roads

- 12.4.1 Junction locations and side roads will be considered in more detail at Stage 2, but it is envisaged that:
- At-grade roundabouts would be provided at interfaces with existing roads:
 - An additional roundabout between the River Caldew and Dalston Road be provided to facilitate future development to the south of Cummersdale;
 - An additional roundabout to the west of Durdar be provided on the Green and Blue routes to simplify connection to Newbiggin Road;
 - Where possible the number of existing frontages with direct access to the new link road be kept to an absolute minimum with bypassed parallel sections of the existing road network retained, at a reduced width, to provide continued access to the highway network; and
 - Opportunities are explored to stop up, reduce the road width, landscape or convert to cycleway/footway redundant sections of the existing road network.

12.5 Engineering assessment of options

Green route

- 12.5.1 The green route leaves the M6 at Junction 42 and utilises a new alignment until it meets the New Brisco Railway Bridge. Initially, the route runs south westerly on a 255m left hand curve and crosses the River Petteril with a 50m span. The route then follows a 360m right hand curve towards the existing New Brisco Railway Bridge. The 255m radius is one step below the desirable minimum and the 360m radius is equivalent to the desirable minimum for a design speed of 70A kph.
- 12.5.2 The route then runs south of and approximately parallel to Newbiggin Road until it reaches Durdar Road. Utilising a 1440m right hand curve the route then heads north west passing under the existing overhead electricity cables crossing Newbiggin Road just to the east of Oak Dene. It then runs on a straight through open countryside passing between Park Fauld Farm and Peastree before crossing the River Calder and the Cumbrian Coastal Railway on a single multi-span viaduct some 218m in total span. The route continues to run in a north west direction passing just to the north of the reservoir and gas pumping stations at High Brownelson before crossing Dalston Road mid way between its junction with Peter Lane and Brow Nelson. It then connects to the existing CNDR roundabout on the A595 via a straight.
- 12.5.3 Unless stated otherwise the horizontal alignment of this route comprises straights or curves which are greater than the minimum radii for the 70A kph design speed. The vertical alignment of this route has been designed with crest K values greater or equal to the desirable minimum value of 30. Likewise sag K values are greater or equal to the absolute minimum value of 20.
- 12.5.4 There will be large cuttings and embankments as the route crosses the Calder Valley, though it should be noted that these slopes would be considered in more detail during Stage 2 and their impact could be reduced.

Blue route

- 12.5.5 The blue route leaves the M6 at Junction 42 and utilises the existing Newbiggin Road until just west of Red Cat Poultry Farm. It should be noted that initially the existing horizontal geometry as far as the New Brisco Railway Bridge comprises of 65m, 255m and 900m radii. While the latter exceeds the minimum radius for the 70A kph design speed, the 255m radius is one step below the desirable minimum and the 65m radius is even lower than a 90m radius which is considered as being two steps below the desirable minimum radii for a 50kph design speed.
- 12.5.6 The maximum gradient on this existing section is 5.35% which is below the desirable maximum of 6%.
- 12.5.7 The route then runs just south of Newbiggin Road until it reaches Durdar Road. Properties fronting the section of existing road between Park View and Red Cat are a constraint and may be impacted due to the widened road, but this would be considered in more detail at Stage 2.

- 12.5.8 Utilising a 600 m right hand curve, which is just greater than the recommended radii of 520m with 3.5% superelevation for the 70A kph design speed, the route then joins the Green Route before crossing the River Caldew and the Cumbrian Coastal Railway. The route then diverges from the Green route passing slightly further to the north of the reservoir and gas pumping stations at High Brownelson and connects directly to a proposed roundabout at the junction of Dalston Road and Peter Lane. Over the remaining kilometre the route runs along Peter Lane and terminates at the existing roundabout on the A595. Properties fronting on to this section of existing road are a constraint and may be impacted due to the widened road, however this would be considered in more detail at Stage 2.
- 12.5.9 Unless stated otherwise the horizontal alignment of this route comprises straights or curves which are greater than the minimum radii for the 70A kph design speed. The vertical alignment of this route has been designed with crest K values greater or equal to the desirable minimum value of 30. Likewise sag K values are greater or equal to the absolute minimum value of 20.
- 12.5.10 There will be large cuttings and embankments as the route crosses the Caldew Valley, though it should be noted that these slopes would be considered in more detail during Stage 2 and their impact could be reduced.

Pink route

- 12.5.11 This route leaves the A6 at a proposed new junction 0.5km to the west of Junction 42. Initially the route runs roughly westerly on a 360m right hand curve with new crossings of the River Petteril, total length 200m, and then the West Coast Railway, span 50m. The radius of 360m is equivalent to the desirable minimum for a design speed of 70A kph with 5% superelevation.
- 12.5.12 The route continues west on 510m right and left hand curves passing just north of the disused brickworks and skirting the northern side of Brisco village. The route then runs in a south westerly direction through open countryside before turning west on a 510m right hand curve and crossing Durdar Road at Holly House. Utilising another 510m right hand curve it passes south of Floses before running parallel to the Carlisle Racecourse as it runs on a straight through open countryside to cross the River Caldew and the Cumbrian Coast Railway 600m further downstream than the Green and Blue routes. At the point selected this will require a single crossing with a multi span viaduct some 165m in length. It then follows a left hand curve through open countryside passing just south of High Cummersdale and connects directly to a proposed roundabout at the junction of Dalston Road and Peter Lane. The route then follows the Blue route over its remaining 1km to join the A595. Properties fronting on to this section of existing road are a constraint and may be impacted due to the widened road, however this would be considered in more detail at Stage 2.
- 12.5.13 A radius of 510 m is equivalent to the minimum radii for a design speed of 70A kph with 3.5% superelevation. Otherwise the horizontal alignment of this route comprises straights or curves which are greater than the minimum radii for its design speed. The vertical alignment of this route has been designed with crest K values greater or equal to the desirable minimum value of 30. Likewise sag K values are greater or equal to the absolute minimum value of 20.

- 12.5.14 There will be large cuttings and embankments as the route crosses the Petteril and Calder valleys, though it should be noted that these slopes would be considered in more detail during Stage 2 and their impact could be reduced.

12.6 Relaxations and departures

- 12.6.1 TD 9/93 defines a three tier hierarchy of geometric design criteria related to Design Speeds. This three tier hierarchy enables a flexible approach to be applied to a range of situations where the strict application of Desirable Minimum Standards would lead to disproportionately high construction costs or severe environmental impact upon people, properties or landscapes. Designs with at least Desirable Minimum Standards will produce a high standard of road safety and should be the initial objective. However, the level of service may remain generally satisfactory and a road may not become unsafe where these values are reduced. This second tier of the hierarchy is termed a *Relaxation*.
- 12.6.2 The limit for Relaxations is defined by a given number of Design Speed steps below a specific benchmark, usually the Desirable Minimum. Relaxations vary according to the type of road, motorway or all purpose, and whether the Design Speed is band A or band B.
- 12.6.3 Relaxations may be introduced at the discretion of the Designer, having regard to the advice given in TD 9/93 and all the relevant local factors. Careful consideration must be given to layout options incorporating Relaxations, having weighed the benefits and any potential disbenefits. Particular attention should be given to the safety aspects and environmental and/or cost benefits which would result from the use of Relaxations.
- 12.6.4 In situations of exceptional difficulty which cannot be overcome by Relaxations, it may be possible to overcome them by adoption of *Departures*, the third tier of the hierarchy. Proposals to adopt Departures from Standard must be submitted to the Overseeing Department, in this case the County Council and most likely Highways England regarding the approach to M6 junction 42, for approval.
- 12.6.5 From the engineering assessment directly above it can be seen that the only sections of any of the proposed routes which would require a relaxation or a departure are the adjacent 255m and 65m radius horizontal curves on the existing approach to Junction 42.
- 12.6.6 When considering a relaxation TD 9/93 requires the Designer to consider whether, and to what degree the location is:
- Isolated from other Relaxations/Departures – in this case they would be adjacent
 - Isolated from junctions - in this case they would be adjacent to a junction
 - One where drivers have Desirable Minimum Stopping Sight Distance – although SSD has yet to be calculated it is almost certain to be below the Desirable Minimum
 - Subject to momentary visibility impairment only – not the case

- One that would affect only a small proportion of the traffic – in this case they would affect all users
- On straightforward geometry readily understandable to drivers – yes in this case
- On a section of road with no frontage access – there are frontages in this case
- One where traffic speeds would be reduced locally – yes in this case approaching the junction
- On a section of road carrying high traffic flows - in this case flows are likely to be at the upper end for a single carriageway

12.6.7 Together with considering whether additional measures can be introduced in conjunction with the relaxation, for example:

- Accident prevention measures e.g. safety fencing, increased skid resistance etc
- Warning signs and road markings
- Speed limit

12.6.8 At this stage it is considered there are grounds for a relaxation being applied to the 255m radius, with appropriate additional measures applied. While it is unlikely Highways England will approve a relaxation or departure for the 65m radius (TD9/93 specifically states horizontal curvature shall never be less than that for a 50kph design speed) it would still be feasible to connect to J42 and reuse the existing railway bridge but a new crossing of the River Petteril would be required. The additional cost of a new crossing is included in the risk register, and is referred to in Table 16.2.

12.6.9 Relaxations and Departures will be considered in more detail during Stage 2.

12.7 Topography and land use

12.7.1 Considerations regarding the existing topography within the study area are included within the Landscape and Visual section of Chapter 8, Environmental Impact Assessment, of this report. The results of that assessment indicate that the option with the least adverse effects on the identified landscape is Option 1: Blue, predominantly due to the fact that this route maximises the reuse of existing road corridors. The least preferred option, following the assessment criteria, would be Option 2: Pink. However, this is largely due to the eastern half of the route through Greenfield land close to Brisco and Carelton; whereas the western half of the route actually presents many benefits of being in close proximity to existing urban features.

12.7.2 Details of land ownership is indicated on *Plan CSDR-CAP-EGN-00-DR-V-0020* within **Appendix A**

12.8 Geology, geomorphology and ground conditions

- 12.8.1 A detailed geotechnical desk study has been undertaken to advise this Stage 1 appraisal, refer to Appendix G. This desk study includes assessments of geology, geomorphology and ground conditions, with recommendations for further detailed investigation work required prior to the design of respective options and mitigation measures.
- 12.8.2 All of the alignment routes are expected to encounter similar geology. However where the Pink Route crosses the River Caldew bedrock of the Mercia Mudstone group is present. The Green and Blue Routes cross the River Caldew above bedrock of the Sherwood sandstone group. Despite the variation in geology the choice of crossing point is not expected to have a negative or positive impact on the geotechnical design of the scheme.
- 12.8.3 Outwith the River Caldew corridor it is probable that the majority of each route will be founded on superficial deposits of glacial till. This would not vary dependant on which alignment is selected, although the composition and engineering properties of the materials encountered will vary.
- 12.8.4 If the Pink Route is selected then weak, unstable or voided ground related to a landfill site may be present within the alignment boundary. Issues relating to soil strength and bearing capacity could be resolved however this option may present the following risks to the project: increased excavation and disposal of waste, additional earthworks and importation of an appropriate engineered fill. Each of the potential risks would involve additional costs and implications in relation to time-scales.
- 12.8.5 At this preliminary stage, design earthworks slopes of 1 in 2 have been provided for both cut and fill slopes for the preliminary route options. The incline of the slopes can be steepened or slackened as required during Stage 2 should more details be determined for the ground conditions.

12.9 Hydrology and drainage

- 12.9.1 Considerations regarding hydrology and drainage within the study area are included within the Road Drainage and Water Environment section of Chapter 8, Environmental Impact Assessment, of this report. Proposals for road drainage should be considered in more detail in Stages 2 and 3.
- 12.9.2 The Main Rivers in the study area are the Caldew and the Petteril. These water bodies are discussed in more detailed in Section 13. Both of the above identified watercourses are potential outfalls for the road drainage system.
- 12.9.3 The full extent of the study area is designated as a Major Aquifer by the Environment Agency. Groundwater Vulnerability is primarily Low but increases to Intermediate adjacent to the River Petteril and High adjacent to the River Caldew. There are no designated Groundwater Protection Zones within or in the vicinity of the study area.

12.9.4 All routes have potentially large negative effects at their proposed crossing of the River Caldew due to restrictions in river flow and changes to flood zones. For the same reason the Pink Route will also have potentially large negative effects at its proposed crossing of the River Petteril. These could be mitigated through design but, due to the width of these valleys it is considered unlikely that they could be eliminated. Other effects are slight to moderate and relate to management of road drainage. Compliance with current good practice and use of SuDS should ensure that these risks are adequately addressed.

12.10 Public utilities

12.10.1 Preliminary information was gathered using on line information to the major utility operators. Note that a single main may be affected at multiple locations along its route and so may appear more than once in **Table 12.1** below.

Table 12.1 Existing utility equipment and impact

UTILITY	IMPACT		
	GREEN	BLUE	PINK
Twin OH HV Electricity	Require clearance to pylons and lines to west of Durdar	Require clearance to pylons and lines to west of Durdar	No impact
Regional high pressure gas main	High skew crossing of main close to High Brownelson	High skew crossing of main close to High Brownelson	Skew crossing of main at east approach embankment to Caldew Viaduct
Medium pressure gas main	Perpendicular crossing of main close to Brow Nelson	Perpendicular crossing of main close to Brow Nelson	Perpendicular crossing of main close to Brow Nelson
Medium pressure gas main	Perpendicular crossing of main close to Kingrigg Farm	No impact	No impact
Medium pressure gas main	No impact	Along full length of Peter Lane	Along full length of Peter Lane
Low pressure gas main	Perpendicular crossing of main in Dalston Road	Perpendicular crossing of main in Dalston Road	Perpendicular crossing of main in Dalston Road
Low pressure gas main	No impact	No impact	Perpendicular crossing of main in Durdar Road
Trunk water mains	Perpendicular crossing of two parallel mains close to High Brownelson	Perpendicular crossing of two parallel mains close to High Brownelson	Perpendicular and high skew crossing of two mains close to High Brownelson
Trunk water main	No impact	Along full length of Peter Lane	Along full length of Peter Lane
Distributor water main	Perpendicular crossing of main in Dalston Road	Perpendicular crossing of main in Dalston Road	Perpendicular crossing of main in Dalston Road

UTILITY	IMPACT		
	GREEN	BLUE	PINK
Trunk water main	High skew crossing of main close to Peastree	High skew crossing of main close to Peastree	No impact
Trunk and Distributor water mains	Skew crossing of mains in Newbiggin Road west of Durdar	Skew crossing of mains in Newbiggin Road west of Durdar	No impact
Distributor water main	Perpendicular crossing of main in Durdar Road	Perpendicular crossing of main in Durdar Road	Perpendicular crossing of main in Durdar Road
Distributor water main	Perpendicular crossing of main in Brisco Road	No impact	Perpendicular crossing of main in Brisco Road
Trunk and Distributor water mains	Along Newbiggin Road between J42 and New Brisco Bridge	Along full length of Newbiggin Road	No impact
Combined Sewer	No impact	No impact	Perpendicular crossing of sewer adjacent Durdar Road

12.10.2 This was to only establish the presence of major apparatus, identify any major constraints on route location and assess the impact on each of the route option. Details of the major utilities locations can be found in **Appendix A** of this report.

12.10.3 The results of this limited assessment indicate that the option least impacted by utilities apparatus is the Pink Route, due to the fact that this route is predominantly off line. However even for this route carefully alignment selection will be required to avoid the high pressure gas main in the vicinity of the Racecourse. The least preferred option would be the Blue Route. This is largely due to the number of utilities located in Newbiggin Road and Peter Lane which will need to be protected or diverted.

12.11 Structures

12.11.1 Given the junction strategy of providing at-grade roundabouts there will no grade-separated crossings of other roads and therefore the majority of structures will involve the crossing of watercourses and railways. Generally, the types of structure will comprise:

- Culverts for small streams;
- Bridges for large streams and rivers, railways; and
- Multi-span viaducts for combined river and railway crossings.

12.11.2 Significant structures are summarised in **Table 12.2** below:

Table 12.2 Structures location and type

OPTION	CROSSING	LOCATION	SUGGESTED TYPE
Green Route	River	River Petteril	Single span reinforced concrete bridge with precast concrete beams
	Railway	New Brisco	Refurbish existing
	River & Railway	River Caldew & Cumbria Coastal Line	Four span reinforced concrete with steel beams/structural steel viaduct
Blue Route	River	Newbiggin New	Refurbish existing
	Railway	New Brisco	Refurbish existing
	River & Railway	River Caldew & Cumbria Coastal Line	Four span reinforced concrete with steel beams/structural steel viaduct
Pink Route	River	River Petteril	Four span reinforced concrete with steel beams/structural steel viaduct
	Railway	West Coast Main Line	Single span reinforced concrete bridge with precast concrete beams
	River & Railway	River Caldew & Cumbria Coastal Line	Four span reinforced concrete with steel beams/structural steel viaduct

12.11.3 There could also be a need for:

- Retaining structures where routes are constrained by existing development or topography; and
- Accommodation under or over bridges to connect severed agricultural holdings.

12.11.4 Identification of these structures will take place during Stage 2.

12.11.5 *Culverts* for field drains and small streams would mostly be constructed using slightly oversized precast concrete pipes. At this stage, it is assumed that 1.2m to 1.5m diameter pipes would be sufficient to carry the flow from the small streams that cross the routes.

12.11.6 Simple *single span bridge* crossings would be constructed with decks of precast prestressed concrete beams on reinforced concrete abutments with appropriate footings. In-situ or pre-cast concrete box structures could be used as underpasses to carry accommodation tracks under the new routes where necessary.

12.11.7 *Longer span viaduct* crossings will be necessary in places to cross the rivers with wide floodplain while providing structures with an open aspect for aesthetic reasons. This type of crossing could be a four-span structure consisting of composite structural steel beams and in-situ reinforced concrete slab deck. The potential main span range is quite large and could be increased up to around 50m if required.

12.11.8 At all proposed structures a cross section of 17.3m has been assumed.

12.11.9 The *existing bridges* on Newbiggin Road were designed for HA and 45 units HB loading and previously assessed as capable of carrying full Construction and Use loading. They are:

- Newbiggin New: The superstructure consists of 26 No. precast prestressed concrete Dowmac 'Eagle' beams placed contiguously and infilled with concrete to form a solid slab deck. The deck is simply supported on two reinforced concrete abutment walls which cantilever vertically from reinforced concrete base slabs supported on piled foundations.
- New Brisco Railway: A deck comprising 30 No. PSC beams with solid concrete infill simply supported on two reinforced concrete abutment walls which cantilever vertically from reinforced concrete base slabs.

12.11.10 They are likely to require an element of refurbishment or upgrade within the on-line sections of the Green and Blue routes depending on their condition, load capacity and the selected road cross section. Initial information provided by the County Council in the form of General and Principal Inspection Reports for Newbiggin New and a General Inspection Report for New Brisco indicate that both structures are in reasonable condition and stable with no significant visible defects. Further more detailed assessment will be required at Stage 2.

12.12 Other constraints

12.12.1 The only other major constraint to route options is the location of the Carlisle Racecourse at Durdar. Due to its location and the density of development immediately to the north of the race course all three route options taken to further appraisal run to the south of the race course.

13. Southern link road environmental impact appraisal

13.1 Introduction and context

13.1.1 This chapter presents findings of the Transport Analysis Guidance (TAG) Part 1 Environmental Impact Appraisal which draws on guidance provided in the Design Manual for Roads and Bridges (DMRB), Volume 11.

13.1.2 The aim of the TAG Part 1 Appraisal is to enable a comparison of alternative route options, ensuring that those taken forward for detailed appraisal in Stage 2 have been initially sifted to establish satisfactory value for money and/or deliverability. The Environmental Impact Appraisal forms part of this process and focuses on the impact of the transport proposals on the built and natural environment, and on people.

13.1.3 Three route options for the Carlisle Southern Link Road have been assessed and are presented in this report. These options have been sifted down in number from a wide range of alternatives through consultation with key stakeholders. Details of this process are provided in 10 of this report.

Approach to assessment

13.1.4 The approach to assessment follows guidance outlined in TAG 'The Transport Appraisal Process', TAG Unit A3 'Environmental Impact Appraisal' and topic specific chapters in DMRB Volume 11. Where appropriate other industry best practice guidance has been referred to and commentary provided in the relevant sections of this report.

13.1.5 In accordance with the guidance and project brief provided by the Overseeing Organisation (Cumbria County Council), the assessment considers impacts of the proposals under a number of environmental topic areas. These are as follows:

- Noise
- Air quality
- Landscape and visual
- Historic environment
- Nature conservation
- Water environment
- Outdoor access and recreation

- 13.1.6 A Stage 1 appraisal is primarily a desk-based exercise. Whilst site visits have been required to gain contextual understanding of the study area, it has not been necessary to conduct detailed environmental surveys at this stage to gain an understanding of the baseline conditions. The methodology applied for data gathering is defined more thoroughly in each environmental topic area however, in general the following was carried out:
 - consultation with key stakeholders to obtain factual information i.e. secondary datasets;
 - desk based surveys; and,
 - walkover field surveys.
- 13.1.7 Following a review of collated baseline information, likely impacts on the environment (i.e. the changes resulting from an action) and their effects (i.e. the consequences of those impacts) have been identified and then where possible a qualitative assessment completed using the TAG criteria seven point scale (see **Table 13.2**, below). The scale describes the ‘significance of environmental effect’ and is a product of both the environmental ‘value’ (or sensitivity) of the receptor and the ‘magnitude’ (or extent of change) of any impact identified.
- 13.1.8 All assessments are based on professional judgement of the relevant environmental specialist, supported by topic specific guidance provided in TAG / DMRB Volume 11 where necessary. The process of assigning environmental value and magnitude of an impact can be both qualitative and quantitative in nature and is carried out against a predefined graduated scale. For those topics that allow assessment through measurements or the calculation of numerical values (e.g. the number of properties affected by noise disturbance due to their proximity to the route), criteria descriptors may refer to a set banding or threshold of values. For those that are less amenable to numerical measurement, professional judgement and the views of appropriate organisations are applied.
- 13.1.9 In general, environmental value (or sensitivity) is defined on a five point scale with descriptors for; *very high, high, medium, low* and *negligible* values. Magnitude of impact is defined on a four point scale with descriptors for; *major, moderate, minor* and *no change* to magnitude.
- 13.1.10 The approach of assigning significance of the effect is then carried out using a matrix, with the value (or sensitivity) of the receptor on one axis and the magnitude of the impact on the other axis (see **Table 13.1**, below).

Table 13.1 Significance of environmental effect matrix

		VALUE / SENSITIVITY				
		Very High	High	Medium	Low	Negligible
MAGNITUDE OF IMPACT	Major	Large	Large	Moderate	Slight	Neutral
	Moderate	Moderate	Moderate	Slight	Slight	Neutral
	Minor	Moderate	Slight	Slight	Neutral	Neutral
	No change	Neutral	Neutral	Neutral	Neutral	Neutral

Table 13.2 TAG seven point qualitative scale

Scale	Description
Large beneficial (positive) effect	Major positive effect that the assessor feels should be of principal consideration when assessing an option’s eligibility for funding.
Moderate beneficial (positive) effect	Moderate positive effect which when taken in isolation may not determine an option’s eligibility for funding, but taken together do so.
Slight beneficial (positive) effect	Small positive effect which is worth noting but the assessor believes is not likely to contribute materially to determining whether an option is funded or otherwise.
Neutral effect	The option is anticipated to have no or negligible beneficial/adverse effect.
Slight adverse (negative) effect	Small negative effect which is worth noting but the assessor believes is not likely to contribute materially to determining whether an option is funded or otherwise.
Moderate adverse (negative) effect	Moderate negative effect which when taken in isolation may not determine an option’s eligibility for funding, but taken together do so.
Large adverse (negative) effect	Major negative effect that the assessor feels should be of principal consideration when assessing an option’s eligibility for funding.

13.1.11 It should be noted that this stage of the assessment involves the comparison of alternative route options and the extent to which individual environmental effects are capable of being mitigated has not yet been fully established. The impacts and their effects reported are therefore prior to application of mitigation. Further consideration of mitigation proposals will form part of the TAG/DMRB Stage 2 assessment should a preferred option be taken forward.

13.2 Noise and vibration

Introduction

13.2.1 This section considers the potential noise and vibration impacts of the Carlisle Southern Link Road, detailing the sources and effects of noise and vibration on sensitive receptors and where appropriate, specifying mitigation.

Methodology

13.2.2 The assessment of potential effects on Noise and Vibration has been carried out where possible in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3, Part 7 Noise and Vibration and TAG Unit A3 Section 2 Noise Impacts. At Stage 1 the objective of the assessment is to:

‘Gather sufficient data to provide an appreciation of the likely noise and vibration consequences associated with the project identified by the Overseeing Organisation’s supply chain and agreed with the Overseeing Organisation. Any option that could involve significant disruption due to the proximity to population centres, or possible need for tunnelling, bridgeworks or other intrusive construction processes, should be identified.’

- 13.2.3 Guidance set out in DMRB Volume 11 Section 3 Part 7 focuses on a risk based approach using three assessment levels: scoping; simple; and detailed. All levels are dependent on a spatially detailed traffic model which is not currently available for the shortlisted Carlisle Southern Link Road options. In the absence of sufficient information to provide a quantitative assessment fully compliant with DMRB, an alternative approach to assessment has been undertaken at this stage, with agreement of the Overseeing Organisation, enabling the comparison of options.
- 13.2.4 The approach adopted involved first identifying residential buildings and sensitive receptors (i.e. hospitals, schools, community facilities, designated areas and Public Rights of Way) within 500m of each route option alignment (the 'study area'). The receptors were identified using a combination of site visits and desktop research.
- 13.2.5 A qualitative assessment was then conducted with the aim of providing a measure to compare each option against. This involved creating 100m bands from the road centreline up to a distance of 500m and calculating the number of sensitive receptors within each band from OS Address Point data. The assessment was not able to consider reasonably foreseeable future developments (i.e. new residential housing estates) as the likely number of receptors and their location is unknown at this stage.
- 13.2.6 A 'Do Nothing' option was defined for the baseline which involved establishing property counts within 100m bands up to 500m from the road centreline of existing highway infrastructure, specifically Peter Lane and Newbiggin Road. It was considered that these existing roads were representative of routes currently used for traffic travelling in an east-west/ west-east direction between the A689 and junction 42 of the M6 within the study area.

Baseline

- 13.2.7 The baseline for noise and vibration is described as the 'do nothing' scenario and as such, identifies the number and type of sensitive receptors within 500m of the existing main highway infrastructure running in an east-west/west-east direction (Newbiggin Road and Peter Lane). Due to the variable size and length of designated areas and PRow, their presence is noted but a count is not provided. See **Table 13.3** below.

Table 13.3 Noise and vibration sensitive receptors

Receptor	Distance (m)					Total
	0-100	100-200	200-300	300-400	400-500	
Residential buildings	80	42	32	37	29	220
Schools	-	-	-	-	-	0
Religious/communal	-	-	-	-	-	0
Hospitals	-	-	-	-	-	0
Pubs/Hotels	2	1	1	1	-	5
Workplaces	1	-	-	2	-	3

Receptor	Distance (m)					Total
	0-100	100-200	200-300	300-400	400-500	
Designated areas	x	x	x	x	x	-
PRoW	✓	✓	✓	✓	✓	-
Total	83	43	33	40	29	228

Options Assessment

Option 1: Blue

13.2.8 **Table 13.4** below provides a count of the sensitive receptors within each distance band for Option 1. There was found to be a slight reduction in the number of receptors within the first band (0-100m) when compared against the baseline, indicating a potential improvement in the amount of properties experiencing the highest level of nuisance. Further distance band property counts were found to be similar to the baseline, a reflection of the high percentage of existing infrastructure utilised under this option.

Table 13.4 Noise and vibration options assessment (option 1 blue)

Receptor	Distance (m)					Total
	0-100	100-200	200-300	300-400	400-500	
Residential buildings	54	60	36	31	45	226
Schools	-	-	-	-	-	0
Religious/ communal	-	-	-	-	-	0
Hospitals	-	-	-	-	-	0
Pubs/Hotels	2	1	1	1	-	5
Workplaces	-	1	-	2	-	3
Designated areas	✓	✓	✓	✓	✓	-
PRoW	✓	✓	✓	✓	✓	-
Total	56	62	37	34	45	234

Option 2: Pink

13.2.9 **Table 13.5** below provides a count of the sensitive receptors within each distance band for Option 2. A large reduction in the number of properties within the 0-100m distance band was observed when compared against the baseline, however, further distance bands showed a large increase in numbers. This is a reflection of the proposed routes proximity to existing villages/settlements on the periphery of Carlisle.

Table 13.5 Noise and vibration options assessment (option 2 pink)

Receptor	Distance (m)					Total
	0-100	100-200	200-300	300-400	400-500	
Residential buildings	11	40	80	92	83	306
Schools	-	-	-	-	1	1
Religious/ communal	-	-	-	2	-	2
Hospitals	-	-	-	-	-	0
Pubs/Hotels	-	-	-	1	2	3
Workplaces	1	1	-	2	2	6
Designated areas	✓	✓	✓	✓	✓	-
PRoW	✓	✓	✓	✓	✓	-
Total	12	41	80	97	88	318

Option 3: Green

13.2.10 **Table 13.6** below provides a count of the sensitive receptors within each distance band for Option 3. Both the 0-100m and 100-200m distance bands showed large reductions in the number of properties potentially experiencing nuisances from noise and vibration when compared against the baseline. The furthest distance bands showed an increase in counts where the route would affect properties situated in the built up area of Durdar. Overall the total number of properties would be less than the baseline, a reflection of the routes alignment through a predominantly rural area.

Table 13.6 Noise and vibration options assessment (option 3 green)

Receptor	Distance (m)					Total
	0-100	100-200	200-300	300-400	400-500	
Residential buildings	4	19	37	57	73	190
Schools	-	-	-	-	-	0
Religious/ communal	-	-	-	-	-	0
Hospitals	-	-	-	-	-	0
Pubs/Hotels	-	2	1	2	-	5
Workplaces	-	-	1	3	1	5
Designated areas	✓	✓	✓	✓	✓	-
PRoW	✓	✓	✓	✓	✓	-
Total	4	21	39	62	74	200

Mitigation

13.2.11 Possible mitigation measures to reduce noise and vibration effects and to be taken forward into the next stages of design and assessment include:

- **Horizontal/Vertical alignment** – move route away from sensitive receptors, keep route low within the natural topography to exploit any natural screening and enhancing this by the use of cuttings;
- **Environmental barriers** – in the form of earth mounding or acoustic fencing or a combination of the two;
- **Low noise surfaces** – to reduce higher frequency noise generated by tyres at speeds in excess of 75km/hr; and,
- **Speed and volume restrictions** –above 40km/hr noise levels of travelling vehicles increase with speed. Similarly, volume and composition of traffic will directly influence the noise level.

Summary

13.2.12 The assessment of noise and vibration has considered possible nuisances on sensitive receptors within 500m of the existing and proposed route alignments. In the absence of a spatially detailed traffic model the assessment has been designed to allow a comparison of route options through the calculation of property counts.

13.2.13 Option 2 showed the largest overall increase in the number of sensitive receptors potentially affected by noise and vibration when compared against the baseline. This option has therefore been identified as the least preferred.

13.2.14 Option 1 is identified as the intermediate option as only a small increase in the number of properties was observed when compared against the baseline, with a reduction in the band up to 100m.

13.2.15 Option 3 showed large reductions in the first two bands (0-100m and 100-200m), a reflection of the routes alignment through a predominantly rural area. This option has been selected as the preferred. See **Table 13.7** below for a summary.

Table 13.7 Noise and vibration preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	x	✓	x
2 (Pink)	x	x	✓
3 (Green)	✓	x	x

13.3 Air quality

Introduction

- 13.3.1 This section considers the potential impacts of the Carlisle Southern Link Road on local air quality, detailing likely sources and the effects on sensitive receptors and where appropriate, specifying mitigation. Wider impacts on regional/national air quality are not considered as they are beyond the scope of this assessment.

Methodology

- 13.3.2 The assessment of potential effects on local air quality has been carried out where possible in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3, Part 1 'Air Quality' and TAG Unit A3. At Stage 1 the objective of the assessment is to:

'...indicate whether there are likely to be significant impacts associated with particular broadly defined routes or corridors, as developed by the design organisation and the Overseeing Organisation.'

- 13.3.3 Guidance set out in DMRB Volume 11 Section 3 Part 1 focuses on a risk based approach using three assessment levels: scoping; simple; and detailed. All levels are dependent on a spatially detailed traffic model which is not currently available for the shortlisted Carlisle Southern Link options. In the absence of sufficient information to provide a quantitative assessment fully compliant with DMRB, an alternative approach to assessment has been undertaken at this stage with agreement of the Overseeing Organisation enabling the comparison of options.

- 13.3.4 The stage 1 assessment for local air quality includes:

- The preparation of a map showing properties which may potentially experience a change in local air quality within 200m of the existing and proposed alignments. Particularly sensitive properties, such as those containing the young, elderly or vulnerable (i.e. schools and hospitals) are highlighted. Designated nature conservation sites are also marked due to their possible sensitivity to air pollutants (i.e. SACs, SPAs, and SSSIs); and,
- A count of the number of properties within 200m from the road centreline for the existing and proposed alignments, separated into 50m incremental bands, using OS Address Point data.

- 13.3.5 The assessment was not able to consider reasonably foreseeable future developments (i.e. new residential housing estates) as the likely number of receptors and their location is unknown at this stage.

Baseline

- 13.3.6 The baseline condition is defined by establishing property counts within bands of 50m up to 200m from the road centreline of the existing highway infrastructure. This includes existing routes which run generally in an east-west / west-east direction, specifically Peter Lane and Newbiggin Road. Due to the variable size and length of designated areas, their presence is noted but a count is not provided. See **Table 13.8** below.

Table 13.8 Air quality sensitive receptors

Receptor	Distance (m)				Total
	0-50	50-100	100-150	150-200	
Residential buildings	52	31	23	22	128
Schools	-	-	-	-	0
Hospitals	-	-	-	-	0
Designated areas	x	x	x	x	-
Total	52	31	23	22	128

*Options Assessment*Option 1: Blue

- 13.3.7 **Table 13.9** below provides a count of the sensitive receptors within each distance band for Option 1. There was found to be a reduction in the number of receptors within the first band (0-50m) when compared against the baseline, indicating a potential improvement in the amount of properties experiencing the highest level of impact on air quality. Other distance band property counts were found to be similar to, or slightly higher than the baseline, a reflection of the high percentage of existing infrastructure utilised under this option.

Table 13.9 Air quality options assessment (option 1 blue)

Receptor	Distance (m)				Total
	0-50	50-100	100-150	150-200	
Residential buildings	17	39	30	34	120
Schools	-	-	-	-	0
Hospitals	-	-	-	-	0
Designated areas	✓	✓	✓	✓	-
Total	17	39	30	34	120

Option 2: Pink

- 13.3.8 **Table 13.10** below provides a count of the sensitive receptors within each distance band for Option 2. A large reduction in the number of properties within the 0-50m and 50-100m distance bands was observed when compared against the baseline however, other distance bands showed comparable counts. Overall there was a reduction in the number of existing properties potentially affected by air quality issues.

Table 13.10 Air quality options assessment (option 2 pink)

Receptor	Distance (m)				Total
	0-50	50-100	100-150	150-200	
Residential buildings	5	7	14	27	53
Schools	-	-	-	-	0
Hospitals	-	-	-	--	0
Designated areas	✓	✓	✓	✓	-
Total	5	7	14	27	53

Option 3: Green

- 13.3.9 **Table 13.11** below provides a count of the sensitive receptors within each distance band for Option 3. There were reductions observed in the number of properties across all bands when compared against the baseline, particularly at the 0-50m, 50-100m and 100-150m distances. Overall the total number of properties would be much less than the baseline, a reflection of the routes alignment through a predominantly rural area.

Table 13.11 Air quality options assessment (option 3 green)

Receptor	Distance (m)				Total
	0-50	50-100	100-150	150-200	
Residential buildings	1	3	6	15	25
Schools	-	-	-	-	0
Hospitals	-	-	-	-	0
Designated areas	✓	✓	✓	✓	-
Total	1	3	6	15	25

Mitigation

- 13.3.10 Possible mitigation measures to reduce effects on local air quality and to be taken forward into the next stages of design and assessment include:
- **Route alignment** – move route away from sensitive receptors, orientate the road relative to prevailing winds, locate junctions and intersections away from sensitive locations and place the road in a cutting or on an embankment to increase the distance between the road and a sensitive receptor;

- **Vegetation works** – use of vegetation screens or barriers; and,
- **Traffic management** – fixed and variable speed limits.

Summary

- 13.3.11 This assessment has considered possible impacts on sensitive receptors as a result changes to local air quality within 200m of the existing and proposed route alignments. In the absence of a spatially detailed traffic model the assessment has been designed to allow a comparison of route options through the calculation of property counts.
- 13.3.12 Option 1 blue showed a small decrease in the number of residential properties potentially affected by reductions in air quality when compared against the baseline. This option has been identified as the least preferred as is showed the smallest reductions compared to the other options.
- 13.3.13 Option 2 pink is identified as the intermediate option as showed the second largest decreases in the number of properties was observed when compared against the baseline.
- 13.3.14 Option 3 green showed large reductions across all bands but especially at the 0-50m, 50-100m and 100-150m distances, a reflection of the routes alignment through a predominantly rural area. This option has been selected as the preferred. See **Table 13.12** below for a summary.

Table 13.12 Air quality preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	x	x	✓
2 (Pink)	x	✓	x
3 (Green)	✓	x	x

13.4 Landscape and visual

Introduction

- 13.4.1 The following section provides a DMRB Stage 1 and TAG Step 6 assessment of potential impacts of three identified route option corridors for the Carlisle Southern Link Road on the landscape character and visual amenity of the area. The aim of the section is to use this assessment to identify a preferred option from the shortlist. This option, if acceptable against all other sifting criteria, will be taken forward for more detailed assessment in Stages 2 and 3.

Methodology

- 13.4.2 The assessment of potential effects on the landscape and visual amenity of the area has been carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3 Part 5 “Landscape Effects” and TAG Unit A3. Other references used to inform this section include: the Guidelines for Landscape and Visual Impact Assessment (Third Edition) by the Landscape Institute and Institute of Environmental Management & Assessment; Natural England’s National Character Area profile 6: Solway Basin; and Cumbria Landscape Character Guidance.
- 13.4.3 The Study Boundary is highlighted on **Plan CSDR-CAP-EGN-00-DR-V-0002** in **Appendix E** and defines a broad corridor between the A595 and the M6 for route options to fall within. The study boundary was identified at Step 4b in TAG process following identification of the scheme objectives.
- 13.4.4 To begin the study, an understanding of the environmental baseline was achieved through a combination of desk study research, collaborative workshops and a site visit. This enabled an appreciation of landscape character, key views and any constraints to development from a landscape and visual perspective.
- 13.4.5 The key landscape and visual receptors within the study area identified through the desk study and site were then assigned an environmental value, indicating their sensitivity. To ensure that subjective decisions were undertaken in a consistent way and to clarify reasons for judgements, these values were based upon descriptors provided in **Appendix A**, which have been developed from *Interim Advice Note 135/10 “Landscape and Visual Effects Assessment”*, November 2010.
- 13.4.6 A number of key visual receptors have been identified within the study area and include: residents of the major settlements (Cummersdale, Durdar, Brisco and Carleton); residents of isolated rural dwellings; recreational users of Public Rights of Way (PRoW), waterways, open spaces and cycle routes. The photographs that illustrate these can be found in **Appendix F**.
- 13.4.7 Next, an options appraisal identified the impacts, effects, magnitude and the overall significance of the effects resulting from each of the three options, using the matrix shown in **Table 13.1**. This was supported by commentary text that have been summarised by a series of tables. The TAG seven point qualitative scale was used to provide a consistent method of assessment.
- 13.4.8 Mitigation measures and recommendations have been outlined with the aim of reducing the impacts of any significant effects resulting from the proposed development. This has largely been influenced by the Guidelines produced by Cumbria County Council within their Landscape Character Guidance documents, as well as considerations following the team site visit.
- 13.4.9 The Landscape and Visual Impact Appraisal concludes by providing a brief summary of the findings within this section and provided an indication of the preferred option based on the overall findings of the study.

*Baseline*Landscape character

- 13.4.10 The study area is located within National Character Area 6: Solway Basin, however, more accurate descriptions of the landscape character types are summarised in Cumbria County Council's "Cumbria Landscape Character Guidance" (2011). The boundaries of these Landscape Character Types can be found in **CSDR-CAP-EGN-00-DR-V-0004** in **Appendix E**, North Cumbria, Carlisle and The Borders, which shows the study area for the Carlisle Southern Link Road to comprise of: "5a. Ridge and Valley" to the west of the study area around Cummersdale; "5b. Low Farmland" which covers most of the study boundary around Durdar and Brisco; and "5d. Urban Fringe" to the very north of the study area, around Carlisle Racecourse.
- 13.4.11 The western portion of the study area is described as "5a. Ridge and Valley" landscape. The key characteristics of this landscape character type are described as:
- A series of ridges and valleys that rises gently toward the limestone fringes of the Lakeland fells;
 - Well managed, regular shaped medium to large pasture fields;
 - Hedge bound pasture fields dominate, interspersed with native woodland, tree clumps and plantations;
 - Scattered farms and linear villages found along ridges; and,
 - Large scale structures generally scarce.
- 13.4.12 The most valuable features of this landscape character type are the strong field patterns of the well managed pastoral land; the species rich hedgerows that define these boundaries; the pockets of interspersed native broadleaf woodland and shelterbelts, as well as conifer plantations which provide important habitat for red squirrels; the dispersed farm settlements that are modest in size and sit discretely within the landscape; linear settlements along ridge tops that are sensitive to expansion; and the open and interrupted views from ridge tops to the Solway Firth and Lakeland fells. The pleasant, peaceful atmosphere of the pastoral working farmed landscape is a key characteristic of this local area and will be sensitive to change. This character area has been identified to have a **moderate sensitivity**, due to the absence of any landscape statutory designations but the strong landscape character that is apparent through much of the study area, consequently meaning that the area would not adapt well to the introduction of a major new road.
- 13.4.13 The eastern portion of the study area is described as "5b. Low Farmland" landscape. The key characteristics of this landscape character type are described as:
- Undulating and rolling topography;
 - Intensely farmed agricultural pasture dominates;

- Patchy areas of woodland provide contrast to the pasture;
- Fields are large and rectangular; and,
- Hedges, hedgerow trees and fences bound fields and criss-cross up and over the rolling landscape.

13.4.14 The most valuable features of this landscape character type are the matrix of interlocking hedgerows, woodlands and trees along rivers and fields that provide interest to the open views of the relatively flat pastoral landscape; the traditional feel of villages and interspersed farms are sensitive to village expansion and urbanisation. This character area has been identified to have a **moderate sensitivity**, due to the absence of any landscape statutory designations but the strong landscape character that is apparent through much of the study area, consequently meaning that the area would not adapt well to the introduction of a major new road.

13.4.15 The only option likely to lie within area type “5d. Urban Fringe” to the very north of the study area is Option 2, which is shown to be close to Carlisle Racecourse. The key characteristics of this landscape character type are described as:

- Long term urban influences on agricultural land;
- Recreation, large scale buildings and industrial estates are common; and,
- Wooded valleys, restored woodland and some semi-urbanised woodland provide interest.

13.4.16 The most valuable features of this landscape character type are the areas of woodland in valleys, restored woodland and some semi urbanised woodland; the intact field patterns defined by hedges and hedgerow trees; and fields close to settlement boundaries are sensitive to development. This character area has been identified to have a **low sensitivity**, due to the absence of any landscape statutory designations and the more urban characteristics of this area meaning it would be more likely to adapt to the introduction of a major new road.

13.4.17 For all the landscape character areas mentioned in the sections above, however, it must be recognised that mitigation could in part be achieved by developing the route in tandem for the masterplan for the wider site, a key component of which will be an appropriate and effective green infrastructure framework.

Visual amenity

13.4.18 The key visual receptors are as follows (see drawing **CSDR-CAP-EGN-00-DR-V-0002** for location):

- Cummersdale (**Viewpoint 1**)
- Cumbria Way/ National Cycle Route 7/ River Caldew (**Viewpoint 2**)
- Durdar (Viewpoint 3)
- Low Burthwaite (**Viewpoint 4**)
- Brisco (Viewpoint 5)
- Carleton (**Viewpoint 6**)

Table 13.13 Landscape and visual sensitive receptors

Receptor	Description	Value (sensitivity)
<i>Landscape Character</i>		
Character area 5a Ridge and Valley	Refer to section 1.4.7 for details.	Moderate
Character Area 5b Low Farmland	Refer to section 1.4.9 for details.	Moderate
Character Area 5d Urban Fringe	Refer to section 1.4.11 for details.	Low
<i>Visual Amenity</i>		
Cummersdale (Viewpoint 1)	The baseline view from the edge of this village with a population of approximately 451 (2011) is that of open ridge and valley agricultural land with medium to large fields defined by hedgerows. Fields are used for both pastoral grazing and livestock related crops, creating a patchwork field pattern. Small areas of plantation woodland, isolated mature broadleaf trees and isolated dwellings are also present in the landscape. Due to this visual receptor being the residents of Cummersdale the sensitivity has been classed as “High”.	High
Cumbria Way/ NCN 7/ River Caldew (North) (Viewpoint 2)	The baseline view from this major recreational route offers open rural views of the Caldew river valley, with rich and varied landscape elements from the pebble beach on the meanders of the river and expanses of native grassland and succession willow wetlands within the floodplain to areas of mature broadleaf woodland and rolling pastoral fields on the valley sides. Due to this visual receptor being both the Cumbrian Way and National Cycle Network Route 7, the sensitivity has been classed as “High”.	High
Cumbria Way/ NCN 7/ River Caldew (South) (Viewpoint 3)	As above.	High

Receptor	Description	Value (sensitivity)
Durdar (Viewpoint 4)	The baseline view from the edge of this small linear village consists of relatively flat land on the edge of Carlisle Racecourse that comprises of large fields used for both pastoral grazing and livestock related crops, defined by hedgerows and interspersed with isolated mature broadleaf trees. Occasional wind turbines, large agricultural sheds at the racecourse and electricity pylons in the distance provide dominant features in the landscape. Due to this visual receptor being the residents of Durdar the sensitivity has been classed as "High".	High
Low Burthwaite (Viewpoint 5)	The baseline view from this small group of isolated dwellings is from an elevated ridge position that offers open expansive views extending over Carlisle and on to mountains in the distance. The view predominantly features large pastoral fields divided by hedgerows, an area of mature plantation woodland and a belt of mature broadleaf trees that flank Newbiggin Road along with a small number of residential properties. Due to this visual receptor being the residents of Low Burthwaite the sensitivity has been classed as "High".	High
Brisco (Viewpoint 6)	The baseline view from the eastern edge of the village is a relatively open view from an elevated position across the Petteril valley comprising of medium sized pastoral fields divided by hedgerows and scattered with mature broadleaf trees. Across the valley in the distance the residential properties of Carleton that run along the A6 can be seen, with the outlines of mountains just visible beyond. The West Coast Mainline railway line dissecting the view running along an elevated bank, yet because it is well screened by hedging and the infrequent trains means that it is not a dominant feature. Due to this visual receptor being the residents of Brisco the sensitivity has been classed as "High".	High
Carleton (Viewpoint 7)	The baseline view from this elevated viewpoint offers expansive open views across the floodplain of the River Petteril. The land here is again predominantly used for pastoral agriculture with large fields on the floodplain being more organic in shape and defined by timber post and rail fences as well as hedgerows. A belt of mature broadleaf woodland screens a portion of the busy A6 from view and the West Coast Mainline Railway is difficult to pick out within the landscape, as is the Brick Works, resulting in a predominantly rural view across the valley, with glimpsed views of Carlisle in the distance. Due to this visual receptor being the residents of Carleton the sensitivity has been classed as "High".	High

Options Assessment

Option 1: Blue

13.4.19 Out of all of the three options, Option 1 indicated the most use of existing road networks, with the route following the alignment of Peter Lane and a long section of Newbiggin Road. Not only will this result in a reduced visual impact from key receptors, but it will reduce the impact on the landscape as a resource as along these existing road corridors the route will not be dissecting through prime agricultural land that would reduce the viability of many of the fields and disrupt the distinct field patterns that have been identified by Cumbria County Council as a key characteristic of this landscape.

13.4.20 However, there is a limit to the existing road network that can be reused, meaning that between Durdar and Peter Lane the route is forced to dissect straight through a large number of pastoral fields and cross the River Caldew and the Cumbria Coast Railway Line at a particularly wide section of the valley at a point where a crossing would need to be particularly high to clear the railway. This is a particularly sensitive section of the route and the proposals would have a highly negative impact on both the landscape character and the visual receptors at this key recreational point. South-east of the River Caldew valley, the route also comes within close proximity to a number of dwellings and farms.

Table 13.14 Landscape and visual options assessment (option 1 blue)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
<i>Landscape Character</i>				
Character area 5a Ridge and Valley (Moderate)	Removal of hedgerow boundaries, intersection of field patterns, and loss of good quality productive grazing land south of Cummersdale. Dissects PRoW.	Loss of character and peaceful experiential qualities south of Cummersdale.	Major	Moderate Adverse
Character Area 5b Low Farmland (Moderate)	Large, highly engineered crossing and embankment cutting required to bridge River Caldew Valley at particularly wide, open location. Further loss of good quality productive grazing land and dissecting of field patterns between River Caldew and Durdar, resulting in loss of hedgerow boundaries. Road widening required on Newbiggin Road.	Loss of visual amenity at river crossing on Cumbrian Way and NCN Route 7. Loss of character between River Caldew and Durdar. Slight feeling of urbanisation caused by increasing road width on Newbiggin Road and loss of hedgerows and mature broadleaf trees.	Major	Moderate Adverse
Character Area 5d. Urban Fringe(Low)	No change.	No change.	No change.	Neutral
<i>Visual Amenity</i>				
Cummersdale Viewpoint 1 (High)	The route will be clearly visible across the valley only one and a half fields away and will be particularly close to a small collection of properties on Grace Lane off Dalston Road.	The visual amenity from Cummersdale will be compromised for both residents of on looking properties and people using the public bridleway on the edge of the village.	Major	Large Adverse
Cumbria Way/ NCN 7/ River Caldew (North) Viewpoint 2 (High)	No change.	No change.	No change	Neutral
Cumbria Way/ NCN 7/ River Caldew (South)	A large highly engineered approach will be necessary to cross the Caldew valley, the Cumbrian Way	The visual amenity from this strategic route will be affected by the loss of	Major	Large Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Viewpoint 3 (High)	and the railway line at this particularly wide section, including a large bridge crossing, clearance of vegetation and embankment works.	vegetation and the scarring of the valley sides. The strong sense of place of the area will be transformed with a strong urban influence. The open views of the river and surrounding landscape will be dominated by the crossing.		
Viewpoint 4 Durdar (High)	The route will dissect a large section of agricultural land to the west of Durdar coming in very close proximity to several isolated dwellings and crossing over Newbiggin Road to bypass the village to the south by approx. 100m. The reuse of Newbiggin Road to the east of the village will likely mean the removal of hedgerows, small areas of plantation woodland, agricultural land and some mature broadleaf trees to allow for road widening.	The route will result in a loss of visual amenity as it will be at least partially visible by most residents in the village particularly to the west and south west of the village. Where the new route would dissect open pasture land.	Major	Large Adverse
Viewpoint 5 Low Burthwaite (High)	The route will follow the Newbiggin Road corridor but will involve the widening of the road and the potential of a roundabout resulting in a loss of hedgerows and agricultural land.	Loss of visual amenity from residents of isolated dwellings around Low Burthwaite.	Minor	Slight Adverse
Viewpoint 6 Brisco (High)	Newbiggin Road would need to be widened and the introduction of a roundabout or other junction alterations around the existing junction with Brisco Road. Removal of hedgerows and loss of agricultural land around junction and where road widening is necessary.	Only elements of the proposals would be discernible from certain locations within the village resulting in a slight loss in visual amenity through glimpsed views.	Minor	Slight Adverse
Viewpoint 7 Carleton (High)	No change.	No change.	No change	Neutral

Option 2: Pink

- 13.4.21 This route is the most northern out of the three options and is proposing to align in relatively close proximity to existing urban features including the village of Cummersdale, Carlisle Racecourse and Durdar, Brisco and meets the A6 at the eastern extent rather than the roundabout at Junction 42. This route also follows the alignment of Peter Lane, but from there it crosses agricultural land, woodland and river floodplain.
- 13.4.22 The point of crossing over the River Caldew and Cumbria Coast Railway Line is situated further north than for the other two routes and is again highly sensitive, crossing a valuable area of open space with high recreational value as well as having strong qualities of landscape character with broadleaf woodland, agricultural fields, the topography of the rolling valley and the river itself. However, this crossing is in closer proximity to the existing rail bridge that crosses the River Caldew and a small area of land that appears to be used for storage with shipping containers. There is also more opportunity for the road to be screened due to the existing woodland that the route is shown to dissect. The route proposes to encroach on the village of Brisco which from the site visit was noted as being particularly sensitive both as a residential receptor but also as a landscape resource due to its traditional rural character that contributes to the character of the local landscape. The creation of an additional transport corridor between Brisco and the A6 over the West Coast Mainline Railway and the River Petteril is considered to have an adverse effect on both the visual receptors of Carleton and Brisco as well as the landscape as a resource as it will have an adverse effect on the existing rural valley, as the route is proposing to cross a point where the valley is particularly wide offering open views of the river and surrounding pastoral land.

Table 13.15 Landscape and visual options assessment (option 2 pink)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
<i>Landscape Character</i>				
Character area 5a Ridge and Valley (Moderate)	Removal of hedgerow boundaries, intersection of field patterns, and loss of good quality productive grazing land immediately south of Cummersdale. Dissects PRoW at three points.	Loss of character and peaceful experiential qualities south of Cummersdale. Increases feeling of urban sprawl.	Major	Moderate Adverse
Character Area 5b Low Farmland (Moderate)	Large, highly engineered crossing and embankment cutting required to bridge River Caldew Valley at relatively wide location close to existing railway bridge but much higher to allow crossing of river and Cumbrian Coastal Railway line. Major loss of good quality productive grazing land and dissecting of field patterns Cummersdale and Carleton, resulting in loss of hedgerow boundaries. Road widening required on	Severe loss of visual amenity through large section of the study area. Perception of urbanisation caused by introduction of new major road resulting in loss of character between Cummersdale and Carleton.	Major	Moderate Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	Newbiggin Road.			
Character Area 5d Urban Fringe (Low)	Route will involve introduction of a roundabout and river crossing south of Cummersdale on southern edge of character area, which may expand the extent of this character area. Loss of intact field patterns defined by hedges and hedgerow trees.	Long term urban influences on agricultural land would actually strengthen the character of this area and expand its extent slightly, however, loss of character through dissection of intact field patterns and wooded areas.	Moderate	Slight Adverse
Visual Amenity				
Cummersdale Viewpoint 1 (High)	The route will be clearly visible immediately south of Cummersdale and will be particularly close to a small collection of properties on Grace Lane off Dalston Road.	The visual amenity from Cummersdale will be compromised for both residents of on looking properties and people using the public bridleways south of the village.	Major	Large Adverse
Cumbria Way/ NCN 7/ River Caldew (North) Viewpoint 2 (High)	A large highly engineered approach will be necessary to cross the Caldew valley, the Cumbrian Way and the railway line at this wide section close to the existing railway bridge, including a large bridge crossing, clearance of woodland and other vegetation and embankment works.	The visual amenity from this strategic route will be affected by the loss of vegetation and the scaring of the valley sides. The strong sense of place of the area will be transformed with a strong urban influence. The open views of the river and surrounding landscape will be dominated by the crossing. There will be some visual screening from surrounding existing woodland and from the existing railway bridge for those travelling south.	Major	Large Adverse
Cumbria Way/ NCN 7/ River Caldew (South) Viewpoint 3 (High)	No change.	No change.	No change	Neutral
Durdar Viewpoint 4 (High)	The route will dissect a large section of agricultural land following the edge of Carlisle Racecourse to the west of Durdar and crossing Durdar Road to the north of the village before heading east dissecting	The route will result in a loss of visual amenity as it will be at least partially visible by most residents in the village particularly to the north of the village	Major	Large Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	further agricultural land.	where the new route would dissect open pasture land.		
Low Burthwaite Viewpoint 5 (High)	The route will be screened by existing mature planting around Newbiggin Road.	No change.	No Change	Neutral
Brisco Viewpoint 6 (High)	The route would dissect a large area of agricultural land which lies at a slightly lower level to Brisco around the north of the village. This will cause the removal of hedgerows and loss of agricultural land.	The scale and proximity of the route in relation to the village would result in a loss of visual amenity to residents of Brisco.	Major	Large Adverse
Carleton Viewpoint 7 (High)	The route proposes to cross open agricultural land to the south west of Carleton as it crosses the West Coast Mainline Railway and the River Patteril and meets the A6, which would require a new large junction or roundabout. This will require a highly engineered solution with a large bridge and associated structures which will become a dominant feature in the view.	This would cause a severe loss of visual amenity from the village of Carleton.	Major	Large Adverse

Option 3: Green

13.4.23 This option does not reuse any of the existing road network with the exception of a short stretch of Newbiggin Road to the east, and is the most southerly of the three route options. Rather than utilising the existing road on Peter Lane, this route creates a new junction that heads south of Peter Lane, closer to Kingrigg Farm and through an area of mixed woodland. As it heads eastwards, the route dissects an area of agricultural land at a higher level than the other two route options, before crossing the River Caldew valley at the same location as Option 1 blue. The route follows the same route as Option 1 until it crosses Newbiggin Road, where it swings further south to follow the southern edge of Tarn Plantation south of Newbiggin Road. The route continues across agricultural land, close to existing buildings before bearing north to cross the West Coast Main Line Railway at the same location using the existing Newbiggin Road Bridge, and then forms a new alignment from this railway bridge to Junction 42.

Table 13.16 Landscape and visual options assessment (option 3 green)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
<i>Landscape Character</i>				
Character area 5a Ridge and Valley (Moderate)	Dissects field patterns and agricultural land south of Peter Way, including removal of hedgerow	Loss of character and peaceful experiential qualities south of	Major	Moderate Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	boundaries, intersection of field patterns, and loss of good quality productive grazing land and plantation woodland south of Peter Way. Similar approach south of Cummersdale as road dissects field patterns and boundaries on the opposite side of the valley. Dissects PRow.	Cummersdale.		
Character Area 5b Low Farmland (Moderate)	Large, highly engineered crossing and embankment cutting required to bridge River Caldew Valley at particularly wide, open location. Further loss of good quality productive grazing land and dissecting of field patterns between River Caldew and Durdar close to several farms and isolated dwellings, resulting in loss of hedgerow boundaries, dissection of access lanes and PRow, and the introduction of a spur from a new roundabout linking the road to Dalston. Route dissects further field patterns south of Durdar and only utilises Newbiggin Road corridor for short stretch to east, where road widening may be required.	Severe loss of visual amenity over a large area within Character Area. Loss of character between Cummersdale area and crossing of West Coast Mainline Railway. Increased feeling of urbanisation caused by introduction of new major road corridor and loss of hedgerows and mature broadleaf trees.	Major	Moderate Adverse
Character Area 5d Urban Fringe(Low)	No change.	No change.	No change	Neutral
Visual Amenity				
Cummersdale Viewpoint 1 (High)	The route will be clearly visible across the valley as it dissects Greenfield land and PRow.	The visual amenity from Cummersdale will be compromised for both residents of on looking properties and people using the PRow south of the village.	Major	Large Adverse
Cumbria Way/ NCN 7/ River Caldew (North) Viewpoint 2 (High)	No change.	No change.	No change	Neutral
Cumbria Way/ NCN 7/ River Caldew (South) Viewpoint 3 (High)	A large highly engineered approach will be necessary to cross the Caldew valley, the Cumbrian Way and the railway line at this	The visual amenity from this strategic route will be affected by the loss of vegetation and the scaring	Major	Large Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	particularly wide section, including a large bridge crossing, clearance of vegetation and embankment works.	of the valley sides. The strong sense of place of the area will be transformed with a strong urban influence. The open views of the river and surrounding landscape will be dominated by the crossing.		
Viewpoint 4 Durdar (High)	The route will dissect a large section of agricultural land to the west and south of Durdar coming in very close proximity to several isolated dwellings and crossing over Newbiggin Road to bypass the village to the south. The removal of hedgerows, small areas of plantation woodland, agricultural land and some mature broadleaf trees would be necessary.	The route will result in a severe loss of visual amenity as it will be at least partially visible by most residents in the village.	Major	Large Adverse
Viewpoint 5 Low Burthwaite (High)	The route will become a dominant feature within the view with the introduction of a major road dissecting the large area of open agricultural land and mature hedgerows and the potential of a roundabout.	Loss of visual amenity from residents of isolated dwellings around Low Burthwaite.	Major	Large Adverse
Viewpoint 6 Brisco (High)	No change.	No change.	No change	Neutral
Viewpoint 7 Carleton (High)	No change.	No change.	No change	Neutral

Mitigation

- 13.4.24 The landscape and visual impacts and effects of the proposed options described in the previous sections have been described **without the consideration of any mitigation measures.**
- 13.4.25 The following section includes recommendations for mitigation have been influenced by DMRB Volume 11 Section 3 Part 5 “Landscape Effects” and aim to provide broad suggestions of how the outlined significant effects on both the landscape as a resource and visual amenity can be reduced through informed design.
- 13.4.26 To reduce the adverse effects on both landscape receptors the designer should look for opportunities to:
 - utilise reuse of existing road corridors as much as possible;

- retain as much vegetation as possible to screen the route corridor and retain landscape character;
 - achieve the best fit with the contours;
 - proposed on and offsite planting;
 - proposed subtle earthworks to screen wherever possible without excessive land take;
 - careful consideration of the form and finish of any proposed routes, features and structures, including the use of local natural materials wherever possible; and,
 - minimal use of “street clutter” such as lighting columns, signage and gantries.
- 13.4.27 Such mitigation measures would help to reduce the adverse effects, particularly on the visual receptors, as demonstrated in other projects of a similar nature, such as the **A69 Haydon Bridge Bypass**, shown in **Figure 13.1**, **Figure 13.2** and **Figure 13.3** below.
- 13.4.28 Through use of the earthworks the road will appear less visible from surrounding settlements and Public Rights of Way. Over time, as the vegetation establishes, this will also help to screen the visual impact of the proposed route. Minimal street clutter has also been used, with the exception of the overhead cables, which also helps to reduce the visual impact and to retain a more rural character.
- 13.4.29 The use of natural stone for new walls, shown in **Figure 13.3**, also helps to reinforce a sense of place and retain a rural character that helps to mitigate the effects of a major road.
- 13.4.30 Similar careful consideration of landform and cuttings using minimal land take could help to reduce some of the large adverse effects described in the previous sections, together with proposed on and offsite planting which would reduce the adverse effects after a number of years once this had established.
- 13.4.31 As much existing vegetation should be retained as possible, as this will help to interrupt the visual presence of the road making it a less dominant feature, for example, for Option 1: Blue at Cummersdale, where the effect on the visual amenity could be Large Adverse. Where hedgerows, individual trees, groups and woodland must be removed to reduce overall land take, these should be replanted both to reduce the visual impacts and a loss of character after a number of years.

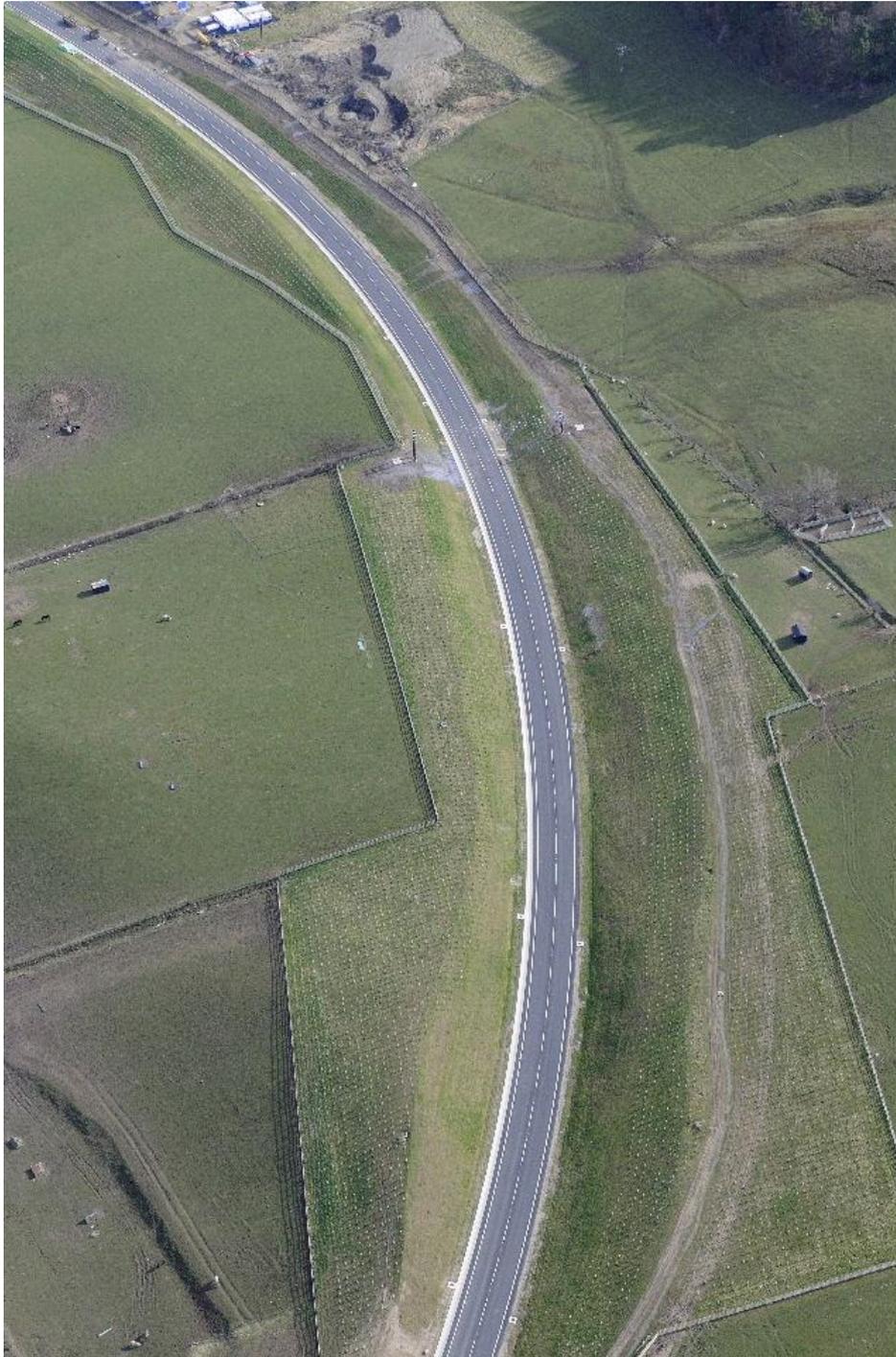


Figure 13.1 Aerial image of Haydon Bridge Bypass, A69



Figure 13.2 Earthworks and mitigation planting on the Haydon Bridge Bypass, A69



Figure 13.3 Natural stone used in new walls, Haydon Bridge Bypass A69

- 13.4.32 Another approach where several of these mitigation measures could be adopted is the combination of certain sections of multiple route options. For example, it could be beneficial for the western section of Option 2: Pink, from Peter Lane to Durdar, to be joined to Option 1, east of Durdar along Newbiggin Road, to maximise the use of existing road corridors and consequently further reduce the significant adverse effects of the proposals.
- 13.4.33 As Option 2: Pink, uses the existing road network on Peter Lane, compared to Option 3: Green, which would require an entirely new junction on the A595 round about and dissects a large area of agricultural land and plantation woodland. Option 2 also crosses the River Caldew at a slightly more suitable location than the crossing point of Options 1 and 3 further south, due to partial visual screening from surrounding existing woodland, a narrower valley, and the grouping with the existing railway bridge. Whilst the effect is still likely to be considered Large Adverse, it is likely that careful design and mitigation could ensure that this approach has less of an impact than for the other two options. The route of Option 2: Pink is also more favourable south of the racecourse, where it closely follows the edge of Carlisle Racecourse, therefore creating a new edge to the Character Area 5d Urban Fringe, which could equally be screened by proposed vegetation. At Durdar, the crossing of Durdar Road further north will have less of an impact on landscape character as it is considered a slightly more urban setting. Here, a using minimal landtake and avoiding encroachment on residential properties at Durdar, there is an opportunity to then use the remainder of the Option 1: Blue Route, which is considered to have the least adverse effects on landscape character due to the use of the existing road network on Peter Lane.

Summary

- 13.4.34 The results of the landscape and visual effects assessment have not been conclusive in indicating a clear preferred option. All three alternatives could potentially result in numerous large adverse effects on the identified landscape and visual receptors without considered implementation.
- 13.4.35 Despite this, it is believed that through careful design and the implementation of mitigation methods covered above, the overall adverse effects of the proposed routes could be significantly reduced over time.
- 13.4.36 The results of the assessment indicate that the option with the least adverse effects on the identified landscape and visual receptors is Option 1: Blue, predominantly due to the fact that this route maximises the reuse of existing road corridors. The least preferred option, following the assessment criteria, would be Option 2: Pink. However, this is largely due to the eastern half of the route through Greenfield land close to Brisco and Carelton; whereas, as described in the mitigation section, the western half of the route actually presents many benefits of being in close proximity to existing urban features and has a preferred crossing point of the River Caldew, which is the most sensitive location within the study area.
- 13.4.37 It is, therefore, recommended that further investigation of the combination of a number of options, as well as the other outlined mitigation measures, could be considered to minimise the overall adverse effects on both the landscape and visual receptors.

Table 13.17 Landscape and visual preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	✓	x	x
2 (Pink)	x	x	✓
3 (Green)	x	✓	x

13.5 Historic environment

Introduction

- 13.5.1 This section of the report identifies the impacts upon the heritage resource of the options considered for the Carlisle Southern Link Road. The heritage resource consists of archaeology, statutory designations such as listed buildings and scheduled monuments, and the historic landscape. Three options have been considered within this appraisal and recommendations have been made for the preferred option in terms of least impact on the heritage resource.

Methodology

- 13.5.2 The assessment of potential effects on the historic environment has been carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3 Part 2 HA 208/07 Cultural Heritage and TAG Unit A3.
- 13.5.3 The study boundary is highlighted on plan **CSDR-CAP-EGN-00-DR-V-0005** in **Appendix E** and defines a broad corridor between the A595 and the M6 for route options to fall within. The study boundary was identified at Step 4b in TAG process following identification of the scheme objectives.
- 13.5.4 A desk based study of publicly accessible information was conducted to identify known heritage assets. This included the National Heritage List for England (NHLE) maintained by Historic England for statutorily designated assets and the local authority Historic Environment Record for other designated and non-designated assets. The Cumbria Historic Environment Record holds digital information and grey (unpublished) literature on finds and structures previously identified in and around the study area. Heritage Gateway (www.heritagegateway.org.uk) and MAGIC (www.magic.gov.uk) were also consulted to cross check national and local designations. The datasets have been collated and presented using ArcMap GIS.
- 13.5.5 A preliminary walkover of the site was carried out on the 17th August 2015 to confirm current land use, identify any visible assets, confirm relevant historic landscape character mapping and briefly check the condition of known assets.
- 13.5.6 The methodology for appraising the impact of the scheme uses the following steps as defined in TAG Unit A3:
1. Scoping and identification of the study area
 2. Identifying key environmental resources and describing their features
 3. Appraise environmental capital

4. Appraise the proposal's impact
5. Determine the overall assessment score

- 13.5.7 The key historic environment receptors within the study area identified through the desk study and site were described using a series of features including: form; survival; condition; complexity; context; and period. They were then assigned an environmental value, indicating their sensitivity.
- 13.5.8 The evaluation of the asset has been considered in relation to the National Planning Policy Framework (NPPF, 2012). The conservation of heritage assets in a manner appropriate to their significance is a core planning principle of the NPPF. Section 132 of the NPPF states 'when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation...As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification'.
- 13.5.9 The values (or sensitivity) of all the known and potential assets ('receptors') that may be affected by the scheme are ranked according to the following scale (descriptors for this scale are included in **Appendix D**):
- Very High
 - High
 - Medium
 - Low
 - Negligible
- 13.5.10 An options appraisal identified the impacts, effects, magnitude and the overall significance of the effects resulting from each of the three options. The magnitudes of impact of all known and potential assets that may be affected by the scheme are ranked according to the following scale (descriptors for this scale are included in **Appendix D**):
- Major
 - Moderate
 - Minor
 - No Change
- 13.5.11 The significance of the effects of the scheme brings together the value of the resource and the magnitude of the impact for each asset using the matrix identified in the approach to assessment section of this report.

Baseline

History and development

- 13.5.12 Despite evidence of human activity from the Prehistoric and Roman periods, the area around Carlisle remained sparsely populated until the post-medieval period. The uncertainty of life on the border between England and Scotland led many landowners to live in fortified houses. The present Dalston Hall developed around a Pele tower of c.1500, and the scheduled site of Bishop Dykes is believed to be a 14th century defensive earthwork.
- 13.5.13 Landscape and land use remained agricultural until the late 18th when new industry developed along the fast flowing water of the River Caldew.
- 13.5.14 Blackwell Hall, now Race Course House was Bonnie Prince Charlie's lodging when his army attempted to besiege Carlisle in 1745. The race course moved to its present location in 1905.
- 13.5.15 The study area is bisected north to south with transport routes into Carlisle. Roman and later roads and the River Caldew were joined in the 19th century by the railway and in 1970 by the M6.

Scheduled Monuments

- 13.5.16 Scheduled Monuments are nationally important archaeological sites, which benefit from close management. Scheduling derives from the Ancient Monuments and Archaeological Areas Act 1979.
- 13.5.17 Scheduled Monument Bishop's Dyke (listing No.1007136) part falls within the study area and the 500m buffer zone close to Dalston Hall Hotel at grid reference NY 361 507. Bishop's Dyke is believed to be a defensive earthwork constructed to protect the Manor of Dalston during the Scottish wars of the 13th century and consists of a double ditch with a causeway between. It is also said to mark the position of a medieval gate recorded as Dalston Barrs in the reign of Edward IV (NY374518). Commencing near the River Caldew at Cummersdale, the dyke passes to the north of Dalston Hall, crosses the Dalston-Carlisle road and later turns south-west towards a strip of woodland (extract from PastScape (www.pastscape.org)).
- 13.5.18 Please refer to plan **CSDR-CAP-EGN-00-DR-V-0005** in **Appendix E**.

Listed Buildings

- 13.5.19 When buildings are listed they are included on statutory lists of buildings of 'special archaeological or historic interest' under the Planning (Listed Buildings and Conservation Areas) Act 1990. The listing designation identifies only those buildings that are of national architectural and historical interest. The listing includes any object or structure fixed to the building, and any object or structure within the curtilage of the building forming part of the land since before 1948. It is not intended to be a preservation order, simply a mark that celebrates a building's special architectural and historic interest and ensures its future is considered within the planning system. The following grades apply to listings:

- **Grade I** buildings are of exceptional interest, sometimes considered to be internationally important. Just 2.5% of listed buildings are Grade I.
- **Grade II*** buildings are particularly important buildings of more than special interest. 5.5% of listed buildings are Grade II*
- **Grade II** buildings are nationally important and of special interest. 92% of all listed buildings are in this class and it is the most likely grade of listing for a home owner.

13.5.20 Listed buildings that fall within the study area are detailed in **Table 13.18** below and the locations of these buildings are shown on plan **CSDR-CAP-EGN-00-DR-V-0005** in **Appendix E**.

Table 13.18: Listed Buildings

List Entry	Name	Grade
1087441	Dalston Hall	II*
1087720	Newbiggin Hall	II*
1087721	Ice House to North East of Newbiggin Hall	II
1087742	Milestone (East Of Newby Cross Farm)	II
1087745	St Ninian's Well	II
1087746	Brisco Hill	II
1087747	Brisco Hall	II
1335492	Newby West Farmhouse and Barn	II
1335495	Brisco Farmhouse	II
1335496	Langarth	II
1335497	Wooden Walls	II
1335503	Blackhall Wood Farmhouse and Adjoining Barn	II
1335518	Green Cottage and Millstone Cottage, South of Blackhall Wood Farmhouse, and Threshing Barn to South	II
1335520	Garden Wall to South East of Newbiggin Hall	II
1386533	Newbiggin Hall Farmhouse and Attached Outbuildings.	II
1386534	Farm Buildings to the South East of Newbiggin Hall Farmhouse and Attached Outbuildings	II
1335500	Carleton Farmhouse And Barns	II
1335498	The Cottage, Carleton	II
1335499	Farm Buildings to the East of The Beeches, Carleton	II
1087748	Croft House Petheril Villas, Carleton	II
1087751	Orchard House, Carleton	II
1087750	The Beeches, Carleton	II
1087749	Outbuilding to the South East of The Cottage and NW of The Beeches	II
1087722	Woodside Lodge with Stable Block	II
1335522	Gate Piers to West of Woodside Lodge	II
1335494	Blackwell Farmhouse	II

List Entry	Name	Grade
1087744	Blackwell House and Stables	II
1335493	Brookside Cammock House	II

Conservation Areas

- 13.5.21 Conservation Areas are areas of special architectural or historic interest, the character or appearance of which is desirable to preserve or enhance. NPPF paragraph 137 states '*local planning authorities should look for opportunities for development within Conservation Areas and... within the setting of heritage assets to enhance or better reveal their significance.*'
- 13.5.22 The southern edge of the Holme Head conservation area (designated in 1968) touches the Northern boundary of the buffer zone around the site area. Please refer to plan **CSDR-CAP-EGN-00-DR-V-0005** in **Appendix E**.

Historic Environment Record

- 13.5.23 Cumbria County Council holds an archive of information relating to the historic environment, (the Historic Environment Record (HER)) records information regarding known archaeological sites and other undesignated heritage assets in the borough. It also records non designated archaeology.
- 13.5.24 HER records located within the study area (including the buffer zone) are predominantly of post medieval origin relating to the infrastructure of the railways and mill activities within the area. However there are also some interesting records of roman origin including the crop mark of Cummersdale fort and excavated features of Thursby Roman road. St Ninian's well located near Brisco is of historical interest as it is believed to be the place that St Ninian baptised Christians in AD 400.
- 13.5.25 Please refer to figure **CSDR-CAP-EGN-00-DR-V-0005** which shows the location of all find spots, lines and sites recorded on the HER.

Historic Landscape

- 13.5.26 The area west of the river Caldew including Cummersdale up to the A595 road consists of well managed, regular shaped, medium to large pasture fields with hedge boundaries that reflect the planned enclosure of open common pastures in the 19th century. The settlement pattern is of a dispersed nature with the exception of Cummersdale village and Dalston (an ancient market town) which are typical of a nucleated settlement type centred around the village green and public buildings such as the church and local school.
- 13.5.27 The area east of the River Caldew up to the M6 motorway consists of an undulating and rolling topography with agricultural pasture land. The fields are mainly large and rectangular bound by hedges, trees and fences which also reflect the enclosure of former common arable land. The settlement pattern is of small nucleated character with three small hamlets namely Brisco, Durdar and Blackwell.

Table 13.19 Historic environment sensitive receptors

Receptor	Description	Value (sensitivity)
Bishop's Dyke Scheduled Monument	Bishop's Dyke is a partly upstanding, surviving earthwork, alleged as defensive earthwork to protect the Manor of Dalston during the Scottish wars and consists of a double ditch with a causeway between. The monument is set in an area of open pasture fields.	High
Holme Head Conservation Area	Holme Head conservation area (designated in 1968). The conservation area covers a tranquil part of the river Caldew river valley extending through enclosed pasture land from Denton Holme to Cummersdale.	Low
Listed buildings in Brisco	<i>Brisco Hill</i> – A late 18 th century 2 storeys, 5 bay house built of red sandstone rubble walls with a slate roof. Located on high ground with views of the local fells. <i>Brisco Hall</i> – A 17 th century 2 storeys, 5 bay farmhouse built of red sandstone rubble walls with a slate pitched roof. Filled doorway provides evidence of changes to the layout of the original building. Located in a small hamlet formerly part of the Woodside estate. <i>Brisco Farmhouse</i> – Early 19 th century 2 storeys, 3 bays farmhouse built of stucco walls with a hipped slate roof. Located in a small hamlet formerly part of the Woodside estate and surrounded by open pasture fields. <i>Langarth</i> – an early 19 th century 2 storeys, 5 bays house built from sandstone coursed rubble walls with a slate roof designed in a Tudor style. Once owned by the Losh family. Located in a small hamlet surrounded by open pasture fields. <i>Wooden Walls</i> – a 17 th century house with 18 th century extension built of rendered walls with wooden dormers, a slate roof and brick chimneys. Post Office directory of 1880 lists the building as an Inn. <i>St Ninian's Well</i> – well head rebuilt by Sarah Losh on site of an ancient well dedicated to St Ninian.	Medium
Listed buildings in Newbiggin	<i>Newbiggin Hall</i> – 14 th century house incorporating medieval tower house with 17 th century façade and 19 th century additions. Built from red sandstone walls with graduated slate roof and ashlar chimney stacks. Design is probably by Thomas Machell with stonework by Edward Addison. Located close to the M6 motorway and the Lancaster-Carlisle railway. <i>Ice House to the North east of Newbiggin Hall</i> – A 19 th century ice house for Newbiggin Hall fully built of red sandstone with a single chamber below the ground level. <i>Newbiggin Hall Farmhouse and attached outbuildings</i> – A 18 th century house with 19 th century alterations built from coursed square sandstone with brick chimneys and a slate roof. Located close to the M6 motorway and the Lancaster-Carlisle railway. <i>Farm buildings to the south east of Newbiggin Hall farmhouse and attached outbuildings</i> – early 19 th century farm outbuildings with 20 th century alterations. L shaped range with 2 storey cowhouse and single storey stable built from coursed rubble sandstone with slate roof. <i>Garden wall to the south east of Newbiggin Hall</i> – wall incorporating earlier out building wall associated with the tower house. <i>Woodside Lodge with Stable block, St Cuthbert Without</i> – 19 th century house designed by C.J Ferguson built from sandstone to ground floor with half timbered first floor and green slate roof. Located west of Newbiggin in an area formerly of heavy woodland. <i>Gate Piers to west of Woodside Lodge</i> – gate piers to original Woodside house which is now demolished.	Medium

Receptor	Description	Value (sensitivity)
Listed buildings in Cummersdale	<i>Spinner's Arms Pub</i> – a 20 th century public house by Harry Redfern in vernacular revival style of whitewashed brick walls with some timber framing. Located in the centre of the village with many neighbouring buildings. <i>Cummersdale House</i> – a 19 th century 2 storeys house with Flemish brick walls and slate roof. <i>Caldew Bank</i> – early 19 th century 2 storeys house with English garden wall bond brickwork. Formerly the mill owner's house for nearby Cummersdale Mill.	Medium
Listed Buildings in Blackwell	<i>Blackwell Farmhouse</i> – early 18 th century 2 storeys, 5 bay farmhouse with rendered brick walls and 20 th century brick porch at entrance. <i>Blackwell House and Stables</i> – 18 th century 2 storeys, 5 bay house with 20 th century stable extension. Used by both Rebels and Crown during sieges of Carlisle in 1745. Prince Charles Edward Stuart stayed here in 1745. <i>Brookside Cammock House</i> – early 19 th century row of 2 houses built of red sandstone with hipped slate roof. Probably workers cottages for nearby cotton works.	Medium
Listed buildings in Carleton	<i>Carleton Farmhouse and Barns adjoining</i> - 18 th century 2 storeys farmhouse built of red sandstone with graduated slate roof. <i>The Cottage, Carleton</i> – late 18 th century 2 storeys house with whitewashed rendered walls. <i>Farm buildings to the east of the Beeches, Carleton</i> – 19 th century cartshed and barn built of mixed red and yellow ashlar. <i>Croft House Petteril Villas, Carleton</i> – early 19 th century row of 3 houses of 2 storeys each and built of red sandstone walls with brick chimneys. A carriage arch separates Croft house from No.1 Petteril Villas. <i>Orchard House, Carleton</i> – Late 18 th century house built of red sandstone coursed rubble walls and brick gable chimneys. <i>The Beeches, Carleton</i> – 19 th century 2 storey farmhouse with Flemish bond brickwork, stone quoins and slate roof. Adjoined to building at right angle is the earlier 18 th century farmhouse built of sandstone rubble walls and slate roof. <i>Outbuilding to the South East of the Cottage and North West of the Beeches</i> – store and outbuilding originally a house and integral barn, now divided between two named properties. Early 18 th century built of sandstone rubble and part rendered walls.	Medium
Listed buildings in Blackhall	<i>Blackhall Wood farmhouse and adjoining barn</i> – 18 th century 2 storeys and double span farmhouse built of mixed red and yellow coursed sandstone rubble walls. Joined to farmhouse is original house with lower roof line. <i>Green cottage and millstone cottage, south of Blackhall Wood farmhouse, and threshing barn to south</i> – house and cottage formerly the farmhouse and barns. House is mid 18 th century with painted brick walls, stone dressings and stone-slate roof. The 19 th century steam threshing barn is at right angle to the house.	Medium
Listed Building- Dalston Hall	<i>Dalston Hall Hotel</i> – late 15 th century fortified house. West wing is 16 th century with late 17 th century alterations by C.J Ferguson. 15 th century tower is 3 storeys, has thick walls with battlemented parapet and flat lead roof.	High

Receptor	Description	Value (sensitivity)
HER sites in Brisco	St Cuthbert Without enclosure cropmark, St Cuthbert Without, Scugger House enclosure cropmark, St Cuthbert Without, Netherton Linear Cropmark, St Cuthbert Without, Ashleigh enclosure cropmark Brisco Railway Station (station closed in 1852 but station house remains), Axe find, Clay pipes and bowl finds.	Low
HER lines	Lancaster- Carlisle railway line and Carlisle-Maryport railway line	Medium
HER points in Durdar	Peastree (ridge and furrow), Durdar linear cropmark, Glendene (former Smithy) and Findspots.	Low
HER sites in Cummersdale	Cummersdale Mill Race- (a stream running off the river Caldew which powered the corn mills in the area), Cummersdale Dye Works- (owned by the Ferguson family for bleaching and manufacturing cotton. Now Stead McAlpin.) , Flints and pottery finds, Coin find, Cummersdale Farmstead (Roman enclosure), Cummersdale Corn mill (documentary evidence of 13 th century mill), Carlisle Racecourse deserted village (medieval earthwork) and Cummersdale Fort (excavated feature possibly Roman)	Medium
HER sites in Newbiggin	Newbiggin Hall (Grade II* listed), Sawpit Wood and Sawpit Park (circumstantial evidence) and Newbiggin Settlement cropmark	Medium
HER sites in Blackhall	Blackhall Wood Hall farmstead and field system (cropmark), Blackhall Wood Deer Park, Cropmarks and Dalston Hall wood earthworks	Low
HER sites in Brownelson	Low Brownelson boundary dyke (earthwork), Low Brownelson circular depression (earthwork), Platform at Brownelson (earthwork) and Dalston enclosure and finds (pottery, flints)	Low
Historic landscape character area A	Area to the West of the River Caldew up to the A595 consisting of well managed, regular shaped, medium to large pasture fields with hedge boundaries that reflect the planned enclosure of open common pastures. The village of Cummersdale with its industrial mill history is included along with Dalston Hall.	Medium
Historic landscape character area B	Area to the East of the River Caldew up to the M6 motorway consisting of an undulating and rolling topography with agricultural pasture land. The fields are mainly large and rectangular bound by hedges, trees and fences which also reflect the enclosure of former common arable land. The settlement pattern is of small nucleated character with three small hamlets namely Brisco, Durdar and Blackwell.	Medium

Options Assessment

Option 1: Blue

- 13.5.28 The development of the blue route may increase noise levels within the wider setting of the listed buildings located in Brisco.
- 13.5.29 Increased volume of traffic travelling along the route passed Newbiggin may increase noise levels within the setting of the listed buildings however the buildings are currently located between the Lancaster-Carlisle railway line and the M6 motorway so the setting is already visually and acoustically affected by highways development.

- 13.5.30 There is low potential for the development of the blue route to affect the views looking north-northwest from the listed buildings located in Blackhall and vice versa which are currently overlooking the Caldew river valley and pasture land.
- 13.5.31 The blue route uses existing infrastructure to cross the Lancaster-Carlisle railway line so will not cause any physical impacts to the HER recognised asset. However for the route to cross the Carlisle- Maryport railway line a new bridge will need to be constructed. This may cause disturbance to the operation of the railway line during construction. The construction of this bridge will create a new visual feature along both of the railway routes therefore impacting to a degree on their setting. However the impact assessment takes into account that the bridge will pass over only a small part of the railway line in comparison to its full recorded length which has numerous bridges crossing at numerous points.
- 13.5.32 The route will cut through the northern end of the Durdar linear cropmark, as recorded on the Cumbria HER
- 13.5.33 The route will be constructed through the middle of the HER site (Dalston enclosure) recorded as where flints and pottery have been found which will reduce the potential for further physical evidence of previous human activity being obtained. Trial trenching may be advisable to find out if there is potential for unknown archaeological deposits.
- 13.5.34 The route will be constructed through the northern edge of the HER site recorded as Blackhall Wood Deer Park.. The site is recorded as covering a large area of land between the River Caldew and Durdar however this is based on documentary evidence, there is no ground evidence. Also the route will only cross through a small section of the recorded area therefore for those reasons there will be a low effect on this site as a result of the road construction.
- 13.5.35 The construction of a new bridge across the river Caldew valley will require physical and visual alteration of the landscape within the area of the proposed crossing. This may be regarded as a negative effect on the views across the river valley however the bridge construction will also play a part in the future HLC assessment as evidence of how the area has been shaped by human activity (HLC area A). The route will be developed through pasture fields and will alter part of the enclosure pattern in a small area from the river until it joins existing road infrastructure to join the A595.
- 13.5.36 The route will utilise existing road infrastructure from the M6 roundabout around Newbiggin road until just before Durdar which will reduce the impact on the physical nature of the historic landscape however from Durdar it then cuts through pasture fields to the point where it will cross the river Caldew. In this area it will alter field boundaries and the enclosure pattern which provides evidence of previous land use in the area.

Table 13.20 Historic Environment Options Assessment (option 1 blue)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Bishop’s Dyke Scheduled Monument (High)	No direct/ indirect impact.	No effect.	No change	Neutral
Holme Head Conservation Area (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed buildings in Brisco (Medium)	Indirect impact-increased traffic.	Increased noise level.	Minor	Slight Adverse
Listed buildings in Newbiggin (Medium)	Indirect impact-increased traffic.	Increased noise level.	Minor	Slight Adverse
Listed buildings in Cummersdale (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed Buildings in Blackwell (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed buildings in Carleton (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed buildings in Blackhall (Medium)	Potential to affect views.	Reduce aesthetically pleasing nature of views looking North- northwest and towards the listed buildings.	Minor	Slight Adverse
Listed Building-Dalston Hall (High)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Brisco (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
HER lines (Medium)	Route will bridge over the Lancaster- Carlisle railway line and the Carlisle-Maryport railway line.	Visual impact on setting of Carlisle- Maryport railway route. Possible impacts on operation during construction.	Minor	Slight Adverse
HER points in Durdar (Low)	Route will cut through Durdar linear cropmark.	Possible disturbance to physical evidence.	Minor	Neutral
HER sites in Cummersdale (Medium)	Route will cut through the middle of the Dalston enclosure site where flints and pottery finds have been discovered.	Reduce potential for unknown archaeology to be preserved.	Minor	Slight Adverse
HER sites in Newbiggin (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Blackhall (Low)	Route passes through edge of Blackhall Wood Deer Park.	Direct impact will have low effect due to no ground evidence.	Minor	Neutral

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
HER sites in Brownelson (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
Historic landscape character area A (Medium)	Bridge will be constructed over the River Caldew.	Physical and visual alteration of the landscape.	Minor	Slight Adverse
Historic landscape character area B (Medium)	The route only uses existing road infrastructure for part of the route only.	Alteration of enclosure pattern.	Minor	Slight Adverse

Option 2: Pink

- 13.5.37 The pink route will pass within 100-200m of the listed buildings located in Brisco. The area is currently made up of open fields however the development of the route will have a negative impact on views looking north from the listed buildings by decreasing the aesthetic appeal of the rolling landscape within the setting of the heritage asset. The close proximity will also increase the noise level within the area around the buildings reducing its peaceful nature.
- 13.5.38 The pink route will have a direct impact on the northern edge of the HER site recorded as Netherton Linear cropmark described as linear features of an enclosure system dating to the prehistoric era. Destruction of the linear feature will reduce evidence to support the historic landscape classification.
- 13.5.39 For the pink route to be developed bridges over the Lancaster- Carlisle railway line and the Carlisle- Maryport railway line will need to be constructed; both of these railway lines are recorded as HER recognised assets. The construction of these bridges will create a new visual feature along both of the railway routes therefore impacting to a degree on their setting. The construction of the bridges will also involve a considerable amount of earthworks in the vicinity of the railway lines and may cause a disruption to operations. However the impact assessment takes into account that the bridge will pass over only a tiny part of the railway lines in comparison to their full recorded length which have numerous bridges crossing at numerous points.
- 13.5.40 Earthworks for the bridge crossing the river Caldew and the Carlisle-Maryport railway line will cut into the footprint of the Cummersdale Dye Works grounds and the Cummersdale mill race. The disruption caused by the construction works will affect evidence of the industrial development of the area and therefore have a negative impact on the value of the historic landscape. The route will also cut through the edge of the site where flints and pottery finds have been discovered which may reduce potential for further archaeological finds. Mitigation in the form of a watching brief may be advisable.

13.5.41 Disturbance to the physical nature of the Cummersdale mill race and the footprint of the Cummersdale Dye works (direct impacts) will affect the value of these HER sites and reduce their significance in informing how the features have contributed to shaping the land and therefore reduce the evidential value of the historic landscape characterisation (HLC area A). The construction of bridges over the railway lines will add new physical and visual features to the landscape and will become physical evidence of how the area has been developed by human activity.

13.5.42 The curved alignment of the pink route (through HLC area B) will alter the enclosure pattern of the landuse by altering the field sizes and shapes so will reduce the evidential value of the enclosure pattern within future assessment. It will also alter the general views across the rolling landscape.

Table 13.21 Historic environment options assessment (option 2 pink)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Bishop's Dyke Scheduled Monument (High)	No direct impact.	No effect.	No change	Neutral
Holme Head Conservation Area (Low)	No direct impact.	No effect.	No change	Neutral
Listed buildings in Brisco (Medium)	Route will pass within 100-200m of the assets.	Negative impact on setting of asset.	Minor	Slight Adverse
Listed buildings in Newbiggin (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed buildings in Cummersdale (Medium)	No direct / indirect impact.	No effect.	No change	Neutral
Listed Buildings in Blackwell (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
Listed buildings in Carleton (Medium)	No direct impact.	No effect.	No change	Neutral
Listed buildings in Blackhall (Medium)	No direct / indirect impact.	No effect.	No change	Neutral
Listed Building- Dalston Hall (High)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Brisco (Low)	Netherton Linear cropmark.	Historic landscape characterisation.	Minor	Neutral
HER lines (Medium)	Route will bridge over the Lancaster- Carlisle railway line and the Carlisle-Maryport railway line.	Visual features in setting. Possible disruption during construction of bridges.	Minor	Slight Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
HER points in Durdar (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Cummersdale (Medium)	Construction of bridge will cut into the Cummersdale Dye Works ground and Cummersdale mill race. Route will also cut through the edge of the site where flints and pottery finds have been discovered.	Reduce evidential value of historic landscape.	Moderate	Slight Adverse
HER sites in Newbiggin (Medium)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Blackhall (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
HER sites in Brownelson (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
Historic landscape character area A (Medium)	Disturbance to the Cummersdale mill race and the Cummersdale Dye works.	Reduce evidential value of the mill race and the Dye works in terms of their contribution to the HLC.	Minor	Slight Adverse
Historic landscape character area B (Medium)	Altering the field boundaries and layout of the enclosed area. Visual impact.	Reduce evidential value of enclosure pattern in terms of its contribution to the HLC.	Moderate	Slight Adverse

Option 3: Green

- 13.5.43 Increased volume of traffic travelling along the route passed Newbiggin may increase noise levels within the setting of the listed buildings however the buildings are currently located between the Lancaster-Carlisle railway line and the M6 motorway so the setting is already visually and acoustically affected by highways development.
- 13.5.44 There is low potential for the development of the green route to affect the views looking north-northwest from the listed buildings located in Blackhall which are currently overlooking the Caldew river valley and pasture land. The development of the link road will make the buildings more visible than currently which will have a minor impact on their secluded setting.

- 13.5.45 The green route uses existing infrastructure to cross the Lancaster-Carlisle railway line. However for the route to cross the Carlisle- Maryport railway line a new bridge will need to be constructed across the river valley. This may cause disturbance to the operation of the railway line during construction. The river valley may contain unknown archaeology which could be determined by a GPR survey and/or trail trenching in the area. The construction of this bridge will create a new visual feature along the railway route therefore impacting to a degree on its setting. However the impact assessment takes into account that the bridge will pass over only a small part of the railway line in comparison to its full recorded length which has numerous bridges crossing at numerous points.
- 13.5.46 The route will cut through the southern end of the Durdar linear cropmark, as recorded on the Cumbria HER.
- 13.5.47 The green route will traverse the pasture fields in the vicinity of the HER point locations recorded as Newbiggin settlement cropmark and Sawpit Wood. The route will also have no direct effect on the current status of the cropmark or Sawpit Wood.
- 13.5.48 The route will be constructed through the northern edge of the HER site recorded as Blackhall Wood Deer Park based on documentary evidence. The site is recorded as covering a large area of land between the River Caldew and Durdar however there is no physical evidence on the ground therefore impact on the identified site will be minor.
- 13.5.49 The construction of a new bridge across the river Caldew valley will require physical and visual alteration of the landscape within the area of the proposed crossing. This may be regarded as a negative effect on the views across the river valley. The route will alter the enclosure pattern of the area and has potential to destroy further evidence of previous human activity.
- 13.5.50 The alignment of the green route traverses through the pasture fields in the southern part of the study boundary to the south of the existing Newbiggin Road which will alter the field boundaries and enclosure pattern of HLC area B. During construction of this route there is high potential that further evidence of previous settlement in the area could be found and/or destroyed as the alignment is in close proximity to numerous HER find spots. However a watching brief could be undertaken and any finds preserved by record.

Table 13.22 Historic Environment Options Assessment (option 3 green)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Bishop’s Dyke Scheduled Monument (High)	No direct/ indirect impacts.	No effect.	No change	Neutral
Holme Head Conservation Area (Low)	No direct/ indirect impacts.	No effect.	No change	Neutral
Listed buildings in Brisco (Medium)	No direct/ indirect impacts.	No effect.	No change	Neutral
Listed buildings in	Indirect impact- increased	Increased noise level.	Minor	Slight

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Newbiggin (Medium)	traffic.			Adverse
Listed buildings in Cummersdale (Medium)	No direct/ indirect impacts.	No effect	No change	Neutral
Listed Buildings in Blackwell (Medium)	No direct/ indirect impacts.	No effect.	No change	Neutral
Listed buildings in Carleton (Medium)	No direct/ indirect impacts.	No effect.	No change	Neutral
Listed buildings in Blackhall (Medium)	Potential to affect views.	Reduce aesthetically pleasing nature of views looking North- northwest and towards the buildings.	Minor	Slight Adverse
Listed Building- Dalston Hall (High)	No direct/ indirect impacts.	No effect.	No change	Neutral
HER sites in Brisco (Low)	No direct/ indirect impacts.	No effect.	No change	Neutral
HER lines (Medium)	Route will bridge over the Lancaster- Carlisle railway line and the Carlisle- Maryport railway line.	Visual impact on setting of Carlisle- Maryport railway route. Possible impacts on operation during construction.	Minor	Slight Adverse
HER points in Durdar (Low)	Route will cut through Durdar linear cropmark.	Possible disturbance to physical evidence.	Minor	Neutral
HER sites in Cummersdale (Medium)	No direct/ indirect impacts.	No effect.	No change	Neutral
HER sites in Newbiggin (Medium)	Route will pass in vicinity of Newbiggin settlement cropmark and Sawpit Wood.	No effect.	No change	Neutral
HER sites in Blackhall (Low)	Route passes through edge of Blackhall Wood Deer Park.	Direct impact will have low effect due to no existing ground evidence.	Minor	Neutral
HER sites in Brownelson (Low)	No direct/ indirect impact.	No effect.	No change	Neutral
Historic landscape character area A (Medium)	New bridge crossing and alignment through pasture fields.	Bridge will affect visual setting and alignment will alter enclosure pattern.	Minor	Slight Adverse
Historic landscape character area B (Medium)	Alignment through pasture fields.	Alignment will alter enclosure pattern and may have negative effect on further evidence.	Minor	Slight Adverse

Mitigation

- 13.5.51 'Options for reducing the harm arising from development may include the relocation of a development or its elements, changes to its design, the creation of effective long term visual or acoustic screening, or management measures. Good design may reduce or remove the harm, or provide enhancement, and design quality may be the main consideration in determining the balance of harm and benefit' (Historic England, Good Practice Advice 3- Setting of heritage assets).
- 13.5.52 The following mitigation measures are recommended to reduce the negative impacts on the significance of the historic environment:
- To reduce the impact of noise levels on the setting of listed buildings noise bunds (earth bunds) could be provided around the parts of the road passing within the setting of listed buildings, in Brisco and Newbiggin. Consideration should be given to the design of the bunds so that they do not cause an adverse effect on the character and visual appearance of the historic landscape.
 - To remove the impact of the road on the visual appearance of the setting of listed buildings, vegetation screening should be provided around parts of the road passing within the setting of listed buildings in Brisco and Blackhall. Consideration should also be given to the design of the screening itself so that it does not cause an adverse effect on the form and appearance of the historic landscape.
 - The design of the new bridge crossing over the River Caldew should be in-keeping with the character of the historic landscape to reduce any potential impacts on views across the historic landscape. The Building in Context toolkit prepared by CABI sets out eight principles which should be taken into consideration when designing the new structure. If designed appropriately then new views can be introduced which add to the public experience and thereby enhancing the significance of the historic landscape.
 - Trial trenching and/ or a GPR survey may be carried out in areas where there is potential for further evidence of previous human settlement activity. Depending on the results, a watching brief may then be required. These methods of archaeological evaluation can enhance the significance of the historic environment by revealing or restoring a lost historic feature that that can be used to further explain the historic development of an area.

Summary

- 13.5.53 With moderate impacts on the significance of HER sites in Cummersdale and the historic landscape character the pink route will have the most negative impact on the historic environment. This route will also have the most negative impact effect on the setting of listed buildings in the study area. On the other hand the pink route also has the most neutral impacts on receptors. Due to the relatively high number of negative impacts compared to the other route options, the pink route is the least preferred option.

- 13.5.54 The blue route has greater potential to increase noise levels and visual impacts on the setting of listed buildings in the study area. The construction of a new bridge across the Caldew river valley will have a negative impact the historic landscape character which will have a slight impact on its significance.
- 13.5.55 The green route also has a high number of neutral impacts on the historic environment. Negative impacts include direct effects on the significance of the historic landscape character across the whole study area.
- 13.5.56 The blue and green route options are very similar in terms of their impacts due to the alignments following a similar route, the main difference is that the blue route uses existing road infrastructure so has a lower impact on the historic landscape. For this reason, the blue route has been given higher preference over the green route.

Table 13.23 Historic environment preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	✓	✗	✗
2 (Pink)	✗	✗	✓
3 (Green)	✗	✓	✗

13.6 Nature conservation

Introduction

- 13.6.1 This section of the report describes the assessment of the effects of the three route options on nature conservation. The purpose of the assessment is to establish the nature conservation baseline within the study area ensure that potential adverse effects on nature conservation and need for mitigation measures are identified at an early stage.

Methodology

- 13.6.2 The assessment of potential effects on nature conservation has been carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3, Part 4 'Ecology & Nature Conservation', TAG Unit A3, Interim Advice Note 130/01 – Ecology & Nature Conservation Criteria for Impact Assessment and CIEEM Guidelines for Ecological Impact Assessment in the United Kingdom.
- 13.6.3 A study area of 500m was established around each of the route options (a wider zone of influence was investigated for statutory sites which may affected by watercourse or migratory pathways).

- 13.6.4 A desk study was undertaken to identify any statutory and non-statutory designated sites of nature conservation interest, habitats present within each study area and to obtain information on protected species or species of nature conservation interest. The desk study involved collation and review of information from the following resources:
- Cumbria Biodiversity Data Centre (CBDC) species and site data
 - The National Biodiversity Network (NBN) Gateway
 - Natural England's Multi-Agency Geographical Information (MAGIC)
 - Joint Nature Conservation Committee (JNCC)
- 13.6.5 The assessment of value of nature conservation features (receptors) was undertaken following guidance provided by DMRB Interim Advice Note 130/01 – Ecology & Nature Conservation Criteria for Impact Assessment and CIEEM Guidelines for Ecological Impact Assessment in the United Kingdom, Chapter 3 Determining Value. The criteria used to assess the value of nature conservation features are shown in **Appendix D**.
- 13.6.6 It should be noted that legal protection is considered separately to value. The protection of a particular nature conservation receptor may not necessarily be considered when determining value. For example the presence of one receptor protected by national legislation would not be assessed as being of national value. Legislation is however considered in terms of appropriate mitigation.
- 13.6.7 The methods for assessing the effects of the Route options follows the IEEM EclA Guidelines. The effect of potential impacts depends upon:
- Magnitude: 'size' or 'amount' of impact, determined on a quantitative basis where possible, e.g. the numbers of a species that are influenced;
 - Extent: The area over which the impact occurs;
 - Duration: The time over which the impact is expected to last prior to recovery or replacement of the resource or feature;
 - Reversibility: whether recovery is possible within a reasonable timescale; and
 - Timing and Frequency: Whether impacts coincide with critical life changes or seasons (e.g. breeding bird season) and how frequent the impacts are likely to be.
- 13.6.8 These factors are brought together to assess the magnitude of the impacts on key nature conservation receptors. Professional judgment is then used to assign the effects on the receptors to one of four classes of magnitude, defined in **Appendix A**.

Baseline

Statutory Designated Sites

- 13.6.9 The River Eden Special Area of Conservation (SAC) / Site of Special Scientific Interest (SSSI) is an internationally and nationally designated site. It lies to the western extent of the study area and is shown in **CSDR-CAP-EGN-00-DR-V-0006** in **Appendix E**. The site is designated for the following criteria:
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*. (Alder woodland on floodplains)
 - Water courses of plain to montane levels with floating vegetation often dominated by watercress)
 - White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
 - Sea lamprey *Petromyzon marinus*
 - Brook lamprey *Lampetra planeri*
 - River lamprey *Lampetra fluviatilis*
 - Atlantic salmon *Salmo salar*
 - Bullhead *Cottus gobio*
 - Otter *Lutra lutra*
- 13.6.10 The conservation objectives for the site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
 - The structure and function (including typical species) of qualifying natural habitats;
 - The structure and function of the habitats of qualifying species;
 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
 - The populations of qualifying species; and,
 - The distribution of qualifying species within the site.
- 13.6.11 The River Caldwel falls in unit 235 of the SSSI designation and was last assessed as being in unfavourable recovering condition in 2010.

Non-statutory Designated Sites

13.6.12 Five non-statutory designated sites of local importance were recorded within the study area. These are:

- Brownelson Wood County Wildlife Site;
- Thurnam Wood County Wildlife Site;
- Newbiggin Wood County Wildlife Site;
- Cummersdale Shingle Banks Site of Invertebrate Significance;
- Cummersdale Landslip & Blackhall Wood Site of Invertebrate Significance.

13.6.13 While ancient woodland is not afforded legal protection, National Planning Policy Framework (NPPF) guidance (Paragraph 118) identifies it as a key biodiversity resource which should be protected from development.

13.6.14 A number of areas of ancient woodland have been identified within the study area. These are shown on drawing **CSDR-CAP-EGN-00-DR-V-0006** in **Appendix E**.

Terrestrial Habitats

13.6.15 A review of satellite imagery and OS maps as well as a site walkover indicates that the majority of the study area is dominated by improved or arable grassland bounded by native hedgerows interspersed with areas of both plantation and semi-natural deciduous woodland.

13.6.16 The green route passes directly through a section of mixed (predominantly broadleaf) plantation woodland. These areas of woodland are common on a national level and are considered of a local importance.

13.6.17 To the west of the study area along the riparian corridor are extensive areas of woodland, scrub and semi-improved grassland. Other habitats types such as marshy grassland dominated by *Juncus sp.* also occur adjacent to watercourses.

Aquatic Habitats

13.6.18 The River Caldew runs north / south at the western extent of the study area and is one of the tributaries falling under the designation of River Eden SAC / SSSI. The River Petteril runs north west / south east to the eastern extent of the site boundary and while not part of the designation, is a tributary of the River Eden SSSI / SAC.

13.6.19 A number of other becks including Wire Mire Beck, Cammock Beck and Woodside Beck are also present within the study area. One large pond (Hammond's Pond) is present to the north west of the study area with a smaller pond being visible to the south of Caldew Road.

13.6.20 The NBN Gateway shows records of a number of species within the study area which are listed as both UK and Local BAP species. These are:

- Basil Thyme *Clinopodium acinos*

- Tubular Water-dropwort *Oenanthe fistulosa*
- Corn Buttercup *Ranunculus arvensis*
- Annual Knawel *Scleranthus annuus*
- Marsh Stitchwort *Stellaria palustris*

13.6.21 Records show that Japanese Knotweed *Fallopia japonica*, Giant Hogweed *Heracleum mantegazzianum* and Himalayan Balsam *Impatiens glandulifera* are all known to occur in the study area. During the site walkover, Himalayan Balsam was noted to be abundant along the banks of the River Caldew and other watercourses within the site boundary.

European Protected Species

13.6.22 Otter are considered to be widespread in Cumbria, and a number of records of otter exist within the study area. While most of the existing records are associated with the River Caldew (which is designated for the presence of otter) otters are known to travel long distances using minor watercourses as connecting habitat.

13.6.23 Records exist for up to six species of bats within the study area including Daubentons *Myotis daubentonii*, Whiskered *Myotis mystacinus*, Noctule *Nyctalus noctula*, Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Brown long-eared *Plecotus auritus*. The majority of the records relate to sightings or roosts along the River Caldew and River Petteril however these species are likely to use a number of structures within the study area for roosting and will forage in woodland and grassland habitats.

13.6.24 No CBDC records of Great Crested Newt exist within the study area, however NBN Gateway data and presence of suitable habitat indicated the species is likely to be present.

Nationally Protected Species

13.6.25 A number of road casualty records of badger exist within the study area. It is considered highly likely that badger setts and foraging habitat will exist within the wooded areas and areas of grassland present within the study area. Badger are protected through the Protection of Badgers Act, 1992.

13.6.26 A high number of red squirrel records exist throughout the study area. Given the extent of both woodland within the study area and the presence of commuting features such as hedgerows and individual trees it is highly likely that squirrel will be present.

13.6.27 Squirrel are protected under Schedule 5 of the Wildlife & Countryside Act as well as being a species of principle importance both nationally and through the LBAP

13.6.28 No CBDC records exist for reptiles within the study area, however NBN Gateway records suggest the following species are likely to occur:

- Slow-worm *Anguis fragilis*

- Grass Snake *Natrix natrix*
- Common Lizard *Zootoca vivipara*

Annex / Schedule 1 Birds

13.6.29 NBN Gateway and CBDC data records indicate that the following Annex 1 (Birds Directive 1979) and Schedule 1 (Wildlife & Countryside Act 1981) species are likely to occur within the study area:

- Kingfisher *Alcedo atthis*
- Barn Owl *Tyto alba*

Species of Principle Importance

13.6.30 The study area lies within the Cumbria Local Biodiversity Action Plan (LBAP) area. The plan has been prepared to implement national biodiversity targets at a local level, with a focus on local priorities. It seeks to make people in Cumbria more aware of the issues and build wide commitment to taking the necessary actions.

13.6.31 A number of species have been recorded within the study area which are a priority species on the LBAP as well as the UK BAP, these include:

- Grey Partridge *Perdix perdix*
- Lapwing *Vanellus vanellus*
- Curlew *Numenius arquata*
- Grasshopper Warbler *Locustella naevia*
- Wood Warbler *Phylloscopus sibilatrix*
- Spotted Flycatcher *Muscicapa striata*
- House Sparrow *Passer domesticus*
- Tree Sparrow *Passer montanus*
- Lesser Redpoll *Carduelis cabaret*
- Yellowhammer *Emberiza citronella*
- Reed Bunting *Emberiza schoeniclus*

13.6.32 In order to determine the likelihood of a significant effect, it is first necessary to identify whether an ecological receptor is sufficiently valuable for a significant effect upon it to be material in decision making. The values of features are described within a geographical frame of reference, as described in **Table 13.24** below.

Table 13.24 Value of ecological receptors

Value (sensitivity) of resource	Descriptor
<p>International VERY HIGH</p>	<p><u>Habitats</u> A site designated, or identified for designation at the international level (e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), and/or Ramsar site). Proposed or candidate sites are given the same consideration as designated sites. A sustainable area of any habitat listed in Annex I of the Habitats Directive or smaller areas of such habitat that is essential to maintain the viability of a larger whole.</p> <p><u>Species</u> Any regularly occurring population of an internationally important species (e.g. Red Data Book species), which are listed as occurring in 15 or fewer 10km squares in the UK, and that is identified as of unfavourable conservation status in Europe or global conservation concern in the UK BAP. A regularly occurring, nationally significant population of any internationally important species.</p>
<p>National HIGH</p>	<p><u>Habitats</u> A site protected by national designations (e.g. Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), or Marine Protected Area or a site considered worthy of this designation). A sustainable area of any priority habitat identified in the UK BAP, or smaller areas of such habitat that is essential to maintain the viability of a larger whole. A feature identified as of critical importance in the UK BAP.</p> <p><u>Species</u> A regularly occurring, regionally or county significant population/number of an internationally/nationally important species. Any regularly occurring population of a nationally important species that is threatened or rare in that region of the County, and for which the LBAP identifies the need to protect all remaining sites.</p>
<p>Regional MEDIUM</p>	<p><u>Habitats</u> Sustainable areas of key habitat identified in the Regional BAP or smaller areas of such habitat that is essential to maintain the viability of a larger area. Sites which exceed the county-level designations but fall short of the SSSI selection criteria. Some non-statutory designated sites (Ancient Woodland, TPOs).</p> <p><u>Species</u> Any regularly occurring, locally important population of a species listed as being nationally scarce. A regularly occurring, locally significant population/number of a regionally important species.</p>
<p>County MEDIUM/LOW</p>	<p><u>Habitats</u> Some designated sites (e.g. Local Nature Reserves). Some non-statutory designated sites (including SLNCI/CWS). A viable area of a habitat that is uncommon in the county/district.</p> <p><u>Species</u> Sustainable population of a species that is rare or scarce within a county.</p>

Value (sensitivity) of resource	Descriptor
	Sites or populations that appreciably enrich the county/district habitat resource.
Local LOW	<p><u>Habitats</u> Area of internationally or nationally important habitats, which are degraded and have little potential for restoration. Areas within the site or locally, or populations, that appreciably enrich the habitat resource within the locality, (e.g. species-rich hedgerow).</p> <p><u>Species</u> Species or populations within the site or locally, that appreciably enrich the ecological resource within the locality.</p>

13.6.33 An evaluation of the features in respect to their nature conservation value (sensitivity) is presented in **Table 13.25** below.

Table 13.25 Nature conservation sensitive receptors

Receptor	Description	Value (sensitivity)
Statutory Designated Sites	River Eden SSSI / SAC	Very High
Non-Statutory Designated Sites	Brownelson Wood County Wildlife Site, Thurnam Wood County Wildlife Site, Newbiggin Wood County Wildlife Site Cummersdale Shingle Banks Site of Invertebrate Significance, Cummersdale Landslip & Blackhall Wood Site of Invertebrate Significance and Ancient Woodland	Medium
Habitats	Broadleaf woodland, Scrub, Semi-improved grassland, Marshy grassland, Arable land, River Peterill, Cammock Beck and Woodside Beck	Low
European Protected Species	Otter, Bats and Great Crested Newt	Medium
Nationally Protected Species	Badger, Red Squirrel, Slow worm, Grass snake and Common Lizard	Medium
Annex / Schedule 1 Birds	Kingfisher and Barn Owl	Medium
Species of Principle Importance	Bird species listed on the LBAP which have resident or migratory populations of local interest.	Low

Options Assessment

13.6.34 The significance of an impact upon a nature conservation receptor is derived from consideration of the magnitude of the impact and the value (sensitivity) of the receptor. Table 13.1 illustrates the assessment matrix used.

13.6.35 At this options assessment stage it is possible to identify that the key areas of concern for each route option are:

- Mortality of species
- Loss of habitat
- Fragmentation of habitats or populations
- Disturbance
- Indirect impacts such as pollution, reduction in air or water quality etc.

Option 1: Blue

- 13.6.36 Of the three options, option 1 represents the most use of existing road networks, with the route following the alignment of Peter Lane and along section of Newbiggin Road to connect to the existing Junction 42 roundabout. This will result in minimal loss of vegetation and habitat severance where new route sections are introduced.
- 13.6.37 Most significant is the crossing of the River Caldew which will result in a direct loss of a large section of semi-improved grassland which forms part of the site of invertebrate significance as well as loss of a number of trees within the riparian corridor. Introduction of lighting in to this area is also likely to alter invertebrate behaviour. This direct loss of designated habitat is considered a moderate adverse impact.
- 13.6.38 The crossing is likely to sever a key foraging and commuting route for bat species both in the local and wider area and introduction of lighting in to this previously unlit area will change foraging behaviour for a number of species, it is also possible that road traffic mortality will occur where the road bisects the river. Otter foraging routes along the river corridor are also likely to be fragmented by the removal of vegetation. Impacts on protected species are considered to be moderated adverse.
- 13.6.39 Construction within the River Caldew may result in a direct loss of habitat which support the qualifying features of River Eden SSSI / SAC which could result in significant changes to local species abundance. There is also potential for the construction to result in disruption or prevention of Atlantic Salmon migration. Pollution or sedimentation events may cause reduction in water quality which will reduce habitat suitability for species such as lamprey and white clawed crayfish. The potential impacts on the River Eden SSSI / SAC are considered major adverse.
- 13.6.40 Between Peter Lane and the connection back to the existing road at Durdar there will be a loss of agricultural land to facilitate the new route. While this habitat is of limited ecological value for species, the hedgerows are likely to represent key commuting routes. It is likely that a number of individual trees which may support species of nature conservation interest will need to be removed to facilitate the development These habitats and habitat features are considered to be replaceable and therefore this is considered to be a minor adverse impact.

13.6.41 The introduction of the road in to this agricultural landscape also has potential to result in Barn Owl road traffic mortality incidents which could have short term effects on local population levels. Impacts on Barn Owl are considered to be minor adverse. The other birds likely to be present within the study area will be affected by a small loss of nesting and foraging habitat with the semi-improved grassland in the riparian corridor being the most significant loss. It is considered that impacts on other bird species are Negligible adverse.

Table 13.26 Nature conservation options assessment (option 1 blue)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Statutory Designated Sites (very high)	Direct habitat loss through construction of river crossings. Pollution / Sedimentation incidents. Fragmentation of the riparian corridor.	Disruption or prevention of migration of Atlantic Salmon. Reduction in habitat suitability for lamprey and white-clawed crayfish. Disruption to otter foraging habitats and reduction in otter prey.	Major	Large Adverse
Non-Statutory Designated Sites (medium)	Direct habitat loss through construction of river crossings. Disturbance from introduced lighting.	Loss of habitat supporting locally important invertebrate populations. Loss of quality foraging habitat for other protected and bird species.	Moderate	Slight Adverse
Habitats (low)	Direct habitat loss. Severance of hedgerows.	Loss of foraging habitat for protected and bird species. Reduction in commuting features for protected species. Loss of potential roost / nest sites for bird species.	Moderate	Slight Adverse
European Protected Species (medium)	Killing or injury. Habitat loss. Disturbance.	Reduction in local populations. Changes in distribution of populations. Changes in foraging behaviour.	Moderate	Slight Adverse
Nationally Protected Species (medium)	Killing or injury. Habitat loss. Disturbance.	Reduction in local populations. Changes in distribution of populations. Changes in foraging behaviour.	Moderate	Slight Adverse
Annex / Schedule 1 Birds (medium)	Killing or injury.	Reduction in local populations.	Minor	Slight Adverse
Species of Principle Importance (low)	Direct habitat loss. Disturbance.	Changes in distribution of populations.	Negligible	Neutral

Option 2: Pink

- 13.6.42 Option 2 also initially follows the alignment of Peter Lane with the new route sections crossing agricultural land, woodland and both the River Caldew and River Petteril to join the A6 at the eastern extent of the study area.
- 13.6.43 As with the other options, most significant is the crossing of the River Caldew which will result in a direct loss of a smaller section of semi-improved grassland. Although this does not fall within the designated site of invertebrate significance it is still likely functional habitat for the species. The route then passes alongside the racecourse adjacent to an area of Ancient Woodland; while none of the trees will be directly impacted by this route option, an increase in run off or dust deposition in the area may have a negative impact on the trees. Impacts on non-statutory designated sites are considered moderate adverse impact.
- 13.6.44 As with option 1 the crossing of the River Caldew is likely to sever a key foraging and commuting route for bat species both in the local and wider area and introduction of lighting in to this previously unlit area will change foraging behaviour for a number of bat species, it is also possible that road traffic mortality will occur where the road bisects the river. Unlike option 1 the road will bisect the river in close proximity to the exiting railway line, it is therefore considered that severance impacts will be slightly lower as the railway corridor is also likely to be used by foraging and commuting bats. Otter foraging routes along the river corridor are also likely to be fragmented by the removal of vegetation. Impacts on protected species are considered to be moderated adverse.
- 13.6.45 Construction within the River Caldew may result in a direct loss of habitat which support the qualifying features of River Eden SSSI / SAC which could result in significant changes to local salmon abundance. There is also potential for the construction to result in disruption or prevention of Atlantic Salmon migration. Pollution or sedimentation events may cause reduction in water quality which will reduce habitat suitability for species such as lamprey and white clawed crayfish. The potential impacts on the River Eden SSSI / SAC are considered major adverse.
- 13.6.46 There will be a loss of agricultural land to facilitate route option 2. As with option 1, these habitats are of limited ecological value for foraging species, however the hedgerows are likely to represent key commuting routes. To the eastern extent of this route option a number of individual trees will need to be removed may support species of nature conservation interest. Before joining the A6, this route option will need to cross the River Petteril and Camnmock Beck which will involve removal of trees and scrub from the riparian corridor as well as a loss of marshy grassland in the flood plain. While the River Petteril is not designated, it is a tributary of the River Eden / SAC, therefore and disturbance, pollution or sedimentation events which occur in this section of the river have potential to impact upon the SSSI / SAC. Impacts on habitats are therefore considered to be moderate.
- 13.6.47 As with option 1, the introduction of the road in to the agricultural landscape also has potential to result in Barn Owl road traffic mortality incidents which could affect local population levels in the short term. Impacts on Barn Owl are considered to be minor adverse.

13.6.48 The other birds likely to be present within the study area will be affected by a small loss of nesting and foraging habitat with the semi-improved grassland and scrub in the riparian corridor being the most significant loss. It is considered that impacts on other bird species are negligible adverse.

Table 13.27 Nature conservation options assessment (option 2 pink)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Statutory Designated Sites (very high)	Direct habitat loss through construction of river crossings. Pollution / Sedimentation incidents. Fragmentation of the riparian corridor.	Disruption or prevention of migration of Atlantic Salmon. Reduction in habitat suitability for lamprey and white-clawed crayfish. Disruption to otter foraging habitats and reduction in otter prey.	Major	Large Adverse
Non-Statutory Designated Sites (medium)	Pollution / Sedimentation. Loss of functional habitat.	Loss of habitat supporting locally important invertebrate populations. Loss of quality foraging habitat for other protected and bird species. Loss of ancient woodland trees.	Moderate	Slight Adverse
Habitats (low)	Direct habitat loss. Severance of hedgerows. Deterioration of River with pathways to SSSI / SAC.	Loss of foraging habitat for protected and bird species. Reduction in commuting features for protected species. Loss of potential roost / nest sites for bird species. Reduction in SSSI / SAC habitats through river corridor pathway.	Major	Slight Adverse
European Protected Species (medium)	Killing or injury. Habitat loss. Disturbance.	Reduction in local populations. Changes in distribution of populations. Changes in foraging behaviour.	Moderate	Slight Adverse
Nationally Protected Species (medium)	Killing or injury. Habitat loss. Disturbanc	Reduction in local populations. Changes in distribution of populations. Changes in foraging behaviour.	Moderate	Slight Adverse
Annex / Schedule 1 Birds (medium)	Killing or injury.	Reduction in local populations.	Minor	Slight Adverse
Species of Principle Importance (low)	Direct habitat loss. Disturbance.	Changes in distribution of populations.	Negligible	Neutral

Option 3: Green

- 13.6.49 Option 3 follows a broadly similar route to option 1 although it uses less of the existing road network cutting through agricultural land between Peter Lane and running south of the existing Newbiggin Road before connecting with the existing Junction 42 roundabout.
- 13.6.50 The crossing point of the River Caldew is the same as that proposed for Option 1, as such the impacts are considered to be the same.
- 13.6.51 The majority of the habitat to be lost to facilitate Option 3 is similar to that for Option 2 including the crossing of the River Petteril (although not Cammock Beck) to the east of the study area. In addition to these habitats, between Peter Lane and the connection through Dalston Road, the route passes through a section of broadleaved woodland. A number of trees would therefore have to be removed to accommodate the development. This habitat type is common nationally as well as on a more local scale and is therefore considered to be of local value. Impacts on habitats as a result of Option 3 are therefore considered to be moderate adverse.
- 13.6.52 Impacts on Barn Owl and other bird species are considered the same as those for options 1 and 2.

Table 13.28 Nature conservation options assessment (option 3 green)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Statutory Designated Sites (very high)	Direct habitat loss through construction of river crossings. Pollution / Sedimentation incidents. Fragmentation of the riparian corridor.	Disruption or prevention of migration of Atlantic Salmon. Reduction in habitat suitability for lamprey and white-clawed crayfish. Disruption to otter foraging habitats and reduction in otter prey.	Major	Large Adverse
Non-Statutory Designated Sites (medium)	Direct habitat loss through construction of river crossings. Disturbance from introduced lighting.	Loss of habitat supporting locally important invertebrate populations. Loss of quality foraging habitat for other protected and bird species.	Moderate	Slight Adverse
Habitats (low)	Direct habitat loss Severance of hedgerows Deterioration of River with pathways to SSSI / SAC.	Habitat for protected and bird species. Reduction in commuting features for protected species. Loss of potential roost / nest sites for bird species. Reduction in SSSI / SAC habitats through river corridor pathway.	Moderate	Slight Adverse
European Protected Species (medium)	Killing or injury. Habitat loss. Disturbance.	Reduction in local populations. Changes in distribution of populations. Changes in foraging behaviour	Moderate	Slight Adverse
Nationally	Killing or injury. Habitat	Reduction in local populations.	Moderate	Slight

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Protected Species (medium)	loss. Disturbance.	Changes in distribution of populations. Changes in foraging behaviour.		Adverse
Annex / Schedule 1 Birds (medium)	Killing or injury	Reduction in local populations.	Minor	Slight Adverse
Species of Principle Importance (low)	Direct habitat loss. Disturbance.	Changes in distribution of populations.	Negligible	Neutral

Mitigation

- 13.6.53 Mitigation measures to avoid, reduce or compensate for significant adverse effects on nature conservation receptors resulting from the proposed route options should be considered in more detail at the next stage of assessment but may include:
- Realignment of the route to avoid loss of habitat e.g. away from woodland or watercourses;
 - Compensatory habitat creation/planting i.e. replacement of lost trees, hedgerows and grasslands;
 - Provision of appropriate protection or exclusion for protected species i.e. fencing or mammal tunnels; and,
 - Restrictive use of artificial lighting in sensitive areas i.e. adjacent to water bodies or woodlands.
- 13.6.54 Such mitigation measures would help to reduce the effects to **slight adverse** or **neutral**, particularly with regard to the River Eden SAC/SSSI and its qualifying features.
- 13.6.55 A similar scheme: the A69 Haydon Bridge Bypass included a number of river crossings and sensitive nature conservation receptors. To ensure minor impacts on these receptors, vegetation clearance was kept to the absolute minimum and many new trees, hedgerows and shrubs were planted as part of the landscaping works to compensate for and enhance the habitat. Flightlines for bats were maintained during construction through the use of bunting and wire mesh, and to minimise the risk of bats flying over the road and also to reduce disturbance to otters and fish, the bridge parapets were made solid to minimise light spillage, creating an area of darkness. Artificial otter holts were created and badger fencing was erected to direct badgers to the underpasses.

Summary

13.6.56 The assessment of nature conservation has identified key receptors and potential impacts likely to arise as a result of the proposed development. A combination of desktop research, consultation with the local biodiversity record centre and a site visit was used to identify key sites, habitats and species within the study area. Impacts and effects on the identified receptors were then identified for each of the route options.

13.6.57 A summary of each option is provided below:

- **Option 1 - Blue** the crossing of the River Caldew will result in large adverse effects on the River Eden SAC /SSSI due to a loss of habitat supporting qualifying species and potential impacts upon the migratory pathway of Atlantic salmon. The crossing will also have adverse effects on the locally designated sites of invertebrate significance due to potential habitat loss.
- **Option 2 - Pink** As with Option 1, the crossing of the River Caldew may result in adverse effects on the River Eden SSSI / SAC. Indirect impacts on locally designated sites and areas of ancient woodland are also likely.
- **Option 3 - Green** – Large adverse impacts on the River Eden SSSI / SAC as well as slight adverse impacts on the locally designated sites. Loss of an area of woodland is also likely to result in slight adverse impacts on habitats and the species which they support.

13.6.58 All three route options have been found to have adverse effects on nature conservation receptors and without further survey effort it is not been possible to identify a preferred option from the three. All options have therefore been ranked as 'intermediate' options.

Table 13.29 Nature conservation preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	✘	✓	✘
2 (Pink)	✘	✓	✘
3 (Green)	✘	✓	✘

13.7 Road drainage and the water environment

Introduction

13.7.1 This section assesses the potential impacts on the surface water environment and takes into account surface and groundwater quality and hydrology; including flood risk. A preliminary desktop study of the hydrological and hydrogeological features associated with the three proposed route options has been undertaken. This assessment effectively forms a high level 'scoping' study to highlight if any of the proposed corridors have the potential to significantly impact the water environment and to identify areas in which more in depth assessments are required.

Methodology

- 13.7.2 The assessment of potential effects on road drainage and water environment has been carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3 Part 10 (HD 45/09 - Road Drainage and the Water Environment) and TAG Unit A3. At Stage 1 the objective of the assessment is to:

“Undertake sufficient assessment to provide an appreciation of the likely effects on watercourses, groundwater and flood risk and to identify the relevant constraints associated with particular broadly defined routes, or corridors as developed by the Design Organisation and agreed with the Overseeing Departments Project Manager”

- 13.7.3 The steps taken were as follows:

- **Establishment of the baseline** – identification of existing rivers, watercourses, flood zones and aquifers which may be affected by a possible route corridor;
- **Assessment of potential effects** – assessment in broad terms whether any of the baseline features would potentially be positively or negatively impacted by each of the proposed options;
- **Identification of potential mitigation measures** – identification of primary measures designed to prevent, reduce or compensate for potential effects of the proposals. The requirement for secondary mitigation measures would need to be assessed at TAG Assessment Stage 2 and 3 when an option(s) has been selected.

- 13.7.4 The ‘study area’ has been determined as a broad corridor between the A595 and M6 to the south of Carlisle as identified at Step 4b in the TAG process (see **Section 10**). A buffer off 500m was also applied around this corridor to identify any key features within close proximity. To establish the baseline, site visits were conducted along with a desktop review of the following sources:

- Ordnance Survey 1:25,000 maps;
- Environment Agency map data for flooding, main rivers and groundwater;
- Historic flood mapping;
- Google Maps.

Baseline

Rivers and watercourses

- 13.7.5 Rivers and watercourses within the study area are shown on plan **CSDR-CAP-EGN-00-DR-V-0018** in **Appendix E**. Designated flood zones and historical flooding are shown on plan **CSDR-CAP-EGN-00-DR-V-0019** in **Appendix E**. Key features of the study area include:

- **River Caldew:** Designated main river which crosses the study area from south to north and is crossed by all proposed corridors. There are no identified flood defences associated with this river within the study area.

- **River Petteril:** Designated Main River which crosses the western extents of the study area from south to north and is crossed by all proposed corridors. There are no identified flood defences associated with this river within the study area.
- **Cammock Beck:** Designated Ordinary Watercourse and tributary of the River Petteril which originates within the study area and flows to the north crossing the corridor of the proposed Option 2 (Pink Route).
- **Woodside Beck:** Designated Ordinary Watercourse and tributary of the River Petteril which crosses the south east corner of the study area.
- **Calflins Beck:** Designated Ordinary Watercourse and tributary of the River Caldew which crosses the south western boundary of the study area.
- **Unnamed watercourse north of Dalston:** Designated Ordinary Watercourse and tributary of the River Caldew which crosses the south western boundary of the study area.
- **Unnamed mill race at Cummersdale:** Designated Main River and tributary of the River Caldew which originates within the study area, flows from south to north and is crossed by all proposed corridors.

Groundwater

- 13.7.6 The full extent of the study area is designated as a Major Aquifer by the Environment Agency. Groundwater Vulnerability is primarily Low but increases to Intermediate adjacent to the River Petteril and High adjacent to the River Caldew.
- 13.7.7 There are no designated Groundwater Protection Zones within or in the vicinity of the study area.

Table 13.30 Road drainage and water environment sensitive receptors

Receptor	Description	Value (sensitivity)
River Caldew	Designated Main River flowing through a broad valley crossing the study area from south to north. Associated flood zone 3 covers a majority of the valley floor but data does not include the subdivision into zones 3A and 3B (high risk and functional flood plain respectively). No water quality information was available at the time of the assessment. Within Designated Site: River Eden SAC	Very High
River Petteril	Designated Main River flowing through a broad valley crossing the study area from south to north. Associated flood zone 3 covers a majority of the valley floor but data does not include the subdivision into zones 3A and 3B (high risk and functional flood plain respectively). No water quality information was available at the time of the assessment.	High
Cammock Beck	Designated Ordinary Watercourse and tributary of the River Petteril which originates within the study area and flows to the north. No flood zone information or water quality records available	Low

Receptor	Description	Value (sensitivity)
Woodside Beck	Designated Ordinary Watercourse and tributary of the River Petteril which crosses the south east corner of the study area. Small associated flood zone 3. There is no data available on subdivision into zones 3A and 3B (high risk and functional flood plain respectively) or water quality.	Low
Calflins Beck	Designated Ordinary Watercourse and tributary of the River Caldew which crosses the south western boundary of the study area. Localised flood zone 3. There is no data available on subdivision into zones 3A and 3B (high risk and functional flood plain respectively) or water quality.	Low
Unnamed watercourse north of Dalston	Designated Ordinary Watercourse and tributary of the River Caldew which crosses the south western boundary of the study area. No flood zone information or water quality records available	Low
Unnamed mill race at Cummersdale	Designated Main River and tributary of the River Caldew which originates within the study area and flows from south to north. Located within the River Caldew flood zone 3. Within Designated Site: River Eden SAC	Very High
Groundwater	Major Aquifer with variable Groundwater Vulnerability across the site. Intermediate adjacent to the River Petteril, High adjacent to the River Caldew otherwise Low. No designated Groundwater Protection Zones.	High

Options Assessment

Option 1: Blue

- 13.7.8 All of the proposed options will increase surface water runoff which will need to be discharged to watercourses or ground. This creates the risk of flooding as well as contamination of surface or ground waters. Option 1 (blue) utilises the highest proportion of existing highway infrastructure and will therefore, in principal, minimise the volume of additional surface runoff
- 13.7.9 The corridor utilises the existing bridge over the River Petteril and will have little or no effect on the watercourse.
- 13.7.10 The largest adverse effect will be where the route crosses the Caldew valley near Brownelson. This will require a significant structure with an associated impact on the designated flood zones, river flow patterns and fisheries.

Table 13.31 Road drainage and water environment options assessment (option 1 blue)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
River Caldew (Very High)	New bridge crossing of Caldew valley.	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Major	Large Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
		Obstruction of flows resulting in varied silt deposition/ movement and associated impact on fisheries downstream or adjacent to structure.	Major	Large Adverse
	Potential discharge of road drainage to watercourse.	Risk of contamination/pollution.	Moderate	Moderate Adverse
		Increased flood risk.	Minor	Moderate Adverse
River Petteril (High)	Potential discharge of road drainage to watercourse.	Risk of contamination/pollution.	Moderate	Moderate Adverse
		Increased flood risk.	Minor	Slight Adverse
Cammock Beck (Low)	No impact.	No effect.	No change	Neutral
Woodside Beck (Low)	Potential discharge of road drainage to watercourse.	Risk of contamination/pollution.	Moderate	Slight Adverse
		Increased flood risk.	Moderate	Slight Adverse
Calflins Beck (Low)	Potential discharge of road drainage to watercourse.	Risk of contamination/pollution.	Moderate	Slight Adverse
		Increased flood risk.	Moderate	Slight Adverse
Unnamed watercourse north of Dalston (Low)	No impact.	No effect.	No change	Neutral
Unnamed mill race at Cummersdale (Very High)	New bridge crossing of Caldew valley.	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Minimum	Moderate Adverse
Groundwater (High)	Potential discharge of road drainage to ground.	Contamination of major aquifer.	Moderate	Moderate Adverse

Option 2: Green

- 13.7.11 All of the proposed options will increase surface water runoff which will need to be discharged to watercourses or ground. This creates the risk of flooding as well as contamination of surface or ground waters.
- 13.7.12 There will be significant adverse effect where the route crosses the Petteril valley near Carleton. This will require a structure with an associated impact on the designated flood zones, river flow patterns and fisheries.

13.7.13 The largest adverse effect will be where the route crosses the Caldew valley near Brownelson. This will require a significant structure with an associated impact on the designated flood zones, river flow patterns and fisheries.

Table 13.32 Road Drainage and Water Environment options assessment (option 2 green)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
River Caldew (Very High)	New bridge crossing of Caldew valley	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Major	Large Adverse
		Obstruction of flows resulting in varied silt deposition/movement and associated impact on fisheries downstream or adjacent to structure	Major	Large Adverse
	Potential discharge of road drainage to watercourse	Risk of contamination/pollution	Moderate	Moderate Adverse
		Increased flood risk	Minor	Moderate Adverse
River Petteril (High)	New bridge crossing of Petteril valley	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Major	Large Adverse
		Obstruction of flows resulting in varied silt deposition/movement and associated impact on fisheries downstream or adjacent to structure	Major	Large Adverse
	Potential discharge of road drainage to watercourse	Risk of contamination/pollution	Moderate	Moderate Adverse
		Increased flood risk	Minor	Slight Adverse
Cammock Beck (Low)	No impact	No effect	No change	Neutral
Woodside Beck (Low)	Potential discharge of road drainage to watercourse	Risk of contamination/pollution	Moderate	Slight Adverse
		Increased flood risk	Moderate	Slight Adverse
Calfins Beck (Low)	Potential discharge of road drainage to watercourse	Risk of contamination/pollution	Moderate	Slight Adverse
		Increased flood risk	Moderate	Slight Adverse
Unnamed watercourse north of Dalston (Low)	No impact	No effect	No change	Neutral

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Unnamed mill race at Cummersdale (Very High)	New bridge crossing of Caldew valley	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Minimum	Moderate Adverse
Groundwater (High)	Potential discharge of road drainage to ground	Contamination of major aquifer	Moderate	Moderate Adverse

Option 3: Pink

- 13.7.14 All of the proposed options will increase surface water runoff which will need to be discharged to watercourses or ground. This creates the risk of flooding as well as contamination of surface or ground waters.
- 13.7.15 There will be significant adverse effect where the route crosses the Petteril valley near Carleton. This will require a significant structure with an associated impact on the designated flood zones, river flow patterns and fisheries.
- 13.7.16 The largest adverse effect will be where the route crosses the Caldew valley near Cummersdale. This will require a significant structure with an associated impact on the designated flood zones, river flow patterns and fisheries.

Table 13.33 Road drainage and water environment options assessment (option 3 pink)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
River Caldew (Very High)	New bridge crossing of Caldew valley	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Major	Large Adverse
		Obstruction of flows resulting in varied silt deposition/movement and associated impact on fisheries downstream or adjacent to structure	Major	Large Adverse
	Potential discharge of road drainage to watercourse	Risk of contamination/pollution	Moderate	Moderate Adverse
		Increased flood risk	Minor	Moderate Adverse
River Petteril (High)	New bridge crossing of Petteril valley	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Major	Large Adverse
		Obstruction of flows resulting in varied silt deposition/movement and associated impact on fisheries downstream or adjacent to structure	Major	Large Adverse
	Potential discharge of road drainage to	Risk of contamination/pollution.	Moderate	Moderate Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	watercourse.	Increased flood risk.	Minor	Slight Adverse
Cammoek Beck (Low)	New culvert crossing.	Obstruction of flows resulting in increased flood risk upstream of structure.	Major	Slight Adverse
	Potential discharge of road drainage to watercourse.	Risk of contamination/pollution.	Moderate	Slight Adverse
		Increased flood risk.	Moderate	Slight Adverse
Woodside Beck (Low)	No impact.	No effect.	No change	Neutral
Calflins Beck (Low)	No impact.	No effect.	No change	Neutral
Unnamed watercourse north of Dalston (Low)	No impact.	No effect.	No change	Neutral
Unnamed mill race at Cummersdale (Very High)	New bridge crossing of Caldew valley.	Obstruction of designated flood zones resulting in increased flood risk upstream of structure.	Minimum	Moderate Adverse
Groundwater (High)	Potential discharge of road drainage to ground.	Contamination of major aquifer.	Moderate	Moderate Adverse

Mitigation

13.7.17 Mitigation measures to prevent, reduce or compensate for significant adverse effects resulting from the proposals can be implemented through design (i.e. alteration to the route alignment, revised outfall locations) or through management (i.e. temporary settlement lagoons utilised during construction). Possible mitigation measures which should be considered in the next stage of design and assessment include:

- Designing structures to eliminate/minimise obstruction of flows (to address flood and fisheries risks).
- Utilisation of sustainable drainage systems (SuDS) to manage all road drainage including attenuation (to address flood risk) and treatment (to address pollution)

Summary

13.7.18 Effects of each option included:

- **Option 1: Blue** - Potentially large negative effects at proposed crossing of River Caldew due to restrictions in river flow and changes to flood zones. These could be mitigated through design but, due to the width of the valley it is considered unlikely that they could

be eliminated. Other effects are slight to moderate and relate to management of road drainage. Compliance with current good practice and use of SuDS should ensure that these risks are adequately addressed.

- **Option 2: Green** - Potentially large negative effects at proposed crossing of River Caldew due to restrictions in river flow and changes to flood zones. These could be mitigated through design but, due to the width of the valley it is considered unlikely that they could be eliminated. Potentially large negative effects at proposed crossing of River Petteril due to restrictions in river flow and changes to flood zones. These could be mitigated through design. Other effects are slight to moderate and relate to management of road drainage. Compliance with current good practice and use of SuDS should ensure that these risks are adequately addressed.
- **Option 3: Pink** - Potentially large negative effects at proposed crossing of River Caldew due to restrictions in river flow and changes to flood zones. These could be mitigated through design but, due to the width of the valley it is considered unlikely that they could be eliminated. Potentially large negative effects at proposed crossing of River Petteril due to restrictions in river flow and changes to flood zones. These could be mitigated through design but, due to the width of the valley it is considered unlikely that they could be eliminated. Other effects are slight to moderate and relate to management of road drainage. Compliance with current good practice and use of SuDS should ensure that these risks are adequately addressed.

13.7.19 Option 1 utilises an existing crossing of the River Petteril and has consequently been designated the preferred option in terms of Road Drainage and Water Environment.

13.7.20 Option 2 utilises the same crossing of the River Caldew as Option 1 but uses a new crossing of the River Petteril. This crossing would be shorter than that for Option 3 and is hence the intermediate option.

13.7.21 Option 3 features a new bridge over the River Petteril which would be the longer than that for Option 2 so it is the least preferred option.

Table 13.34 Road drainage and water environment preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (blue)	✓	✗	✗
2 (green)	✗	✓	✗
3 (pink)	✗	✗	✓

13.8 Outdoor access and recreation

Introduction

- 13.8.1 The assessment of outdoor access and recreation aims to identify impacts likely to arise as a result of the proposed development on routes and community facilities used by pedestrians, cyclists and equestrians (referred to jointly as 'non-motorised users' (NMUs)), including a consideration of vulnerable groups whose needs may differ from other NMUs. If appropriate for the site, water based NMUs (i.e. swimmers, canoeists, kayakers and anglers) are also taken into account.

Methodology

- 13.8.2 The assessment of potential effects on outdoor access and recreation has been carried out in accordance with DMRB Volume 11 Section 3 Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and TAG Unit A4 Section 5 (Severance Impacts). At Stage 1 the objective of the assessment is to:

“Undertake sufficient assessment to provide an appreciation of the likely effects on pedestrians, cyclists and equestrians and for people’s ability to move around their community, and to identify the relevant constraints associated with particular broadly defined routes, or corridors as developed by the Design Organisation and agreed with the Overseeing Departments Project Manager”

- 13.8.3 The steps taken were as follows:

- **Establishment of the baseline** – identification of existing Public Rights of Way (PRoW), promoted national routes, cycleways, pedestrianised footways, waterways and community facilities which may be affected by a possible route corridor;
- **Assessment of potential effects** – assessment in broad terms whether NMU journeys would be restricted (including severance), lengthened or reduced by a possible route, whether the amenity value of such journeys would increase or diminish, and whether some people would be deterred from making journeys which they currently make; and,
- **Identification of potential mitigation measures** – identification of measures designed to prevent, reduce or compensate for potential effects of the proposals.

- 13.8.4 In assessing potential effects it is assumed that the route options will be unsuitable for use by NMUs and no new linkages will be created (i.e. the routes do not include multiuse footways to the side or on-road cycle lanes).

Establishment of the baseline

13.8.5 Baseline conditions were identified within the 'study area'; a broad corridor between the A595 and M6 to the south of Carlisle as identified at Step 4b in the TAG process (see **Section 10**). A buffer off 500m was also applied around this corridor to identify any key community facilities and routes within close proximity. To establish the baseline, site visits were conducted along with a desktop review of the following sources:

- Ordnance Survey 1:25,000 maps;
- Cumbria County Council 1976 Definitive Map digital (GIS) lines and post 1976 orders;
- Sustran's National Cycle Network (NCN) GIS layer;
- Natural England's National Trails GIS layer; and,
- Google Maps.

13.8.6 A number of community facilities and routes ('receptors') were identified and included:

- facilities within the local communities that are provided by public authorities, charities or other Non-Governmental Organisations (i.e. public parks/greenspace, beaches, state schools, community centres and public realm);
- facilities within the local communities provided by private or commercial organisations for the use of the whole community (i.e. shops, restaurants, B&Bs/hotels, bars, churches); and,
- land, water and routes available for use by the whole community, or particular groups within the community (i.e. Public Rights of Way (PRoW), National Cycle Network Routes, permitted routes, pedestrianised footways, long distance routes and main watercourses).

Assessment of potential effects

13.8.7 To identify the potential impacts of the scheme and their effects, the three shortlisted route options (pink, blue and green) were overlaid onto a map showing the baseline conditions. The impacts/effects identified included:

- any permanent or temporary restriction or severance to public recreation amenities and routes e.g. existing Public Rights of Way (PRoW), promoted routes and cycleways;
- any effects on existing pedestrians, cyclists and equestrians resulting from changes to journey lengths and times; and,
- any changes in amenity, defined as 'the relative pleasantness of a journey'. Note this excludes changes to the landscape quality/visual intrusion impact elements which is dealt with in **Section 13.4** Landscape and Visual.

13.8.8 The relative importance of values influencing amenity is largely dependent upon the type of activity being pursued and the type of NMU using the facility or route. It has therefore only been possible to carry out a qualitative assessment for amenity at this stage.

- 13.8.9 A quantitative assessment however was possible for effects on journey lengths/times and severance. This was based upon scale descriptors for both 'magnitude' and resource 'sensitivity' as provided in **Appendix D**.

Identification of potential mitigation measures

- 13.8.10 Mitigation measures are designed to prevent or reduce the potential effects of the proposed options. Where this is not possible then measures to offset/compensate for the effect can be proposed.
- 13.8.11 A series of mitigation measures were identified following the assessment of potential effects. These measures should be taken forward into the next design and assessment stages of the scheme.

Baseline

- 13.8.12 The study area contains a network of PRoW (footpaths, bridleways and byways), linking small villages located to the south of Carlisle (i.e. Brisco, Durdar) and the numerous dispersed farms and small hamlets. The PRoW are predominantly rural in nature, crossing for the most part agricultural land or following the course of the River Caldew and River Petteril.
- 13.8.13 Two separate sections of the PRoW network are promoted as a National Trail (Cumbria Way) and Long Distance Route (Miller's Way). The Cumbria Way, a 72 mile trail commencing in Carlisle, follows PRoW through the Caldew valley before heading south towards the Lake District fells. The Miller's Way also commences in Carlisle but takes an alternative route south through the Petteril valley.
- 13.8.14 National Cycle Network Route 7 (NCN 7), the Sea to Sea (C2C) and Reiver's Route cycle trails all run through the Caldew valley between Carlisle and Dalston. The section through the study area is a popular, surfaced, traffic-free path.
- 13.8.15 A number of surfaced footways adjacent to the existing highway network provide additional connectivity to community facilities. These include: a long section of footway along Durdar Road providing pedestrian access to the Black Lion pub at Durdar, Carlisle Racecourse, Hammonds Pond (park, boating lake and sports pitch) and Eden Valley Hospice; a section along the A6 at Carleton providing pedestrian access to a primary school and the Bordergate pub and hotel; and footways within the village of Cummersdale providing pedestrian access to a pub, primary school, village hall, church and village green.
- 13.8.16 The River Caldew and River Petteril provide opportunities for water based recreation/travel i.e. canoeing and kayaking, although there was no evidence of these activities taking place during the site visit. Carlisle Angling Association also operates a permit scheme for game and course angling on the River Eden and its tributaries (including the River Caldew). There are numerous pools located along the stretch of river between Dalston and Cummersdale.
- 13.8.17 Plan **CSDR-CAP-EGN-00-DR-V-0003** in **Appendix E** shows the location of baseline features of relevance to outdoor access and recreation.



Figure 13.4 Cumbria Way National Trail and NCN 7, Caldew Valley



Figure 13.5 Miller's Way LDR, Petteril Valley

Table 13.35 Outdoor access and recreation sensitive receptors

Receptor	Description	Value (sensitivity)
Cumbria Way National Trail	A 72 mile National Trail commencing in Carlisle and following paths south west through the Caldew valley.	Very High
Miller's Way Long Distance Route	A promoted Long Distance Route (LDR) commencing in Carlisle and following paths south-east through the Petteril valley.	Very High
NCN 7/ C2C / Reiver's Route	National / promoted cycle trail following traffic free surfaced paths through the Caldew Valley	Very High
PRoW	43 PRoWs (40 footpaths and 3 bridleways) predominantly rural in nature and providing connectivity between the villages, small hamlets and farms and links through the Petteril and Caldew valleys.	High
Footways Durdar Road	Surfaced roadside footways providing pedestrian access to the Black Lion pub at Durdar, Carlisle Racecourse, Hammonds Pond (park, boating lake and sports pitch) and Eden Valley Hospice.	Low
Footways Carleton A6	Surfaced roadside footways providing pedestrian access to a primary school and the Bordergate pub and hotel	Low
Footways Cummersdale Village	Surfaced roadside footways providing pedestrian access to a pub, primary school, village hall, church and village green	Low
River Petteril	Watercourse opportunities for water based recreation/travel i.e. canoeing, kayaking and angling.	Low
River Caldew	Watercourse opportunities for water based recreation/travel i.e. canoeing, kayaking and angling.	Low

*Options Assessment*Option 1: Blue (Amenity)

- 13.8.18 Option 1 Blue utilises the most existing highway infrastructure and whilst there is likely to be an increase in traffic flow on the proposed route and localised widening (i.e. along Peter Lane and Newbiggin Road) the effect on the amenity values of nearby routes and open spaces is overall expected to be less.
- 13.8.19 The largest adverse effects will be where the route leaves the alignment of the existing highway and travels south east across agricultural fields, bridging the Caldew valley near Brownelson. Several key national trails and promoted routes currently run through the valley, providing a wide surfaced link suitable for a range of different NMUs. These routes have a high landscape quality, isolated from urban areas and traffic movement (with the exception of trains) and providing access to designated nature conservation sites. Whilst the routes are likely to be bridged by the new river crossing and therefore no new junctions/at level crossing points will need to be provided, the proximity of the traffic is likely to result in a loss of amenity.

13.8.20 Beyond the Caldew valley where the proposed route continues through agricultural fields towards Durdar, the alignment will come within close proximity to, and intersect several PRow. These PRow are currently isolated from urban/built up areas and the amenity value of these routes are likely to be adversely effected by introduction of traffic.

Option 1: Blue (Severance)

13.8.21 **Table 13.36** below summarises the impacts, potential effects and significance of severance on outdoor access and recreation.

Table 13.36 Outdoor access and recreation options assessment, severance (option 1 blue)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way National Trail (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
Miller's Way Long Distance Route (Very High)	No impact	No effect	No change	Neutral
NCN 7/ C2C / Reiver's Route (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
PRow (High)	Construction of a new road and roundabouts on line of paths.	4x footpaths severed. Considerable hindrance and change to journey times/ patterns.	Major	Large Adverse
Footways Durdar Road (Low)	No impact	No effect	No change	Neutral
Footways Carleton A6 (Low)	No impact	No effect	No change	Neutral
Footways Cummersdale Village (Low)	No impact	No effect	No change	Neutral
River Petteril (Low)	No impact	No effect	No change	Neutral
River Caldew (Low)	Construction of a new crossing	Journey pattern likely to be maintained but some hindrance (new structure)	Minor	Neutral

Option 2: Pink (Amenity)

- 13.8.22 Option 2 Pink is the most northerly route, aligning itself close to existing residential and industrial areas at Cummersdale, Durdar and Brisco. The route bridges the River Caldew at a location close to the Carlisle to Maryport Railway bridge and therefore the impact on the amenity value of high sensitivity routes within close proximity (i.e. Cumbria Way, NCN 7) is expected to be less than it would be at other potential crossing points.
- 13.8.23 The new bridge crossing over the River Petteril will intersect the Miller’s Way (a promoted LDR). This section of the route already lies within proximity to the A6 road and junction 42 of the M6 motorway therefore it is considered that the introduction of additional traffic will have less of an impact on amenity.
- 13.8.24 Option 2 Pink will intersect a bridleway (BW111002) and 8 footpaths. Amenity values of these routes will be reduced as a result of traffic being within a close proximity and providing a barrier at crossing points.

Option 2: Pink (Severance)

- 13.8.25 **Table 13.37** below summarises the impacts, potential effects and significance of severance on outdoor access and recreation.

Table 13.37 Outdoor access and recreation options assessment, severance (option 2 pink)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way National Trail (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
Miller’s Way Long Distance Route (Very High)	New bridge crossing introduced over the Petteril valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
NCN 7/ C2C / Reiver’s Route (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
PRoW (High)	Construction of a new road and roundabouts on line of paths.	9x PRoW intersected/severed. Considerable hindrance and change to journey times/ patterns.	Major	Large Adverse
Footways Durdar Road (Low)	Construction of a new roundabout	Journey pattern likely to be maintained but some hindrance (journey length increase <250m)	Minor	Neutral

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Footways Carleton A6 (Low)	Construction of a new junction onto the A6	Journey pattern likely to be maintained but some hindrance (journey length increase <250m)	Minor	Neutral
Footways Cummersdale Village (Low)	No impact	No effect	No change	Neutral
River Petteril (Low)	New bridge crossing introduced over the Petteril valley	Journey pattern likely to be maintained but some hindrance (new structure)	Minor	Neutral
River Caldew (Low)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new structure)	Minor	Neutral

Option 3: Green (Amenity)

- 13.8.26 Option 3 Green is the most southerly route, using existing infrastructure only at the eastern end to cross the West Coast Mainline (railway) and join into the M6 Junction 42 roundabout.
- 13.8.27 The route bridges the River Caldew at the same location as Option 1 Blue route therefore impacts on the amenity value of some national trails and promoted routes will be the same as noted previously (see paragraph 13.8.19). It also impacts on the same PRoW (see paragraph 13.8.20).

Option 3: Green (Severance)

- 13.8.28 **Table 13.38** below summarises the impacts, potential effects and significance of severance on outdoor access and recreation.

Table 13.38 Outdoor access and recreation options assessment, severance (option 3 green)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way National Trail (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
Miller’s Way Long Distance Route (Very High)	New bridge crossing introduced over the Petteril valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse
NCN 7/ C2C / Reiver’s Route (Very High)	New bridge crossing introduced over the Caldew valley	Journey pattern likely to be maintained but some hindrance (new subway)	Minor	Moderate Adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
PRoW (High)	Construction of a new road and roundabouts on line of paths.	4x footpaths severed. Considerable hindrance and change to journey times/ patterns.	Major	Large Adverse
Footways Durdar Road (Low)	No impact	No effect	No change	Neutral
Footways Carleton A6 (Low)	No impact	No effect	No change	Neutral
Footways Cummersdale Village (Low)	No impact	No effect	No change	Neutral
River Petteril (Low)	No impact	No effect	No change	Neutral
River Caldew (Low)	Construction of a new crossing	Journey pattern likely to be maintained but some hindrance (new structure)	Minor	Neutral

Mitigation

13.8.29 Mitigation measures to prevent, reduce or compensate for significant adverse effects resulting from the proposals can be implemented through design (i.e. alteration to the route alignment, introduction of crossing points) or through management (i.e. diversions put in place during construction). Possible mitigation measures which should be considered in the next stage of design and assessment include:

- Inclusion of facilities for pedestrians in the design i.e. at grade crossing points, central reservations and footbridges (with ramps);
- Inclusion of facilities for equestrians in the design (where appropriate) i.e. underpasses, Pegasus crossings, central reservations (see **Figure 13.6** below);
- Inclusion of facilities for cyclists in the design i.e. cycle lanes/paths, clear signage, reduction in the number of roundabouts;
- Inclusion of barriers (i.e. fencing, planting or a grass verge) to separate NMUs from the traffic and improve amenity (see **Figure 13.6** below).
- Inclusion of appropriate signage and interpretation on routes (see **Figure 13.6** below);
- Permanent/temporary diversion of routes during operation and construction; and,
- Enhancement (widening and resurfacing) of routes within proximity to the road to compensate for any lost recreational opportunities.

- 13.8.30 The implementation of the above mitigation through considered design will reduce the significance of adverse effects identified, both in relation to amenity and severance. Where new cycleways and footways are included within the route design, **beneficial effects** will likely be observed due to the creation of new linkages across the network, which in turn will have the potential to reduce journey times. Where existing routes can be connected to create short distance circular trails, opportunities for local recreation will be enhanced.
- 13.8.31 Improved surfacing and lighting on routes will likely offset any adverse effects on amenity caused by the proximity of traffic, especially where barriers (fencing, planting, verges etc.) are included to provide a form of separation. These routes will also become suitable for multiple NMU groups i.e. pedestrians and cyclists as well as less mobile users.

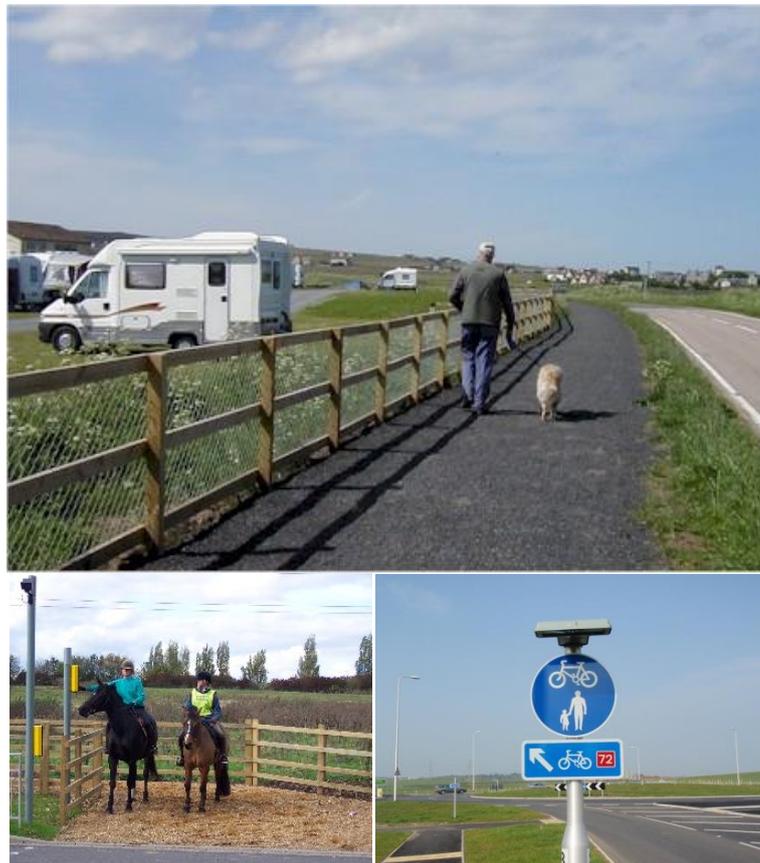


Figure 13.6 Mitigation for Non Motorised Users (NMUs)

Top: A surfaced multiuser route with grass verge to separate NMUs from road traffic.

Left: A 'Pegasus crossing' with an adequate sized holding area and raised crossing buttons.

Right: Clear signage and 'at grade' crossing points with tactile paving.

Summary

13.8.32 The assessment of outdoor access and recreation aimed to identify impacts likely to arise as a result of the proposed development on routes and community facilities used by NMUs. It used a combination of desktop research and site visits to identify key community facilities and routes (receptors) within the study area including: National Trails, Long Distance Routes, promoted routes, Cycle Networks, PRow and other informal or permitted routes. Impacts and their effects on both amenity and route severance were then identified for each of the shortlisted options and assessed using a combination of both qualitative and quantitative methods.

13.8.33 Effects for each option included:

- **Option 1: Blue** – potential effects on amenity are reduced by using the existing highway network where possible however moderate effects are observed on sensitive routes where the alignment bridges the River Caldew, both in terms of severance and loss of amenity. There are large adverse effects on several PRow due to severance and changes to journey length/time. A general loss of amenity on rural routes due to the introduction of traffic.
- **Option 2: Pink** – effects on the amenity value of sensitive routes is lower than other options due to the chosen bridging point over the Caldew. There are moderate impacts on these routes however in terms of severance due to minor hindrances at intersections. Large adverse effects are observed on PRow due to severance and changes to journey time/length. A general loss of amenity on some rural routes.
- **Option 3: Green** – moderate adverse effects on sensitive routes and large adverse effects on PRow in terms of severance. A general loss of amenity on rural PRow and routes within the Caldew valley.

13.8.34 All options have been found to have adverse effects on outdoor access and recreation (without the implementation of any suggested mitigation) and at this stage it has not been possible to identify a preferred option from the three. All options have therefore been ranked evenly for the assessment as ‘intermediate’ options.

Table 13.39 Outdoor access and recreation preferred option summary

Option	Preferred Option	Intermediate Option	Least Preferred Option
1 (Blue)	x	✓	x
2 (Pink)	x	✓	x
3 (Green)	x	✓	x

13.9 Summary

13.9.1 A summary of the preferred, intermediate and least preferred option selections for each environmental topic considered is provided in **Table 13.40** below.

Table 13.40 Summary of option preferences for each environmental topic

Option	Preferred Option			Intermediate Option			Least Preferred Option		
	<i>Blue</i>	<i>Pink</i>	<i>Green</i>	<i>Blue</i>	<i>Pink</i>	<i>Green</i>	<i>Blue</i>	<i>Pink</i>	<i>Green</i>
Noise	x	x	✓	✓	x	x	x	✓	x
Air Quality	x	x	✓	x	✓	x	✓	x	x
Landscape and Visual	✓	x	x	x	x	✓	x	✓	x
Historic Environment	✓	x	x	x	x	✓	x	✓	x
Nature Conservation	x	x	x	✓	✓	✓	x	x	x
Water Environment	✓	x	✓	x	x	x	x	✓	x
Outdoor Access and Recreation	x	x	x	✓	✓	✓	x	x	x
Total	3	0	3	3	3	4	1	4	0

14. Southern link road traffic impact assessment

14.1 Review of traffic modelling

- 14.1.1 The Carlisle Southern Link Road transport modelling report considers the impact of traffic from development at South Carlisle as well as the impact of a proposed southern link road. The study uses the Carlisle transport model to forecast future year scenarios of 2030, at the end of the Carlisle Local Plan period, and 10 years hence with further employment and residential growth around south Carlisle.
- 14.1.2 The Carlisle transport model was originally developed in 2008, but underwent a major update in 2013 following the opening of the CNDR. The update was based on a comprehensive set of traffic data collected following the opening of the CNDR, and origin-destination datasets including Trafficmaster GPS data, the census and schools data.
- 14.1.3 The southern link road as tested in the Carlisle transport model is assumed to run from the M6 Junction 42 via Newbiggin Road to the A595/A689 junction via Peter Lane. The modelling assumed the CSLR would be subject to a 50mph speed limit and with intermediate roundabout junctions located at the following locations:
- Newbiggin Road / Scalegate Road
 - Newbiggin Road / Brisco Road
 - Durdar Road / Newbiggin Road
 - Dalston Road / Peter Lane
- 14.1.4 Future year traffic demand was generated by considering committed developments and the assumed phasing and trip generation of development at south Carlisle in line with assumptions made for the local plan transport modelling. Development trips were distributed using a gravity model developed for the local plan modelling. Growth factors were also calculated from the National Trip End Model using the TEMPRO software, and were adjusted using fuel and income factors.
- 14.1.5 Four scenarios were modelled in the study, as follows:
- Do minimum (no link road) with no development at south Carlisle
 - Do something (link road) with no development at south Carlisle
 - Do minimum (no link road) with south Carlisle development
 - Do something (link road) with south Carlisle development

- 14.1.6 These scenarios allow the impact of the southern link road to be assessed both with and without development at south Carlisle. This is important, as the business case for the scheme needs to demonstrate value for money without development at south Carlisle. The scenarios also allow the impact of development at south Carlisle to be assessed.
- 14.1.7 The results of the modelling study are considered in two parts. Firstly, the number of congested junctions in Carlisle are identified for each scenario by considering the ratio of flow to capacity. Secondly, the overall network statistics are presented, which details how queues, travel times and distances travelled vary across the whole network.
- 14.1.8 The congestion analysis on the with-development scenarios show that there would be fewer junctions over capacity with the addition of the southern link road. This would reduce congestion throughout the network, but particularly in the city centre. The number of over-capacity junctions is halved with the southern link road.
- 14.1.9 The impact of a southern link road without development at south Carlisle was also assessed. There are fewer over-capacity junctions in these scenarios, but the results still show the southern link road would lead to a reduction in the number of both near-capacity and over-capacity junctions.
- 14.1.10 The impact of development at south Carlisle can also be assessed by comparing both do-minimum scenarios. This assessment shows that the impact of south Carlisle without intervention would be significant, with the number of over-capacity junctions increasing fourfold in 2040.
- 14.1.11 The network statistics analysis consider changes in queues, travel times and distance travelled vary across each scenario and are summarised in Table 14.1, to Table 14.4 below.

Table 14.1 2030 network statistics summary with south Carlisle

Network Totals	AM DM	AM DS	Diff	PM DM	PM DS	Diff
Transient queues	1,584	1,359	-225	1,785	1,581	-204
Over-cap queues	159	198	38	354	335	-19
Link cruise time	4,518	4,452	-66	4,617	4,537	-80
Total travel time	6,261	6,009	-252	6,755	6,453	-303
Travel distance	273,605	274,257	653	280,302	280,322	20
Average speed	44	46	2	42	43	1

Source: Carlisle Southern Link Road transport modelling report

Table 14.2 2040 network statistics summary with south Carlisle

Network Totals	AM DM	AM DS	Diff	PM DM	PM DS	Diff
Transient queues	2,654	2,140	-515	3,084	2,429	-655
Over-cap queues	1,229	748	-481	1,871	1,112	-759
Link cruise time	5,476	5,335	-141	5,605	5,454	-151
Total travel time	9,359	8,222	-1,137	10,559	8,995	-1,564
Travel distance	327,849	324,172	-3,676	334,734	331,350	-3,384
Average speed	35	39	4	32	37	5

Source: Carlisle Southern Link Road transport modelling report

- 14.1.12 The results in Table 14.1 and Table 14.2 demonstrate the impact the scheme would have on travel times, especially in 2040 with large decreases in travel time. The large decreases in travel distance with the scheme also indicate how congested the network would be in 2040 without intervention.

Table 14.3 2030 network statistics summary without south Carlisle

Network Totals	AM DM	AM DS	Diff	PM DM	PM DS	Diff
Transient queues	1,358	1,218	-140	1,534	1,412	-122
Over-cap queues	92	115	23	237	238	1
Link cruise time	4,234	4,194	-40	4,334	4,280	54
Total travel time	5,692	5,526	-166	6,105	5,930	-175
Travel distance	257,457	258,056	599	263,813	264,014	201
Average speed	45	47	2	43	45	2

Source: Carlisle Southern Link Road transport modelling report

Table 14.4 2040 network statistics summary without south Carlisle

Network Totals	AM DM	AM DS	Diff	PM DM	PM DS	Diff
Transient queues	1,543	1,375	-168	1,756	1,590	-166
Over-cap queues	197	214	17	351	346	-5
Link cruise time	4,499	4,445	-54	4,600	4,541	-59
Total travel time	6,240	6,034	-206	6,707	6,477	-230
Travel distance	272,669	273,404	735	279,824	280,271	447
Average speed	44	45	1	42	43	1

Source: Carlisle Southern Link Road transport modelling report

- 14.1.13 The results in Table 14.3 and Table 14.4 show that the scheme still demonstrates journey time savings without development in south Carlisle, although the benefits are lower. The statistics show an increase in travel distances, indicating that trips are reassigning onto longer but quicker routes.
- 14.1.14 The modelling report concludes that if a southern link road is built and south Carlisle developments are completed as well, congestion would decrease along major routes. However, because of changes in trip assignment, there would be the potential for increases in congestion at specific junctions without further intervention on the A689 CNDR, M6 J42 and Durdar Road.
- 14.1.15 The modelling report suggests that the southern link road would have a beneficial impact upon the local highway network both with and without major development at south Carlisle. The development at south Carlisle increases the strength of the strategic and economic cases for the scheme as the link helps to deliver these developments, contributing to increased employment and Gross Value Added to the economy.

14.2 Indicative value for money

- 14.2.1 It is possible to use the network statistics to undertake an indicative economic assessment of the value for money of the scheme by calculating its Benefit to Cost Ratio (BCR). The benefit to cost ratio is defined as the value of scheme benefits divided by the value of scheme costs.

- 14.2.2 The benefits of the scheme in economic appraisal are typically those which can be monetised. These chiefly include journey time savings, but also comprise other factors such as vehicle operating costs, accidents, greenhouse gases, noise, air quality and physical activity. For the purpose of this indicative appraisal, only journey time benefits are to be considered.
- 14.2.3 The costs of the scheme are those total costs required to deliver the scheme, including design, project management and construction, as well as maintenance costs once the scheme is operational.
- 14.2.4 The South Carlisle modelling report considered the impact of the road both with development at south Carlisle and without development. The benefits of the scheme both with and without development are considered in this section.
- 14.2.5 An appraisal period of 60 years has been assumed, in line with guidance in TAG Unit A1.1 *Cost-benefit analysis*. As the modelling study has considered future years of 2030 and 2040, the benefits between these years have been interpolated. It has been assumed there will be no change in benefits for years after 2040.
- 14.2.6 The journey time savings from the model outputs are given in PCU-hours, and these need to be monetised. The values of time per vehicle are taken directly from the TAG data book Table A1.3.6 (Autumn 2015) which gives market price values of time per vehicle in 2010 prices for all future years from 2030. As only total changes in journey time are provided, these are disaggregated into vehicle types using the proportions from the Carlisle transport model LMVR, which are given in Table 14.5.

Table 14.5 Vehicle type proportions

Vehicle type	AM	PM
Car	73%	75%
Light goods vehicle	14%	13%
Heavy goods vehicle	13%	12%

Source: Carlisle transport model LMVR

- 14.2.7 Applying the vehicle type proportions and the value of time for each average vehicle to the journey time savings gives a monetised value for the journey time savings for each year from 2030 to 2089 in 2010 prices. However, these values need to be discounted to reflect the fact that people prefer to consume goods and services now rather than in the future.
- 14.2.8 Finally, the benefits need to be annualised, as they currently only represent a single morning and evening peak period in each year. There are 253 working days per year, so these values are multiplied by 253. However, benefits will also be accrued in the inter peak, off-peak and weekends. No data is available on the level of these benefits, but for the purposes of this simple indicative assessment, it is assumed these benefits are equal to four times the morning and evening peak benefits.
- 14.2.9 For the purpose of the sifting process, a cost of £100m was assumed, in 2015 prices. This cost was apportioned across a 10-year programme with the spend profile detailed in Table 14.6.

Table 14.6 Southern link assumed spend profile

Year	% Spend
2016	0.5%
2017	1.5%
2018	1.5%
2019	1.5%
2020	1.5%
2021	8.0%
2022	40.0%
2023	32.0%
2024	8.0%
2025	5.5%

14.2.10 Using the assumed spend profile above, the scheme cost was apportioned across the future years, and adjusted for real price increases, based on forecast inflation and an assumed four per cent increase in construction costs per year. The costs were then converted into 2010 prices, discounted and converted into market prices. This gives a total scheme cost of £82m.

14.2.11 Using the cost and benefits calculated above, an indicative BCR is presented in Table 14.7 and further details are provided in Appendix H.

Table 14.7 Indicative cost benefit analysis

Scenario	Benefits (£m)	Costs (£m)	BCR
Without development	£165	£82	2.0
With development	£948	£82	11.6

14.2.12 The indicative benefit to cost ratio results in Table 14.7 gives a high value for money. Given that this benefit to cost ratio does not include benefits from a number of other sources, it can be considered that the scheme could be expected to achieve a high value for money. Although this indicative assessment has made a number of broad assumptions, it is felt that the figure is a reliable guide to the expected benefits of the scheme.

14.2.13 It should be noted that when appraising a major infrastructure scheme such as this, traffic growth due to new developments needs to be clearly set out in an uncertainty log and constrained to the assumptions contained within the National Trip End Model. This means that in the full appraisal of the scheme, it is unlikely that the full effects of development at south Carlisle would be included. The 'with-development' results are therefore presented for information only.

14.2.14 However, this 'with-development' figure clearly shows the significant impact of the scheme on journey times once south Carlisle is fully developed. Separate benefits will also be accrued if it can be demonstrated, as suggested by the modelling results, that development at south Carlisle is dependent on the link road to proceed, although these will not be included in the benefit to cost ratio.

14.3 Options assessment by route

- 14.3.1 The indicative route options for the Southern Link Road show a link running between the M6 Junction 42 and the A595/A689. There are three route options for consideration, with deviations in where they cross existing highway links as well as the rivers Caldew and Petteril, the West Coast Main Line and the Cumbria Coast Line.
- 14.3.2 In terms of traffic appraisal there is currently little to differentiate between each route as the total length of each option is comparable and should not lead to significant variations in total journey times.
- 14.3.3 There is not yet enough information to determine detailed junction strategies for each route, and hence each route currently assumes the same number of junctions. The number of junctions and the form which these take may have an impact upon journey times along the road. When considering the number and design of the junctions in more detail, consideration needs to be given to forecast traffic flows and whether to give priority to through traffic or traffic travelling to and from the south Carlisle development. This will depend on the layout of development and hence the masterplan.
- 14.3.4 If the Carlisle Southern Link Road is to be successful in relieving congestion from central Carlisle the route must provide journey time benefits. The South Carlisle modelling report assumed a cruise speed of 50 mph along the route. However, this speed may not be appropriate for areas close to development at south Carlisle. Again, this will depend on the proposals included in the masterplan.

14.4 Next steps

- 14.4.1 In terms of traffic modelling, the South Carlisle modelling study represents a good starting point for identifying the potential impacts of the scheme in terms of traffic flows and delays. The results of the study already suggest that the scheme will represent good value for money. However, an extensive and robust transport modelling study would be required to support the appraisal of the scheme and the preparation of the economic case. It is considered that the model would require updating to provide recent origin-destination data and to improve the validation of the model towards the south and east of Carlisle. This would require a data collection exercise, including traffic counts and journey time surveys, as well as origin-destination surveys such as roadside interviews. Due to the size and scale of the scheme, it is also likely that scheme forecasting would require a variable demand assessment. Further details on the modelling methodology and data collection should be provided in the Appraisal Specification Report and a Traffic Data Report.

15. Southern link road planning issues

15.1 Introduction

- 15.1.1 This section discusses the relevant national, regional and local planning policies to the route option discussion and summarises the key planning issues that will need to be considered further when assessing the choice of route.
- 15.1.2 The fundamental issue shaping the consideration of the route options is the strategic objective of delivering a continued and increased supply of new sustainable housing in Carlisle. This is a clearly stated primary objective within the emerging Carlisle District Local Plan 2015–2030 which expects the momentum of housing growth to be maintained for the full life of the Plan.
- 15.1.3 In order to maintain the district's housing growth ambitions the Plan envisages a major mixed-use development in south Carlisle, the delivery of which would commence following the production of a Development Plan Document including an infrastructure delivery strategy.
- 15.1.4 The local housing growth ambitions within the emerging Plan are supported in national planning policy through the National Planning Policy Framework (NPPF) and in particular Policy 47 that encourages local authorities to “*boost significantly the supply of housing.*” In order to deliver these ambitions the proposed new major mixed-use development has to be planned to be sustainable. This requires full consideration of the appropriate scale and mix of uses plus the essential infrastructure required to ensure it is deliverable. A comprehensive masterplanning process is envisaged to achieve this and the consideration of the necessity of a southern link road will be an integral part of the process.

15.2 National Planning Policy Framework (NPPF)

- 15.2.1 The NPPF (Department of Communities and Local Government, 2012) document sets out the Government's policy in relation to promoting the delivery of sustainable development through the planning system. It makes it clear that the planning system has three roles to achieve in order to deliver sustainable development - the economic, social and environmental and that:

“These roles should not be undertaken in isolation, because they are mutually dependent. Economic growth can secure higher social and environmental standards, and well-designed buildings and places can improve the lives of people and communities. Therefore, to achieve sustainable development, economic, social and environmental gains should be sought jointly and simultaneously through the planning system.” (Para. 8).

“At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking.” (Para. 14).

- 15.2.2 Within the NPPF the specific chapter concerned with *“Delivering a wide choice of high quality homes”* contains Policy 47 which encourages local authorities to *“boost significantly the supply of housing”* and within their plans to *“identify a supply of specific developable sites or broad locations for growth, for years 6-10 and, where possible, for years 11-15”*. The proposed new major mixed-use development fulfils the requirement for the second of these two time periods. However, in order to be meaningful it needs to be developable and viable. This is why this preliminary exercise, and ultimately the comprehensive masterplanning of the major mixed-use development and its associated elements, are important.
- 15.2.3 The NPPF also has a specific policy section relating to sustainable transport matters and states in Policy 29 that *“Transport policies have an important role to play in facilitating sustainable development”* and in Policy 30 that *“Encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion.”*
- 15.2.4 Policy 34 requires that *“developments that generate significant movement are located where the need for travel will be minimised and the use of sustainable transport modes can be maximised”*. Policy 37 seeks a balanced approach to land use planning allocations thereby enabling journey lengths to be minimised.
- 15.2.5 Large scale residential developments are specifically addressed in Policy 38 which reinforces the above policy messages by encouraging that they contain a mix of uses including employment, shopping and education.
- 15.2.6 Economic policy objectives in the NPPF feature strongly as part of the overall balanced approach and are relevant as the economic priorities for Carlisle and Cumbria are a consideration in the delivery of the Link Road. Planning positively to deliver infrastructure and support economic regeneration are key objectives (Para. 21).
- 15.2.7 The NPPF places weight on the sustainability and viability of proposed development allocations, with the need for supporting infrastructure to be fully considered and planned for as part of this process. Emergence of a major mixed-use development will need additional highways and transport infrastructure, the principal role of which will be to support the delivery of sustainable housing growth and ensure that the growth ambitions are developable and deliverable in policy terms.
- 15.2.8 This is the national policy context surrounding the route choice and potential delivery of the Link Road. In addition to the principal housing objective the major mixed-use development and route choice also have to address economic objectives, minimise environmental impact and make a positive contribution towards environmental enhancements. These aspects are all reflected in the existing and emerging local planning policies detailed below and discussed extensively elsewhere in this report.

15.3 Development Plan Policy

- 15.3.1 The Carlisle District Local Plan 2001-2016 is the current adopted local plan for Carlisle. However, the proposed delivery timetable for the major mixed-use development and associated supporting elements are beyond the life of this document and it is therefore the emerging Carlisle District Local Plan 2015-2030 that will guide the consideration of the proposal. This Plan has been submitted to the Government for Examination in Public and, at the time of writing, this process is still ongoing. Through this process the broad policy basis of the major mixed-use development will be tested as the Plan contains policies that support its development.
- 15.3.2 The strategic policies outlined below contain the approach being taken in the emerging Plan. Please note following the close of the examination hearing sessions that Carlisle City Council has submitted to the Inspector and consulted on a number of proposed modifications to the Plan (March 2016). In terms of the proposed major mixed-use development they do not fundamentally change the policy thrust, but rather seek to reinforce the need for a comprehensive and co-ordinated approach to the development. They more clearly define the area being considered and emphasise that the proposed masterplanning exercise for the area is the principal mechanism through which the delivery and phasing of Carlisle South will be examined and determined. In recognition of its importance to the realisation of Carlisle South, the masterplan will include an infrastructure delivery strategy.
- 15.3.3 The masterplan, in guiding the scale and content of the mixed use development, will determine the type and number of new homes, the type and size of the employment land and need for other uses. It will also determine the timing and phasing of all elements including the transport infrastructure. The Local Plan is scheduled for adoption in autumn 2016 and the preparation of the masterplan is anticipated to start early in 2017. Full consideration of the transport implications and required improvements, as a fundamental element within the masterplan, will need to inform and run in parallel with this process.
- 15.3.4 In the context of the major mixed-use development the main modifications proposed relate to Policy SP3 detailed below and are shown in bold and strikethrough deletions against the Submission Draft Plan text.
- 15.3.5 Strategic Policy SP 3 - Broad Location for Growth: Carlisle South currently states, including proposed modifications:
- "A broad location for growth for a **major mixed-use ~~urban extension~~ development**, focusing on housing, is identified on the Key Diagram at Carlisle South. ~~The urban extension is expected to be delivered from 2025 onwards.~~ **The release and phasing of Carlisle South will be informed by a Development Plan Document inclusive of an infrastructure delivery strategy.***
- To support the housing development, there will be a requirement for primary and secondary schools, employment and retail sites, community facilities, open space, green and other infrastructure including highways and transport.*

To enable a comprehensive and co-ordinated development approach, Piecemeal or unplanned development proposals within the area which are likely to prejudice its delivery including the ~~large-scale~~ infrastructure required for the area will not be permitted.

The development of this area will be in accordance with a masterplan which will be approved as a Development Plan Document. **The study area for the masterplan will include the whole of the undeveloped extent beyond the city's existing southern edge and any existing allocations.**

The purpose of the masterplan will be as follows:

1. to provide more detail on how **and when** the strategic requirements set out in this policy will be delivered;
2. to set a framework to guide the preparation of future planning applications;
3. to provide a framework against which future planning applications will be assessed;
4. to enable and support the co-ordination and timely delivery of infrastructure provision; and
5. to facilitate the delivery of land release to help address the imbalance of employment land between the north and south of the City.

The potential for the future development of a southern relief road linking Junction 42 of the M6 with the southern end of the A689 will be an integral part of the masterplan.

To ensure that Carlisle South is deliverable when required, work on masterplanning the area will commence in the early years of the plan period.”

15.3.6 The policy sets out a clear process through which delivery of the major mixed-use development will be taken forward. The broad objective of achieving a sustainable mixed use, housing focussed, major development is clearly stated. The preferred approach to delivering this allocation is also clear and emphasised by the proposed modifications; the masterplan process will take precedence in considering the future of the area and all aspects, including the potential for a new Link Road, will be considered within the context of this comprehensive process.

15.3.7 Strategic Policy SP 5 - Strategic Connectivity states, in part, that:

“The City Council will support improvements to the transport network, in partnership with delivery partners and operators, including the Highway Authority, in order to support the District's growth aspirations and Carlisle's role as a strategic transport hub.

Proposals in line with the objectives of the 3rd Cumbria Local Transport Plan will be supported. Interventions to facilitate growth as identified in the Infrastructure Delivery Plan will be prioritised. Opportunities will also be taken to:

5. develop a southern relief road linking Junction 42 of the M6 with the southern end of the A689 as part of developing the broad location of Carlisle South;”

- 15.3.8 This policy promotes the development of a southern link road (point 5) as part of the proposals for a Carlisle South major mixed-use development. Therefore, the specific policy objective is set within the context of the further detailed consideration of the extension through the masterplanning process outlined in SP3 above.
- 15.3.9 In addition to the strategic policies supporting of the delivery of the major mixed-use development and Link Road there are also individual topic area policies that support these goals.
- 15.3.10 Policy *EC1 - Employment Land Allocations* recognises that the Carlisle South masterplanning exercise will need to consider whether any additional employment land should be allocated over and above the existing site allocations in the Plan and, if so, what type, amount and location of such allocation/s would be appropriate. There are a number of reasons for this approach, not least the need to bring into balance the bias of employment land towards the north of the city and to ensure Carlisle maximises its location advantage of being close to the M6. The policy commentary, however, cautions against any premature land release that might prejudice existing allocations and estate improvement aspirations. The provision or prospective provision of the southern link road would have an influence on these considerations and would be likely to broaden the options available.
- 15.3.11 The above has clearly demonstrated that there is strong policy support within the emerging development plan for Carlisle to pursue the provision of a housing focussed major mixed-use development in Carlisle South, the delivery of which would commence following the production of a Development Plan Document including an infrastructure delivery strategy, a pre-requisite of which is the development of a comprehensive masterplan for the area. During this process all aspects of delivering a sustainable development will be fully considered including supporting infrastructure, of which consideration of a new Link Road will form a part.

15.4 Summary of key planning issues

- 15.4.1 The decisions made in relation to the delivery of the proposed major mixed-use development through the masterplanning process will be fundamental to the future of Carlisle as a place to live and work. The delivery of a new southern link road will be part of this process and as detailed elsewhere in this report the initial sifting of potential route alignments has highlighted three potential routes for the new road. The final route chosen is likely to have a significant bearing on the potential nature of the extension and the development choices available.
- 15.4.2 The key strategic planning issues surrounding the choice of route are tabulated in **Table 15.1** below. The list is supported by a brief commentary on the aspects of the individual routes where they have a point of difference.

Table 15.1 Key strategic planning issues

Issue	Considerations
Urban Form and relationship with existing urban area	<p>The options for different approaches towards the type of urban form the proposal might take will be influenced by the choice of route. For example, the Pink route may encourage development that closely physically integrates with the existing urban area; all routes, but particularly the Blue and Green routes, offer greater opportunities to provide separation from it allowing consideration of alternative forms of growth.</p> <p>The Pink route has the potential to become a road integrated into the urban form with development both north and south of it. However, this is not desirable as it will not be a residential road and its scale will inevitably form a considerable barrier between either side. Furthermore, the location of a road along this axis may encourage car use for short journeys and when added to the designed volumes of traffic could increase congestion, contrary to national and local policy.</p>
Existing settlements	<p>One of the key issues the masterplan will need to address is in relation to the major mixed-use development's impact on existing settlements in the area and the extent they should be protected from additional development. However, the choice of route is largely neutral on this issue albeit that the Blue and Green routes do offer more flexibility in terms of the form the major mixed-use development would take.</p>
Defensible Boundaries	<p>Roads have traditionally been used as urban/development 'stops'. Strong boundaries provide a sense of permanence to development. The Blue and Green routes provide an urban "stop" whereas the Pink route is more likely to be integrated into the urban area.</p>
Balancing housing and jobs/strategic employment site opportunities.	<p>All route options offer opportunities to address the imbalance between the concentration of employment land to the north of the city and housing in the south. Strategic allocations with direct access to Junction 42, M6 will be commercially attractive and perhaps the Pink route offers the greater opportunity for this to be located closer to the existing urban area as well as the major mixed-use development.</p>
Liveability	<p>This encompasses a number of different aspects that the major mixed-use development will focus on from the outset, such as achieving a feeling of a sense of place, providing corridors of sustainable travel and access to informal recreational activities and the promotion of healthy lifestyles. The choice of route will not unduly restrict any of these ambitions.</p>
Flexibility	<p>The Pink route is likely to dissect the major mixed-use development creating a sense of severance in the area and potentially increase congestion. The Blue and Green routes offer a wider range of alternatives and therefore additional flexibility in the eventual urban form.</p>
Prematurity	<p>The ability to effectively plan for the new road, should be protected by resisting unplanned development proposals in the area that could prejudice any future decisions or reduce the options being considered. The ability to achieve this will depend to some extent on the robustness of the emerging proposals through the emerging local plan delivery process.</p>

16. Southern link road deliverability

16.1 Impact on existing road users

16.1.1 The impact on existing road users during construction can be divided into the following categories:

- Upgrade of existing carriageways to accommodate the Green and Blue routes;
- Refurbishment of existing structures to accommodate the Green and Blue routes;
- Construction of at-grade roundabouts on all routes.

16.1.2 Both Newbiggin Road and Peter Lane will require on-line carriageway widening and the addition of combined footway/cycleways to bring their current cross section up to proposed standard as tabulated in **Table 16.1** below.

Table 16.1 Required upgrade to existing infrastructure

OPTION	LOCATION	SECTION	EXISTING CROSS SECTION	REQUIRED WORKS
Green	Newbiggin Road	Jct 42 to WCML Bridge		
Blue	Newbiggin Road	Jct 42 to WCML Bridge		
	Newbiggin Road	WCML Bridge to ?		
	Peter Lane			

16.1.3 Current peak hour traffic flows on these roads are relatively light at 350 and 500 on Newbiggin Road and Peter Lane respectively. However given the lack of a suitable diversion route for the former it is anticipated that the potential for localised traffic disruption is high. It is envisaged that the upgrade works could safely take place with single lane running under temporary traffic signal control. To minimise further disruption the Contractor could be restricted from carrying out these works at the same time as construction of Brisco Road and Dalston Road roundabouts. Obviously protection or diversion of existing utilities apparatus in both Newbiggin Road and Peter Lane have the potential to increase the time period for the works.

16.1.4 The existing cross sections of Newbiggin New and New Brisco are 7.3m carriageway with 2.8m to 3m wide footways and 7.3m carriageway with 2.8m and 3.8m wide footways respectively. Clearly these are well below the proposed cross section of 9.3m carriageway with 3m combined footway/cycleway. For the purpose of this assessment it has been assumed that on the grounds of cost the existing cross sections would be retained i.e. the acceptance of short localised pinch points for pedestrians and cyclists at the two locations. Should this recommendation be rejected then to avoid extensive structural widening of both structures separate foot/cycleway bridges could be constructed alongside the existing structures.

- 16.1.5 An initial assessment of Newbiggin New and New Brisco indicates that both will require an upgrade of their parapets. These upgrade works could safely take place with single lane running under temporary traffic signal control. Upgrading the parapet at New Brisco Railway Bridge is likely to require two overnight possessions to erect and dismantle protective scaffold over the railway. It is recommended discussions are held with Network Rail at Stage 2 to better understand their views and requirements.
- 16.1.6 At this stage of the assessment it has been assumed that the majority of the proposed roundabouts would be positioned on the line of the existing side roads. Such a strategy will reduce construction costs and land take but will inevitably lead to some localised traffic disruption during construction. It is recommended that at Stage 2 a more detailed assessment is carried out to establish the most cost effective location for each roundabout. This assessment will need to also take into account the need to divert or protect any utilities apparatus in the existing side roads.

16.2 Cost considerations

- 16.2.1 In order to satisfy the requirements of TAG Stage 1, cost estimates for considered route options should be prepared. However, it must be recognized that due to the preliminary nature of the Stage 1 proposals considered at this stage, only broad-based estimates of cost can be made.
- 16.2.2 With regard to preparing these cost estimates at Stage 1 three factors have to be recognized:
- Information available is limited with desk-top assessments being undertaken, and no physical on-site survey works carried out;
 - At this stage the aim of looking at costs is principally to identify options which will be unaffordable or which seem least likely to deliver good value for money; and
 - It is a requirement for TAG practitioners to consider the full range of selection criteria i.e. Objectives, Environment, Safety, Economy, Integration, Accessibility & Social Inclusion, Deliverability, Public Acceptance & Affordability. Focusing on cost alone at this stage could over influence the selection process moving onto the Stage 2 work. It is therefore essential, that the selection of routes going forward is based on the full range of criteria, without cost influencing decision making too early in the process.
- 16.2.3 In preparing scheme cost estimates advice as been taken from *TAG Unit A1.2 – Scheme Costs*. This recommends that there are three main elements of a scheme cost estimate that need to be estimated and reported in scheme appraisals.
- the base cost i.e. the basic costs of a scheme before allowing for risks;
 - adjustment for risk which should cover all the risks that can be identified, the majority of which then need to be assessed and quantified through a Quantified Risk Assessment (QRA) and included in the risk-adjusted cost estimate; and
 - adjustment for optimism bias to reflect the well established and continuing systematic bias for estimated scheme costs and delivery times to be too low and too short, respectively, and results in the risk and optimism bias-adjusted cost estimate.

Base costs

- 16.2.4 Base costs comprise of construction costs, utilities, land and property costs and preparation and administration costs.
- 16.2.5 SPON'S Civil Engineering and Highway Works Price Book 2015 has been used as the basis of the construction cost estimates and provides unit rates of:
- Single 7.3 m carriageway all-purpose rural road £1,475 per metre top of the range given the extensive earthworks. (no footways or cycle paths included)
 - Wide single 10 m carriageway with 3 m footway all-purpose rural road £1,900 per metre top of the range given the extensive earthworks.
 - 3 m cycle track £205 per metre
 - 2.5 m footway £155 per metre
- 16.2.6 A nominal £300,000 per roundabout has been used for the purposes of estimating.
- 16.2.7 The width of each bridge has been taken as 17.3 m including 9.3 m carriageway, 3.0 m combined footway/cycleways and parapets. The unit rate between abutments has been taken as £4,600 per square metre this is top of the range for reinforced concrete bridges with steel beams over 40m in span. This rate reflects the current unknown ground conditions and the additional costs of working within Network Rail's requirements.
- 16.2.8 For options utilising existing bridges an allowance has been included to reflect that refurbishment may be required. The cost of refurbishment has been taken as nominally £1,000 per square metre.
- 16.2.9 An addition of 15 per cent has been added for Preliminaries.
- 16.2.10 A nominal 6 per cent has been added for utility diversions for the Pink route given the limited information available to date. For the Green and Blue routes this has been increased to 8 per cent and 12 per cent respectively to reflect the number of services within Newbiggin Road and Peter Lane.
- 16.2.11 Land and property costs have been based on a unit price of £650 per metre provided by the County Council and based on the CNDR.
- 16.2.12 20 per cent has been added for preparation and administration costs.

Risk costs

- 16.2.13 An initial, high level review of potential project delivery risks has been considered with regards to significant technical, economical, environmental or statutory risks. Funding issues are not considered at this stage. **Table 16.2** below summarises the top ten risks identified. This list is not exhaustive and will be reviewed during the Stage 2 appraisal.

Table 16.2 Top ten risks

STAGE	RISK	COST
Development	Highways England will not approve departure at Junction 42 resulting in additional crossing of River Petteril.	£1,000k (B)
Development	Design development during Stages 2 and 3 due to scope creep increases cost	£600k
Development	Ground Investigations, topographical and traffic surveys have not been carried out. The results of these will affect the cost.	£500k
Development	A limited assessment of PU apparatus has been undertaken and the information provided is limited. Services will impact on the works and dealing with PU's will be problematic, costly and time consuming.	£500k (B) £300k (G) £150k (P)
Development	Discussion with Network Rail are at a very early stage, outcomes will affect bridge costs and route selection particularly refurbishment of on-line routes.	£400k (G&B) £200k (P)
Construction	Construction delay and additional cost resulting from issues with flood plains and watercourses.	£350k (P) £175k (G&B)
Development	Environmental assessment to date has been desk based, limited survey information is available. Impacts on national designations, scheduled monuments, listed buildings etc may be more severe than anticipated. The results of these may affect ranking and cost. As all of the options involve construction through 'green field' areas impacts on protected species, birds and woodlands may be more significant than anticipated.	£200k
Construction	Contaminated land encountered during construction e.g. landfill	£175k
Construction	Increase in construction costs due to error in assumptions made relating to percentage of acceptable/unacceptable material.	£150k
Development	Key Stakeholders and Landowners may contest outcomes. Statutory processes will be required and will require land acquisition. This could result in the need for a Public Local Inquiry and project delays. Objections should be expected from Statutory and Non-Statutory objectors which may lead to additional mitigation costs.	£120k
	TOTAL	£3,820k (Blue) £2,570k (Green) £2,450k (Pink)

16.2.14 From previous scheme experience an assumption has been made that the Top Ten risks above will constitute approximately 80 per cent of the total risk pot. We have therefore assumed a risk allowance ranging from £2.9m to £4.8m.

Optimism bias

16.2.15 Table 8 of *TAG Unit A1.2 – Scheme Costs* gives a recommended uplift of 44 per cent as being appropriate to the category and stage of development of the project. This uplift is applied to the risk-adjusted scheme cost estimate.

16.2.16 The cost estimates for each route are therefore as indicated in **Table 16.3** below:

Table 16.3 Route cost estimates

ROUTE	BASE COST	RISK COST	OPTIMISM BIAS	TOTAL
Green	£54.3m	£3.2m	£25.3m	£82.8m
Blue	£49.2m	£4.8m	£23.8m	£77.8m
Pink	£72.1m	£2.9m	£33.0m	£108.0m

16.3 Delivery options

16.3.1 The following procurement options could be considered:

- Traditional procurement;
- Design & Build;
- Early Contractor Involvement; and
- Negotiating an extension of the existing CNDR PFI contract to include the design, build, finance and maintenance of this Link Road.

16.3.2 The headline benefits and disadvantages of each of the above are tabulated in **Table 16.4**:

Table 16.4 Delivery options

	Benefit	Disadvantages
Traditional	The client retains responsibility for and control of design team; There is direct reporting by the design team to the Client to ensure that quality is maintained Roles and responsibilities are clearly understood It is easier to evaluate the tenders	No opportunity to use the Contractor's skills and experience during design process There is no incentive for the Contractor to find ways of reducing costs There can be a significant risk of cost overruns
Design & Build	All the design risk and most of the construction risk are transferred to the contractor Single point of responsibility Cost certainty	Unpopular with Contractors due to increased tender costs Design biased to buildability as opposed to whole life cost. Historically has given rise to significant contractual claims
Early Contractor Involvement	Contractor input to the design process reduces scheme cost More scope for innovation	Difficulty agreeing Target Cost Increased preparation costs Design biased to buildability as

	Benefit	Disadvantages
	Improved risk management with fair allocation of risks Shorter construction period and reduced impacts during construction Reduced client supervision costs	opposed to whole life cost
PFI	Certainty of cost More scope for innovation Design and construction with whole life costs in mind	Higher cost over lifetime of the contract Client negotiating with a single provider Future change and variations can be expensive/difficult

16.3.3 The fact that different public sector clients across the UK favour different options, e.g. Highways England favour ECI while Transport Scotland favour D&B and Local Authorities still tend towards traditional procurement, indicates that no one option stands out from the rest.

16.3.4 Likely funding sources could include either or a combination of the following options:

- Developer contributions to mitigate the effects of growth in South Carlisle, in particular S106 and S278;
- Government funding e.g. the LEP, Growth Fund and the DfT;
- Phased construction across two or more stages to match future funding sources/levels e.g. initially providing a link to as far as say Durdar Road or Brisco Road. Stage 1 would then open up significant land for development with developer contributions partially funding Stage 2;
- “Adding” the Link Road to the CNDR PFI concession; and
- Using funds from the Local Government Pension Fund. Lancashire County Council is funding parts of the Preston City Deal from their pension fund.

16.4 Delivery programme

16.4.1 An outline programme based on achieved timescales from similar projects is included in **Appendix H** covering the following headline activities:

- Outline Design Development (incl. surveys, investigations, studies, etc);
- Public Consultation;
- Planning Process;
- Securing other consents and approvals;
- Detailed Design;
- Roads Orders and CPO;
- Procurement; and
- Construction.

- 16.4.2 Based on a two year construction period and using realistic durations seven years is considered to be a feasible timescale for delivery.

17. Southern link road appraisal summary

17.1 Conclusions

17.1.1 Considering the three individual routes against the key criteria as discussed in the preceding chapters it can be seen in general terms:

- The Blue route scores best on affordability and capital cost grounds because it maximises the reuse of existing infrastructure. In contrast the Pink route scores worst because of the need to provide additional expensive major crossings of the West Coast Main Line and River Petteril;
- The Blue route carries the greatest cost risk due to the number of existing utilities within the existing highway that will require diverting and/or protecting coupled with the uncertain cost of refurbishing the existing Newbiggin New and New Brisco bridges;
- There is no difference between the Blue and Green routes on environmental grounds with the Pink route scoring worst on noise, air quality, landscape & visual, historic environment and the water environment;
- The Green route is superior to the Blue route in terms of noise and air pollution due to the much larger number of receptor sites fronting on to the sections of existing highway incorporated into it;
- The Blue route is less damaging to the landscape and the historic environment than the Green route due to it maximising the length of the existing road corridor it follows;
- The Pink route will cause the least disruption to existing road users and frontages during construction;
- The alignment of the Green and Pink routes are the most flexible in contrast the Blue route provides limited flexibility due to be fixed along almost 50% of its length where it follows existing highway corridors;
- The Pink route may encourage development that closely physically integrates with the existing urban area; all routes, but particularly the Blue and Green routes, offer greater opportunities to provide separation from it allowing consideration of alternative forms of growth;
- While no public consultation as yet taken place it is likely that the Green route will be the most acceptable to the public given its location;
- No “show stoppers” have been identified for any of the three routes but further development is obviously required to mitigate the environmental impact of crossing the Caldew Valley. It is likely that where appropriate mitigation is included within the design, any adverse effects will be reduced to a level that is more acceptable. Where residual adverse effects remain, they are likely to be outweighed by other benefits of the scheme;
- All three routes will support development at Carlisle South and assist east/west movement;

- In order to overcome affordability issues phased delivery of all options is possible.

17.2 Recommendations

- 17.2.1 Given the limited nature of this assessment, the unknown outcome of the ongoing South Carlisle masterplanning exercise and limited modelling proportionate to the stage of preparation of Carlisle South and exploration of a link road has taken place it is recommended that all three routes are taken forward for consideration at Stage 2.
- 17.2.2 The routes identified should be considered at this stage as route corridors and as such should be seen as being flexible in their horizontal alignment except at tie-ins to existing infrastructure and pinch points.

17.3 Next steps

- 17.3.1 A TAG Stage 2 and DMRB Stage 2 appraisal should commence following the completion of the Stage 1 assessment. The Stage 2 appraisal should be aligned as far as possible with ongoing masterplanning work for Carlisle South. This would enable the progression of the design and delivery of the scheme.
- 17.3.2 The next stage of scheme development should include the production of a strategic outline business case. The purpose of this business case would be to define the scope of the project and make the case for the project. It would essentially summarise the key information from this report, along with further details on proposed project governance, key stakeholders and assurance arrangements.
- 17.3.3 An Appraisal Specification Report has been produced and is included as Appendix J. The Appraisal Specification Report includes a proposed methodology for the transport modelling to support the appraisal, as well as the methodologies for appraising the economic, environmental and social impacts of the scheme. The acceptance and agreement of the methodologies in this report by key stakeholders and potential scheme funders is key to ensuring the scheme appraisal is appropriate. The report contains recommendations for ensuring the transport modelling to support the appraisal of the scheme is fit for purpose.

Appendix A

Route Development Plans

- A.1 Location Plan
- A.2 Local Study Area Plan
- A.3 Carlisle Southern Bypass 1990s Routes Plan
- A.4 Route Options
- A.5 Proposed X Section
- A.6 Existing Major Utilities Apparatus
- A.7 Existing Landownership

Appendix B

Initial Option Sift

South Carlisle Infrastructure: EAST Summary

Five schemes:

1. Southern link road
2. On-line capacity improvements
3. Sustainable improvements
4. Park and ride
5. Light rail

Scale of impact

To what extent does the option alleviate the identified problem?

1	Very small overall impact	Would have a very small positive impact, possibly with undesirable consequences	
2	Minor impact	Would have a modest overall impact	On-line capacity improvements Sustainable improvements
3	Moderate impact	Expected to have a reasonably significant impact on the problem identified	Park and ride Light rail
4	Significant impact	Expected to significantly alleviate the problem	Southern link road
5	Fully addresses the identified problem	Expected to fully solve the identified problem, without any undesirable consequences	

Fit with wider transport and government objectives

1	Poor fit	There is significant conflict with other policies/options affecting the study area which needs to be resolved.	
2	Low fit	There is some conflict with other policies/options or modes.	
3	Reasonable fit	Overall the option fits well with other policies affecting the study area.	On-line capacity improvements
4	Good fit	The option fits very well with other policies affecting the study area.	Southern link road
5	Excellent fit	Option complements other policies/proposals affecting study area, has no negative impacts on other modes or outcomes and demonstrates 'doing more with less'.	Sustainable improvements Park and ride Light rail

Fit with other objectives

These will vary depending on how the tool is being used. This is an opportunity to draw out and highlight any relevant network or regional objectives specific to an option and to outline how it performs against any local or modal objectives.

1	Poor fit	There is significant conflict with the County and City's Objectives affecting the study area which needs to be resolved.	
2	Low fit	There is some conflict with the County and City's Objectives	
3	Reasonable fit	Overall the option fits well with the County and City's Objectives affecting the study area.	Park and ride Light rail On-line capacity improvements Sustainable improvements
4	Good fit	The option fits very well with the County and City's Objectives affecting the study area.	
5	Excellent fit	Option complements other the County and City's Objectives affecting study area, has no negative impacts or outcomes and demonstrates 'doing more with less'.	Southern link road

Degree of consensus over outcomes

What consultation has taken place with relevant stakeholders?

1	Little or no consultation has taken place yet, or consultation has revealed a high level of disagreement about the option's ability to deliver the stated outcomes	Light rail
2	Little consultation and/or strong reasons to suggest the outcomes are controversial	Park and ride
3	Some consultation has taken place with some agreement	Southern link road On-line capacity improvements Sustainable improvements
4	Wide consultation and broad agreement on the outcomes, possibly one or two areas of disagreement remaining	
5	Extensive consultation has taken place with a high degree of consensus on the outcomes	

Economic Growth

RED	Negative	
RED/AMBER		
AMBER	No change	Sustainable improvements
GREEN/AMBER		On-line capacity improvements Park and ride
GREEN	Positive	Southern link road Light rail

Carbon Emissions

RED	Negative	
RED/AMBER		
AMBER	No change	Southern link road On-line capacity improvements
GREEN/AMBER		Park and ride Light rail
GREEN	Positive	Sustainable improvements

Socio-distributional Impacts and the Regions

RED	Negative	
RED/AMBER		
AMBER	No change	Southern link road On-line capacity improvements
GREEN/AMBER		Park and ride Light rail
GREEN	Positive	Sustainable improvements

Local environment

RED	Negative	
RED/AMBER		Southern link road On-line capacity improvements
AMBER	No change	
GREEN/AMBER		Sustainable improvements Park and ride Light rail
GREEN	Positive	

Well being

RED	Negative	
RED/AMBER		
AMBER	No change	Southern link road On-line capacity improvements
GREEN/AMBER		Sustainable improvements Park and ride Light rail
GREEN	Positive	

Expected VfM category

1.	Very high	
2.	High	Southern link road
3.	Medium	Sustainable improvements
4.	Low	On-line capacity improvements Park and ride
5.	Poor	Light rail

Implementation timetable from inception to delivery

4.	1–2 years	
5.	2–5 years	On-line capacity improvements Sustainable improvements
6.	5–10 years	Southern link road Park and ride
7.	10+ years	Light rail

Public acceptability

An assessment of whether there are likely to be any issues around public acceptability of the option. For example, will the option require a long period for public consultation?

0	Don't know	Light rail
1	Low	
2		
3		On-line capacity improvements Park and ride
4		Southern link road Sustainable improvements
5	High	

Practical feasibility

Has the option been tested and proven to be practical and effective?

1	Low	Light rail
2		On-line capacity improvements Park and ride
3		Southern link road
4		Sustainable improvements
5	High	

Quality of the supporting evidence

1	Low	Park and ride Light rail
2		On-line capacity improvements Sustainable improvements
3		Southern link road
4		
5	High	

Affordability

The issue of affordability needs to be put in the context of the available budget and relevant budget period. Some options that are unaffordable in the immediate budget period may be affordable in later years.

1	Not affordable	Light rail
2		
3		Southern link road Park and ride
4		On-line capacity improvements
5	Affordable	Sustainable improvements

Capital Cost

Capital costs should include all the costs involved in setting up the option and getting it up and running. In some cases cost information may be very uncertain. Respondents need to provide their best estimate.

1.	£0	
2.	£0m to £5m	
3.	£5m to £10m	
4.	£10m to £25m	On-line capacity improvements Sustainable improvements
5.	£25m to £50	Park and ride
6.	£50m to £100m	Southern link road Light rail

Revenue Costs

1.	£0	Southern link road On-line capacity improvements Sustainable improvements
11.	Don't know	Park and ride Light rail

Overall Cost Risk

1	High Risk	Light rail
2		Park and ride
3		Southern link road On-line capacity improvements
4		Sustainable improvements
5	Low Risk	

Flexibility of option

To what extent can the option be scaled up or down depending on the level of funding available? How easily could the scheme be amended to fit with changing circumstances?

1	Static	Light rail
2		Park and ride
3		Southern link road
4		On-line capacity improvements
5	Dynamic	Sustainable improvements

Summary

	Scale of Impact	Government Objectives	Local Objectives	Economic Growth	Socio	Local Environment	Well Being	Value for Money	Public Acceptability	Practical Feasibility	Affordability	Capital Cost (£m)	Cost Risk	Flexibility
Southern link	4	4	5	5	3	2	3	High	4	3	3	50–100	3	3
On-line improvements	2	3	3	4	3	2	3	Low	3	2	4	10–25	3	4
Sustainable improvements	2	5	3	3	5	4	4	Med	4	4	5	10–25	4	5
Park and ride	3	5	3	4	4	4	4	Low	3	2	3	25–50	2	2
Light rail	3	5	3	5	4	4	4	Poor		1	1	50–100	1	1

Early Assessment and Sifting Tool (EAST) - Expanded Print View

Option Name/No.	Southern Link	
Date	Sep-15	
Description	Carlisle Southern Link Road, linking M6 J42 to A595/A689, providing a new route for east-west traffic and reducing congestion and delays on southern radial routes	

Strategic

Identified problems and objectives	Problem: Significantly increased congestion on constrained radial routes with development at south Carlisle. Objectives: support delivery of major development at south Carlisle; reduce congestion on southern radial routes and in city centre; assist east/west movements to/from west Cumbria.	
Scale of impact	4	Supports development, provides a direct route to west Carlisle from south Carlisle, would reduce congestion on radial routes and provides new east-west link
Fit with wider transport and government objectives	4	Would boost economic growth and improve journeys
Fit with other objectives	5. High	Should directly help all three main objectives
Key uncertainties	Expected layout of south Carlisle development will have significant influence on route options	
Degree of consensus over outcomes	3	Potential scheme has previously been proposed in 1990s and is referenced in local plan and examination in public

Economic

Economic growth	5. Green	Would decrease journey times and improve reliability on radial routes; provides significant improvement to infrastructure resilience, especially in wake of Dec 2015 floods
Carbon emissions	3. Amber	Scheme may increase veh-km as more traffic uses new route; may have positive effects on radial routes and city centre by reducing congestion
Socio-distributional impacts and the regions	3. Amber	Scheme is not within an identified regeneration area; scheme impacts on accessibility etc are unknown
Local environment	2. Red/amber	Road would increase noise and worsen air quality in local area of road, but should improve air quality in AQMAs towards city centre; scheme would have negative impact on environment, especially when crossing Caldew valley, which needs to be mitigated
Well being	3. Amber	Scheme should improve safety on radial routes by decreasing traffic. Severance of scheme is unknown due to no detail on development masterplan
Expected VfM category	2. High 2-4	Previous scheme in 1990s achieved good value for money

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	4	Previous southern link scheme achieved generally good reaction in public consultation, although this was 20 years ago
Practical feasibility	3	Concept of new road was explored in previous consultation and there is unlikely to be major showstoppers
What is the quality of the supporting evidence?	3	Transport modelling has assessed indicative impact of scheme, and shown it would support local plan development
Key risks	Cost of structures; utilities; land costs	

Financial

Affordability	3	Scheme should be affordable through combination of developer contributions, LEP growth fund and other funding sources
Capital Cost (£m)	06. 50-100	Indicative estimate based on CNDR costs
Revenue Costs (£m)	01. None	

Cost profile	Unknown	
Overall cost risk	3	
Other costs	Land purchase; utilities	

Commercial

Flexibility of option	3	Multiple route options but constrained at various points e.g. existing settlements, river and rail crossings
Where is funding coming from?	Not currently known; assumed combination of developer contributions, Cumbria LEP and other sources	
Any income generated? (£m)	No	

Early Assessment and Sifting Tool (EAST) - Expanded Print View

Option Name/No.	On-line capacity improvements	
Date	Sep-15	
Description	Link and junction improvements to London Road, Currock Road, Upperby Road and in the city centre to reduce congestion and journey times on southern radial routes	

Strategic

Identified problems and objectives	Problem: Significantly increased congestion on constrained radial routes with development at south Carlisle. Objectives: support delivery of major development at south Carlisle; reduce congestion on southern radial routes and in city centre; assist east/west movements to/from west Cumbria.	
Scale of impact	2	Supports development, would reduce congestion on radial routes; may result in increased traffic on radial routes
Fit with wider transport and government objectives	3	Would boost economic growth and improve journeys but would increase traffic in city centre
Fit with other objectives	3	Should directly help two of three main objectives (support development and reduce congestion)
Key uncertainties	Feasibility of improvements at key junctions, as previous study indicates capacity improvements are not possible within highway boundary	
Degree of consensus over outcomes	3	Principle of junction improvements has been considered in Carlisle Transport Improvements study, which was consulted on as part of local plan. Scheme will involve improvements over and above those identified in study.

Economic

Economic growth	4. Amber/green	Would help decrease journey times and improve reliability on radial routes
Carbon emissions	3. Amber	Capacity improvements may encourage more traffic to use radial routes and travel towards city centre
Socio-distributional impacts and the regions	3. Amber	Scheme is not within an identified regeneration area; scheme impacts on accessibility etc are unknown
Local environment	2. Red/amber	Scheme should reduce noise and improve air quality, but improvements may be lost if more traffic uses radial routes; scheme would encourage traffic to drive to city centre
Well being	3. Amber	Scheme will improve access to services, but will increase severance on radial routes
Expected VfM category	4. Low 1-1.5	

Managerial

Implementation timetable	5. 2-5 years	
Public acceptability	3	Scheme involves upgrade of existing infrastructure; however, scheme may require demolition of roadside properties
Practical feasibility	2	The Carlisle Transport Improvements study has already identified potential improvements. Further improvements are likely to require additional land purchase; review of on-street parking could be controversial
What is the quality of the supporting evidence?	2	The Carlisle Transport Improvements study suggests that capacity improvements could be effective in reducing congestion. This scheme would provide improvements over and above those identified in the study
Key risks	Land purchase; feasibility of significant capacity improvements at key junctions	

Financial

Affordability	4	
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Capital Cost (£m)	04. 10-25	Assumed £2m per junction at five junctions plus £5m for traffic management and £10m for major improvements at Victoria Viaduct/James Street
Revenue Costs (£m)	01. None	
Cost profile	Unknown	
Overall cost risk	3	
Other costs	Land purchase, utilities	

Commercial

Flexibility of option	4	Various constraints at critical junctions but improvements could be delivered independantly of one another if one
Where is funding coming from?	Not currently known; assumed combination of developer contributions, Cumbria LEP and other sources	
Any income generated? (£m)	No	

Early Assessment and Sifting Tool (EAST) - Expanded Print View

Option Name/No.	Sustainable improvements	
Date	Sep-15	
Description	Walking, cycling and public transport improvements to encourage sustainable travel between south Carlisle and the city centre	

Strategic

Identified problems and objectives	Problem: Significantly increased congestion on constrained radial routes with development at south Carlisle. Objectives: support delivery of major development at south Carlisle; reduce congestion on southern radial routes and in city centre; assist east/west movements to/from west Cumbria.	
Scale of impact	2	Supports development, would reduce congestion on radial routes; success of mode shift is unknown
Fit with wider transport and government objectives	5. High	Will boost economic growth, improve journeys and promote sustainable transport
Fit with other objectives	3	Should directly help two of three main objectives (support development and reduce congestion)
Key uncertainties	Expected layout of south Carlisle development will have significant influence on intervention options; specific location and nature of interventions still needs to be considered in detail	
Degree of consensus over outcomes	3	Principle of sustainable improvements has been considered in Carlisle Transport Improvements study, which was consulted on as part of local plan. Scheme will involve improvements over and above those identified in study.

Economic

Economic growth	3. Amber	Effectiveness of measures in encouraging mode shift is not known, and is unlikely to be significant; scheme would have no change in resilience
Carbon emissions	5. Green	Improvements should encourage mode shift away from single-occupancy car trips
Socio-distributional impacts and the regions	4. Amber/green	Scheme would have positive impacts for accessibility
Local environment	4. Amber/green	Scheme infrastructure would have marginal impact on environment and would help encourage mode shift
Well being	4. Amber/green	Scheme will have a small positive impact in reducing traffic flows via mode shift
Expected VfM category	3. Medium 1.5-2	Scheme is expected to have a modest impact on reducing congestion but is not expected to support development without further intervention

Managerial

Implementation timetable	5. 2-5 years	Infrastructure improvements could be delivered quickly; improvements to service frequencies would take longer
Public acceptability	4	Scheme involves upgrade of existing infrastructure and is unlikely to be controversial
Practical feasibility	4	
What is the quality of the supporting evidence?	2	The Carlisle Transport Improvements study suggests that sustainability improvements could be effective in encouraging mode shift. This scheme would provide improvements over and above those identified in the study
Key risks	Working with bus operators to secure service frequency improvements	

Financial

Affordability	5. Affordable	
Capital Cost (£m)	04. 10-25	£15m based on rough costs from Carlisle Transport Improvements study
Revenue Costs (£m)	Don't know	Revenue costs likely to be met through developer contributions

Cost profile	Unknown	
Overall cost risk	4	
Other costs		

Commercial

Flexibility of option	5. Dynamic	Dependent on scale and layout of development at South Carlisle but not excessively tied to existing infrastructure
Where is funding coming from?	Not currently known; assumed combination of developer contributions, Cumbria LEP and other sources	
Any income generated? (£m)	Don't know	

Early Assessment and Sifting Tool (EAST) - Expanded Print View

Option Name/No.	Park and ride	
Date	Sep-15	
Description	Three park and ride sites in south Carlisle and a high-frequency bus service linking these sites and the city centre	

Strategic

Identified problems and objectives	Problem: Significantly increased congestion on constrained radial routes with development at south Carlisle. Objectives: support delivery of major development at south Carlisle; reduce congestion on southern radial routes and in city centre; assist east/west movements to/from west Cumbria.	
Scale of impact	3	Supports development, would reduce congestion on radial routes; success of mode shift is unknown
Fit with wider transport and government objectives	5. High	Will boost economic growth, improve journeys and promote sustainable transport
Fit with other objectives	3	Should directly help two of three main objectives (support development and reduce congestion)
Key uncertainties	Expected layout of south Carlisle development will have significant influence on site options; commercial viability of park and ride; likely mode shift	
Degree of consensus over outcomes	2	Previous consultations regarding park and ride in Carlisle have generally had a favourable public response (park and ride was trialled in 2003)

Economic

Economic growth	4. Amber/green	Should help decrease journey times on radial routes due to mode shift; extent of mode shift is not currently known; no resilience improvements
Carbon emissions	4. Amber/green	Successful mode shift would reduce the number of car journeys and reduce carbon emissions; new bus services would have associated carbon emissions
Socio-distributional impacts and the regions	4. Amber/green	Scheme is not within an identified regeneration area; scheme should improve accessibility
Local environment	4. Amber/green	Improvements for noise and air quality due to mode shift; increases in noise and reductions in air quality close to parking sites
Well being	4. Amber/green	Scheme would improve access to a variety of services and improve safety by reducing traffic flows; design of car parks need to carefully consider security implications
Expected VfM category	4. Low 1-1.5	No evidence to support effectiveness of scheme, especially without bus priority measures; trial of park and ride was undertaken in 2003 which did not meet revenue forecasts

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	3	
Practical feasibility	2	
What is the quality of the supporting evidence?	1. Low	Evidence to support the effectiveness of the intervention does not exist
Key risks	Commercial viability of park and ride; land availability;	

Financial

Affordability	3	Scheme should be affordable through combination of developer contributions, LEP growth fund and other funding sources
Capital Cost (£m)	05. 25-50	Estimate based on similar schemes

Revenue Costs (£m)	Don't know	Around £1m per annum?
Cost profile	Unknown	
Overall cost risk	2	
Other costs	Land purchase; utilities	

Commercial

Flexibility of option	2	Location dependent on available sites and masterplan layout
Where is funding coming from?	Not currently known; assumed combination of developer contributions, Cumbria LEP and other sources	
Any income generated? (£m)	Yes	Don't know

Early Assessment and Sifting Tool (EAST) - Expanded Print View

Option Name/No.	Light rail	
Date	Sep-15	
Description	New light rail system providing two stations in south Carlisle and providing a high-frequency service between south Carlisle and the Carlisle Citadel station	

Strategic

Identified problems and objectives	Problem: Significantly increased congestion on constrained radial routes with development at south Carlisle. Objectives: support delivery of major development at south Carlisle; reduce congestion on southern radial routes and in city centre; assist east/west movements to/from west Cumbria.	
Scale of impact	3	Supports development, would reduce congestion on radial routes; success of mode shift is unknown
Fit with wider transport and government objectives	5. High	Will boost economic growth, improve journeys and promote sustainable transport
Fit with other objectives	3	Should directly help two of three main objectives (support development and reduce congestion)
Key uncertainties	Expected layout of south Carlisle development will have significant influence on site options; feasibility of new station on West Coast Main Line and how this would interact with high-speed inter-city services; commercial viability of light rail system in a small urban area; likely mode shift	
Degree of consensus over outcomes	1. Little	No previous studies considering scheme in Carlisle; it is not currently known how successful a light rail system in Carlisle would be with regards to passenger numbers. Most light rail systems are in urban areas with a significantly larger population than Carlisle.

Economic

Economic growth	5. Green	Should decrease journey times on radial routes through mode shift; mode shift is not currently known; provides significant improvements to infrastructure resilience, especially in wake of Dec 2015 floods
Carbon emissions	4. Amber/green	Successful mode shift would reduce the number of car journeys and reduce carbon emissions; new rail services would have associated carbon emissions
Socio-distributional impacts and the regions	4. Amber/green	Scheme is not within an identified regeneration area; scheme should improve accessibility
Local environment	4. Amber/green	
Well being	4. Amber/green	xx; design of stations and car parks need to carefully consider security implications
Expected VfM category	5. Poor <1	There is no evidence that the scheme could achieve high enough patronage to cover scheme costs

Managerial

Implementation timetable	7. 10+ years	
Public acceptability	Don't know	Scheme has not been previously considered
Practical feasibility	1. Low	Large number of uncertainties regarding deliverability and effectiveness of scheme
What is the quality of the supporting evidence?	1. Low	No evidence to support effectiveness of scheme
Key risks	Network Rail consents; commercial viability of light rail; land availability;	

Financial

Affordability	1. Not affordable	Ongoing revenue costs likely to be significant
Capital Cost (£m)	06. 50-100	£100m based on research of schemes throughout UK

Revenue Costs (£m)	Don't know	Around £6m per annum (assumed £1m per km)?
Cost profile	Unknown	
Overall cost risk	1.High risk	
Other costs	Land purchase	

Commercial

Flexibility of option	1. Static	Stations locations are fixed by existing rail infrastructure
Where is funding coming from?	Not currently known; assumed combination of developer contributions, Cumbria LEP and other sources	
Any income generated? (£m)	Yes	Don't know

Appendix C

Southern Link Route Sift

CSLR: EAST Summary 1/9/15

Scale of impact

To what extent does the option alleviate the identified problem?

1	Very small overall impact	Would have a very small positive impact, possibly with undesirable consequences	90's Northern
2	Minor impact	Would have a modest overall impact	90's Southern Most Southern (Green/Red)
3	Moderate impact	Expected to have a reasonably significant impact on the problem identified	Southern (Green) Reuse ex Infrastructure (Blue)
4	Significant impact	Expected to significantly alleviate the problem	Middle (Orange) Northern (Pink)
5	Fully addresses the identified problem	Expected to fully solve the identified problem, without any undesirable consequences	

Fit with wider transport and government objectives

1	Poor fit	There is significant conflict with other policies/options affecting the study area which needs to be resolved.	
2	Low fit	There is some conflict with other policies/options or modes.	90's Northern
3	Reasonable fit	Overall the option fits well with other policies affecting the study area.	Most Southern (Green/Red) Reuse ex Infrastructure (Blue) Middle (Orange) Northern (Pink) Southern (Green)
4	Good fit	The option fits very well with other policies affecting the study area.	90's Southern
5	Excellent fit	Option complements other policies/proposals affecting study area, has no negative impacts on other modes or outcomes and demonstrates 'doing more with less'.	

Fit with other objectives

These will vary depending on how the tool is being used. This is an opportunity to draw out and highlight any relevant network or regional objectives specific to an option and to outline how it performs against any local or modal objectives.

1	Poor fit	There is significant conflict with the County and City's Objectives affecting the study area which needs to be resolved.	90's Northern 90's Southern
2	Low fit	There is some conflict with the County and City's Objectives	
3	Reasonable fit	Overall the option fits well with the County and City's Objectives affecting the study area.	Most Southern (Green/Red) Southern (Green) Reuse ex Infrastructure (Blue)
4	Good fit	The option fits very well with the County and City's Objectives affecting the study area.	Middle (Orange) Northern (Pink)
5	Excellent fit	Option complements other the County and City's Objectives affecting study area, has no negative impacts or outcomes and demonstrates 'doing more with less'.	

Degree of consensus over outcomes

What consultation has taken place with relevant stakeholders?

1	Little or no consultation has taken place yet, or consultation has revealed a high level of disagreement about the option's ability to deliver the stated outcomes	ALL ROUTES
2	Little consultation and/or strong reasons to suggest the outcomes are controversial	
3	Some consultation has taken place with some agreement	
4	Wide consultation and broad agreement on the outcomes, possibly one or two areas of disagreement remaining	
5	Extensive consultation has taken place with a high degree of consensus on the outcomes	

Economic Growth

Connectivity

Will journeys get shorter, quicker and/or cheaper? **All routes are almost identical at this stage.**

Reliability

Will the option impact on the day to day variability in journey times or the average minutes of lateness? Will there be any impact on the number of incidents?

All routes are almost identical at this stage.

Wider economic impacts

At this stage, respondents are not expected to assess wider economic impacts, instead the questions are intended to screen whether there may be an impact that would need to be considered in more detail later on in the appraisal process, should the option progress.

Resilience

Does the option have an impact on the vulnerability of the network to terrorism, severe weather events or the effects of climate change? **All routes are identical at this stage.**

Delivery of housing

In some cases, the need for new development in a specific location will mean that the development will require some form of transport development to support it. Respondents are asked to assess how their option will facilitate new housing. **Propose we only assess against this impact i.e. how will this option facilitate new housing.**

RED	Prevent	
RED/AMBER		90's Northern 90's Southern
AMBER	May facilitate	
GREEN/AMBER		Most Southern (Green/Red) Southern (Green) Reuse ex Infrastructure (Blue) Middle (Orange) Northern (Pink)
GREEN	Required to meet planned developments	

Carbon Emissions

We do not have any data to assess this impact.

All routes are almost identical at this stage.

Socio-distributional Impacts and the Regions

Regional imbalance

This is intended to identify the extent to which the proposal impacts on a region or sub-region which is underperforming when compared to other areas or to the country as a whole. This underperformance or 'weakness' will need to be defined in terms of economic and/or social indicators.

All routes are almost identical at this stage.

Social and distributional

Social and distributional impacts need to be considered when assessing the impact of options on noise, air quality, severance, accessibility, security, accidents, user benefits and personal affordability. Respondents will need to consider whether the expected impact of their option (both positive and negative) is either significant in extent or concentrated in terms of the people groups or spatial areas affected, or both.

Does the option have an impact on accessibility, affordability, availability, acceptability for vulnerable groups.

RED	Negative	
RED/AMBER		
AMBER	No change	
GREEN/AMBER		
GREEN	Positive	

Regeneration

Does the option have an impact on a targeted regeneration area where poor transport been identified as a constraint and, if so, what is the impact likely to be

RED	Negative	
RED/AMBER		
AMBER	No change	90's Southern Most Southern (Green/Red)
GREEN/AMBER		Southern (Green) Reuse ex Infrastructure (Blue) Middle (Orange) Northern (Pink) 90's Northern
GREEN	Positive	

Local environment

Air Quality

Respondents should note whether their option impacts on any AQMAs (Yes/No)

All routes are almost identical at this stage.

Noise

Assess whether their option is likely to impact on a noise problem area (Yes/No)

All routes are almost identical at this stage.

Does this option reduce absolute disturbance from noise?

RED	No	
RED/AMBER		
AMBER	No change	
GREEN/AMBER		
GREEN	Yes	

Natural environment, heritage and landscape & Streetscape and urban environment

What is the overall impact on the natural and urban environment?

RED	Negative	90's Northern Middle (Orange) Most Southern (Green/Red)
RED/AMBER		Southern (Green) Reuse ex Infrastructure (Blue) Northern (Pink)
AMBER	No change	90's Southern
GREEN/AMBER		
GREEN	Positive	

Well being

Physical activity

The impact the option has on physical activity

All routes are almost identical at this stage.

Injury or Deaths

The impact on the number of people killed or injured in transport accidents should be assessed as well as the impact on the risk of travelling.

No available data at this stage.

Crime

Options that address perceptions of crime and those that demonstrably reduce crime.

All routes are almost identical at this stage.

Enjoying access to a range of goods, services, people and places

Will it have an impact on the number of incidents?

Does the option make it easier for people to access key locations (doctors, hospitals, supermarkets etc)?

Does it make leisure trips quicker or cheaper?

Does it make leisure trips more reliable?

All routes are almost identical at this stage.

Severance

Respondents should consider the impact on pedestrian movement, for example, whether there will be hindrance to pedestrian movement, whether some people (particularly children and old people) are likely to be dissuaded from making journeys on foot, or they will be less attractive to others or whether people will be deterred to the extent that they reorganise their activities?

Does it increase possibility of cross street/corridor connections between neighbourhoods?

RED	Negative	90's Northern
RED/AMBER		Middle (Orange) Northern (Pink)
AMBER	No change	90's Southern Most Southern (Green/Red) Southern (Green) Reuse ex Infrastructure (Blue)
GREEN/AMBER		
GREEN	Positive	

Will more or less people be outside the public realm as a result?

RED	More	90's Northern
RED/AMBER		Middle (Orange) Northern (Pink) 90's Southern Most Southern (Green/Red) Southern (Green) Reuse ex Infrastructure (Blue)
AMBER	No change	
GREEN/AMBER		
GREEN	Less	

Expected VfM category

No available data at this stage.

Implementation timetable from inception to delivery

All routes are almost identical at this stage.

Public acceptability

An assessment of whether there are likely to be any issues around public acceptability of the option. For example, will the option require a long period for public consultation?

1	Low	90's Northern
2		Middle (Orange)
3		Most Southern (Green/Red) Reuse ex Infrastructure (Blue) Northern (Pink)
4		90's Southern Southern (Green)
5	High	

Practical feasibility

Has the option been tested and proven to be practical and effective?

1	Low	90's Northern
2		
3		Middle (Orange) Northern (Pink)
4		90's Southern Most Southern (Green/Red) Southern (Green)
5	High	Reuse ex Infrastructure (Blue)

Quality of the supporting evidence

All routes are identical at this stage.

Affordability

The issue of affordability needs to be put in the context of the available budget and relevant budget period. Some options that are unaffordable in the immediate budget period may be affordable in later years.

1	Not affordable	90's Northern
2		
3		90's Southern Most Southern (Green/Red) Southern (Green) Middle (Orange) Northern (Pink)
4		Reuse ex Infrastructure (Blue)
5	Affordable	

Capital Cost

Capital costs should include all the costs involved in setting up the option and getting it up and running. In some cases cost information may be very uncertain. Respondents need to provide their best estimate.

6.	£50m to £100m	90's Southern Reuse ex Infrastructure (Blue) Southern (Green)
7.	£100m to £250m	90's Northern Most Southern (Green/Red) Middle (Orange) Northern (Pink)

Revenue Costs

All routes are almost identical at this stage.

Overall Cost Risk

1	High Risk	
2		90's Northern Reuse ex Infrastructure (Blue)
3		90's Southern Southern (Green) Most Southern (Green/Red) Middle (Orange) Northern (Pink)
4		
5	Low Risk	

Flexibility of option

To what extent can the option be scaled up or down depending on the level of funding available? How easily could the scheme be amended to fit with changing circumstances?

1	Static	90's Northern Middle (Orange)
2		90's Southern Reuse ex Infrastructure (Blue)
3		Northern (Pink)
4		Most Southern (Green/Red) Southern (Green)
5	Dynamic	

Summary

	Scale of Impact	Government Objectives	Local Objectives	Economic Growth	Socio	Local Environment	Well Being	Public Acceptability	Practical Feasibility	Affordability	Capital Cost	Cost Risk	Flexibility
90's North	1	2	1	2	4	1	1	1	1	1	7	2	1
90's South	2	4	1	2	3	3	3	4	4	3	6	3	2
Green/Red	2	3	3	4	3	1	3	3	4	3	7	2	4
Green	3	3	3	4	4	2	3	4	4	3	6	3	4
Blue	3	3	3	4	4	2	3	3	5	4	6	2	2
Orange	4	3	4	4	4	1	2	2	3	3	7	3	1
Pink	4	3	4	4	4	2	2	3	3	3	7	3	3

Appendix D

Environmental Assessment Scale Descriptors

D.1 Landscape and Visual

D.1.1 Sensitivity

Sensitivity	Typical Descriptors and Examples
High	<p>Landscapes which by nature of their character would be unable to accommodate change of the type proposed. Typically these would be;</p> <ul style="list-style-type: none"> • Of high quality with distinctive elements and features making a positive contribution to character and sense of place. • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale. • Areas of special recognised value through use, perception or historic and cultural associations. • Likely to contain features and elements that are rare and could not be replaced.
Moderate	<p>Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically these would be;</p> <ul style="list-style-type: none"> • Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place. • locally designated, or their value may be expressed through non-statutory local publications. • Containing some features of value through use, perception or historic and cultural associations. • Likely to contain some features and elements that could not be replaced.
Low	<p>Landscapes which by nature of their character would be able to accommodate change of the type proposed. Typically these would be;</p> <ul style="list-style-type: none"> • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place. • Not designated.

	<ul style="list-style-type: none"> Containing few, if any, features of value through use, perception or historic and cultural associations. Likely to contain few, if any, features and elements that could not be replaced.
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D.2 Magnitude

Magnitude of Impact	Typical Criteria Descriptors
Major Adverse	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements
Moderate Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.
Minor Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Negligible Adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
No Change	No noticeable loss, damage or alteration to character or features or elements.
Negligible Beneficial	Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Minor Beneficial	Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Moderate Beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major Beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.

D.3 Historic Environment

D.3.1 Sensitivity

Sensitivity	Description
Very High	Fully contributes to fulfilment of policies at a national level Statutory designation Architectural, historic or archaeological value is highly significant to future generations whether at national, regional or local scale Have high representational value nationally and locally Have high potential for further research, understanding, interpretation and

Sensitivity	Description
	presentation Is extremely fragile and vulnerable
High	Has a major contribution to fulfilment of policies at a national and/or regional level Statutory designation Architectural, historic or archaeological value is significant to future generations whether at national, regional or local scale Have high representational value nationally and locally Have high potential for further research, understanding, interpretation or presentation Is fragile and vulnerable
Medium	Contributes to fulfilment of policies at a regional level Statutory designation/ non statutory designation Architectural, historic or archaeological value has some significance to future generations whether at national, regional or local scale Have moderate representational value nationally and locally Have moderate potential for further research, understanding, interpretation and presentation Has moderate fragility and or vulnerability
Low	Contributes to fulfilment of policies at a local level Statutory designation/ non statutory designation Architectural, historic or archaeological value has low significance to future generations whether at national, regional or local scale Low representational value nationally and locally Low potential for further research, understanding, interpretation and presentation Low fragility and vulnerability
Negligible	Does not contribute to the fulfilment of national, regional or local policies No statutory designation Architectural, historic or archaeological value has no significance to future generations whether at national, regional or local scale No representational value nationally and locally No potential for further research, understanding, interpretation and presentation No fragility or vulnerability

D.3.2 Magnitude

Magnitude of impact	Descriptor
Major	Existing condition of asset and its setting will be completely changed on a permanent basis
Moderate	There is a large change to the existing condition of the asset and/or its setting Medium term effects
Minor	There is a small change to the existing condition of the asset and/or its setting Short-medium term effects
Negligible	There is potential for change to the existing condition of the asset and/or its setting

	Short term effects
No change	There will be no change to the existing condition of the asset and its setting Do nothing

D.4 Nature Conservation

D.4.1 Sensitivity

Value	Criteria
International (Very High)	<p>Natura 2000 sites including: Sites of Community Importance (SCIs); Special Protection Areas (SPAs); potential SPAs (pSPAs); Special Areas of Conservation (SACs); candidate or possible SACs (cSACs or pSACs and Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such. Resident, or regularly occurring, populations of species which may be considered at an International or European level where:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or the population forms a critical part of a wider population at this scale; or the species is at a critical phase of its life cycle at this scale
National (High)	<p>Designated sites including: Sites of Special Scientific Interest (SSSIs); Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and National Nature Reserves (NNRs). Areas which meet the published selection criteria eg JNCC (1998) for those sites listed above but which are not themselves designated as such. Areas of key/priority habitats identified in the UK Biodiversity Action Plan (BAP), including those published in accordance with Section 41 of the Natural Environment and Rural Communities Act (2006) and those considered to be of principal importance for the conservation of biodiversity. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory. Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or the population forms a critical part of a wider population at this scale; or

Value	Criteria
	<ul style="list-style-type: none"> the species is at a critical phase of its life cycle at this scale.
Regional (Medium)	<p>Areas of key/priority habitats identified in the Regional BAP (where available); areas of key/priority habitat identified as being of Regional value in the appropriate Natural Area Profile (or equivalent); areas that have been identified by regional plans or strategies as areas for restoration or re-creation of priority habitats (for example, South West Nature Map); and areas of key/priority habitat listed within the Highways Agency's BAP.</p> <p>Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level and key/priority species listed within the HABAP where:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
County (Medium/Low)	<p>Designated sites including: Sites of Nature Conservation Importance (SNICs); County Wildlife Sites (CWSs); and Local Nature Reserves (LNRs) designated in the county or unitary authority area context.</p> <p>Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such</p> <p>Areas of key/priority habitats identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent).</p> <p>Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species across the County or Unitary Authority Area; or the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
Local (Low/Negligible)	<p>Designated sites including: Local Nature Reserves (LNRs) designated in the local context.</p> <p>Trees that are protected by Tree Preservation Orders (TPOs).</p> <p>Areas of habitat; or populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.</p>

D.4.2 Magnitude

Magnitude of impact	Descriptor
---------------------	------------

Major	The impact is likely to have a permanent or long-term effect on the extent/size or integrity of a site, habitat, species assemblage, population or group. If adverse, this is likely to threaten its sustainability, if beneficial; this is likely to enhance its conservation status.
Moderate	The impact is likely to have a permanent or long-term effect on the extent/size, habitat, species assemblage, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial this is likely to be sustainable but is unlikely to enhance its conservation status.
Minor	The impact is likely to have a short-term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage, population or group this is within the range variation normally experienced between years.
Negligible	The impact is likely to have a short-term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage/, population or group that is within the normal range of annual variation.

D.5 Water Environment

D.5.1 Sensitivity

Sensitivity	Description
Very High	Attribute has a high quality or rarity on a regional or national scale i.e. EC Designated Salmonid fishery, WFD Class 'High', Principal Aquifer providing a regionally important resource or/and a floodplain or defence protecting more than 100 residential properties.
High	Attribute has a high quality or rarity on a local scale i.e. WFD Class 'Good', major Cyprinid fishery, Principal Aquifer providing a locally important resource or/and a floodplain or defence protecting between 1 and 100 residential properties.
Medium	Attribute has a medium quality and rarity on a local scale i.e. WFD Class 'Moderate', aquifer providing water for agricultural or industrial use and/or a floodplain or defence protecting 10 or fewer industrial properties.
Low	Attribute has a low quality and rarity on a local scale i.e. WFD Class 'Poor', unproductive strata and/or floodplain with limited constraints and a low probability of flooding.

D.5.2 Magnitude

Magnitude	Description
Major	Results in loss of an attribute and/or loss of quality and integrity of the attribute (adverse) i.e. loss or extensive change to a fishery or aquifer, increase in peak flood level >100mm. Results in major improvement of attribute quality (beneficial) i.e. removal of existing polluting discharge, reduction in peak flood level >100mm.
Moderate	Results in effect of integrity of attribute or loss of part of attribute (adverse) i.e. partial loss of a fishery or aquifer, increase in peak flood level >50mm.

Magnitude	Description
	Results in moderate improvement of attribute quality (beneficial) i.e. reduction in peak flood level >50mm.
Minor	Results in some measureable change in the quality or vulnerability of an attribute (adverse) i.e. potential low risk of pollution to groundwater (risk score <150), increase in peak flood level >10mm. Results in some beneficial effect on an attribute or a reduced risk of a negative effect occurring (beneficial) i.e. reduction in peak flood level >10mm.
No Change	No change.

D.6 Outdoor Access and Recreation

D.6.1 Sensitivity

Sensitivity	Description
Very High	Nationally recognised or promoted routes i.e. National Trails, Long Distance Routes (LDRs), National Cycle Network Routes, Promoted Cycle Routes.
High	Locally defined routes i.e. Public Rights of Way
Medium	Informal or permitted routes providing links to nationally recognised routes or locally defined routes. Open access areas. Waterways (promoted routes only)
Low	Informal or permitted routes not linking nationally recognised routes or locally defined routes. Roadside footways. Waterways (not promoted)
Negligible	On road routes

D.6.2 Magnitude

Magnitude	Description
Major	People are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits or there will be considerable hindrance caused to people making their journeys i.e. an at grade crossing of a road carrying >16000 vehicles per day, journey length increase by >500m.
Moderate	Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Trips will be made longer or less attractive i.e. an at grade crossing of a road carrying 8000–16000 vehicles per day, journeys increased by 250-500m.
Minor	The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement i.e. an at grade crossing of a road carrying <8000 vehicles per day, a new bridge to be climbed or a subway traversed, journeys increased by >250m.
No Change	No change to a route.

Appendix E

Environmental Assessment Plans

E.1	Noise and Vibration	
	CSDR-CAP-EGN-00-DR-V-0008	Property Count Bandings (Baseline)
	CSDR-CAP-EGN-00-DR-V-0009	Property Count Bandings (Pink Route)
	CSDR-CAP-EGN-00-DR-V-0010	Property Count Bandings (Blue Route)
	CSDR-CAP-EGN-00-DR-V-0011	Property Count Bandings (Green Route)
E.2	Air Quality	
	CSDR-CAP-EGN-00-DR-V-0014	Property Count Bandings (Baseline)
	CSDR-CAP-EGN-00-DR-V-0015	Property Count Bandings (Pink Route)
	CSDR-CAP-EGN-00-DR-V-0016	Property Count Bandings (Blue Route)
	CSDR-CAP-EGN-00-DR-V-0017	Property Count Bandings (Green Route)
E.3	Landscape and Visual	
	CSDR-CAP-EGN-00-DR-V-0002	Landscape and Visual Viewpoints
	CSDR-CAP-EGN-00-DR-V-0004	Landscape Character Areas
E.4	Historic Environment	
	CSDR-CAP-EGN-00-DR-V-0005	Historical Constraints
E.5	Nature Conservation	
	CSDR-CAP-EGN-00-DR-V-0006	Designated Sites
	CSDR-CAP-EGN-00-DR-V-0007	Biodiversity Action Plan and Protected Species
E.6	Water Environment	
	CSDR-CAP-EGN-00-DR-V-0018	Water Environment Constraints
	CSDR-CAP-EGN-00-DR-V-0019	Detailed Baseline Flood Extents
E.7	Outdoor Access and Recreation	
	CSDR-CAP-EGN-00-DR-V-0003	Outdoor Access and Recreation Sites

Appendix F

Landscape and Visual Photographs

F.1 Photographs demonstrating Landscape Character



FIGURE 1 - Peter Lane, looking West.



FIGURE 2 - South of Peter Lane, looking South.



FIGURE 3 - Peter Lane, looking West.



FIGURE 4 - Cumbrian Coast Line bridge over Cumbrian Way, NCN Route 7 and River Caldew looking South.



FIGURE 5 - Cumbrian Way, NCN Route 7 and River Caldew valley looking West.



FIGURE 6 - Carlisle Racecourse from Durdar Road, looking North West.



FIGURE 7 - Durdar Road looking South.



FIGURE 8 - Land to East of Carlisle Racecourse looking East.



FIGURE 9 - Land to South of Durdar looking East.



FIGURE 10 - Newbiggin Road close to Junction 42 looking North East.

F.2 Photographs demonstrating Visual Receptors



FIGURE 11 - Cummersdale / Viewpoint 1.



FIGURE 12 - Cumbrian Way, National Cycle Network Route 7 and River Caldew (North) / Viewpoint 2.



FIGURE 13 - Cumbrian Way, National Cycle Network Route 7 and River Caldew (South) / Viewpoint 3.



FIGURE 14 - Durdar / Viewpoint 4.



FIGURE 15 - Low Burthwaite / Viewpoint 5.



FIGURE 16 - Brisco / Viewpoint 6.



FIGURE 17 - Carleton / Viewpoint 7.

Appendix G

Geotechnical Desktop Study

Appendix H

Indicative Value for Money

Journey time savings (PCU-hrs)
Without South Carlisle Development

	AM	PM
2030	166	175
2040	206	230
2089	206	230

Factor	Annualisation	AM/PM -> IP/OP/Wkend
1,012	253	4

Benefits (£m)	Costs (£m)
£161	£82
BCR = 2.0	

TOTALS	12,140	13,498	£412,957	£437,118	£77,514	£81,792
	PCU-hrs		Monetised times		Discounted	
	AM	PM	AM	PM	AM	PM
2030	166	175	£2,825	£2,831	£1,420	£1,422.53
2031	170	181	£2,949	£2,976	£1,432	£1,444.95
2032	174	186	£3,077	£3,126	£1,444	£1,466.57
2033	178	192	£3,209	£3,281	£1,455	£1,487.40
2034	182	197	£3,350	£3,445	£1,467	£1,508.92
2035	186	203	£3,491	£3,612	£1,477	£1,528.22
2036	190	208	£3,637	£3,783	£1,487	£1,546.75
2037	194	214	£3,791	£3,965	£1,498	£1,566.05
2038	198	219	£3,951	£4,152	£1,508	£1,584.55
2039	202	225	£4,115	£4,345	£1,517	£1,602.25
2040	206	230	£4,284	£4,545	£1,526	£1,619.18
2041	206	230	£4,374	£4,641	£1,513	£1,605.20
2042	206	230	£4,467	£4,739	£1,500	£1,591.35
2043	206	230	£4,561	£4,839	£1,487	£1,577.61
2044	206	230	£4,657	£4,941	£1,474	£1,563.99
2045	206	230	£4,756	£5,045	£1,462	£1,550.49
2046	206	230	£4,862	£5,158	£1,451	£1,539.01
2047	206	230	£4,966	£5,268	£1,439	£1,526.12
2048	206	230	£5,072	£5,381	£1,427	£1,513.35
2049	206	230	£5,181	£5,496	£1,415	£1,500.68
2050	206	230	£5,291	£5,613	£1,403	£1,488.11
2051	206	230	£5,401	£5,730	£1,390	£1,474.69
2052	206	230	£5,513	£5,848	£1,378	£1,461.38
2053	206	230	£5,627	£5,969	£1,365	£1,448.19
2054	206	230	£5,743	£6,093	£1,353	£1,435.12
2055	206	230	£5,862	£6,219	£1,341	£1,422.17
2056	206	230	£5,985	£6,349	£1,329	£1,409.67
2057	206	230	£6,110	£6,482	£1,317	£1,397.27
2058	206	230	£6,244	£6,624	£1,307	£1,386.34
2059	206	230	£6,381	£6,770	£1,297	£1,375.50
2060	206	230	£6,528	£6,925	£1,288	£1,366.07
2061	206	230	£6,678	£7,084	£1,279	£1,356.78
2062	206	230	£6,831	£7,247	£1,270	£1,347.52
2063	206	230	£6,988	£7,414	£1,262	£1,338.33
2064	206	230	£7,142	£7,577	£1,252	£1,327.90
2065	206	230	£7,299	£7,743	£1,242	£1,317.55
2066	206	230	£7,458	£7,912	£1,232	£1,307.11
2067	206	230	£7,621	£8,085	£1,222	£1,296.75
2068	206	230	£7,787	£8,261	£1,213	£1,286.48
2069	206	230	£7,958	£8,442	£1,203	£1,276.28
2070	206	230	£8,131	£8,626	£1,194	£1,266.17
2071	206	230	£8,308	£8,813	£1,184	£1,255.95
2072	206	230	£8,488	£9,004	£1,174	£1,245.80
2073	206	230	£8,672	£9,200	£1,165	£1,235.74
2074	206	230	£8,860	£9,399	£1,155	£1,225.77
2075	206	230	£9,052	£9,603	£1,146	£1,215.87

Journey time savings (PCU-hrs)
Without South Carlisle Development

	AM	PM
2030	166	175
2040	206	230
2089	206	230

Factor	Annualisation	AM/PM -> IP/OP/Wkend
1,012	253	4

Benefits (£m)	Costs (£m)
£161	£82
BCR = 2.0	

TOTALS	12,140	13,498	£412,957	£437,118	£77,514	£81,792
	PCU-hrs		Monetised times		Discounted	
	AM	PM	AM	PM	AM	PM
2076	206	230	£9,248	£9,811	£1,137	£1,206.01
2077	206	230	£9,448	£10,023	£1,128	£1,196.24
2078	206	230	£9,653	£10,240	£1,118	£1,186.55
2079	206	230	£9,862	£10,462	£1,109	£1,176.93
2080	206	230	£10,075	£10,689	£1,100	£1,167.40
2081	206	230	£10,294	£10,921	£1,092	£1,158.03
2082	206	230	£10,518	£11,158	£1,083	£1,148.75
2083	206	230	£10,747	£11,401	£1,074	£1,139.53
2084	206	230	£10,980	£11,649	£1,066	£1,130.39
2085	206	230	£11,219	£11,902	£1,057	£1,121.33
2086	206	230	£11,464	£12,161	£1,054	£1,117.83
2087	206	230	£11,714	£12,427	£1,050	£1,114.39
2088	206	230	£11,970	£12,698	£1,047	£1,110.95
2089	206	230	£12,231	£12,976	£1,044	£1,107.53

Journey time savings (PCU-hrs)
With South Carlisle development

	AM	PM
2030	252	303
2040	1,137	1,564
2089	1,137	1,564

Factor	Annualisation	AM/PM -> IP/OP/Wkend
1,012	253	4

Benefits (£m)	Costs (£m)
£927	£82
BCR = 11.3	

TOTALS	63,353	86,904	£2,213,275	£2,888,635	£397,931	£518,234
	PCU-hrs		Monetised times		Discounted	
	AM	PM	AM	PM	AM	PM
2030	252	303	£4,288	£4,901	£2,155	£2,463
2031	341	429	£5,906	£7,074	£2,868	£3,435
2032	429	555	£7,586	£9,331	£3,559	£4,378
2033	518	681	£9,331	£11,674	£4,230	£5,292
2034	606	807	£11,153	£14,121	£4,885	£6,184
2035	695	934	£13,035	£16,649	£5,516	£7,045
2036	783	1,060	£14,989	£19,273	£6,128	£7,879
2037	872	1,186	£17,032	£22,018	£6,728	£8,697
2038	960	1,312	£19,154	£24,869	£7,310	£9,491
2039	1,049	1,438	£21,358	£27,830	£7,876	£10,262
2040	1,137	1,564	£23,645	£30,904	£8,424	£11,010
2041	1,137	1,564	£24,144	£31,556	£8,351	£10,915
2042	1,137	1,564	£24,654	£32,222	£8,279	£10,821
2043	1,137	1,564	£25,174	£32,903	£8,208	£10,728
2044	1,137	1,564	£25,706	£33,597	£8,137	£10,635
2045	1,137	1,564	£26,248	£34,306	£8,067	£10,543
2046	1,137	1,564	£26,835	£35,074	£8,007	£10,465
2047	1,137	1,564	£27,409	£35,824	£7,940	£10,378
2048	1,137	1,564	£27,995	£36,589	£7,874	£10,291
2049	1,137	1,564	£28,593	£37,372	£7,808	£10,205
2050	1,137	1,564	£29,205	£38,171	£7,742	£10,119
2051	1,137	1,564	£29,809	£38,961	£7,672	£10,028
2052	1,137	1,564	£30,427	£39,768	£7,603	£9,937
2053	1,137	1,564	£31,057	£40,591	£7,535	£9,848
2054	1,137	1,564	£31,700	£41,431	£7,467	£9,759
2055	1,137	1,564	£32,356	£42,289	£7,399	£9,671
2056	1,137	1,564	£33,034	£43,175	£7,334	£9,586
2057	1,137	1,564	£33,726	£44,079	£7,270	£9,501
2058	1,137	1,564	£34,466	£45,046	£7,213	£9,427
2059	1,137	1,564	£35,222	£46,035	£7,156	£9,353
2060	1,137	1,564	£36,030	£47,091	£7,107	£9,289
2061	1,137	1,564	£36,858	£48,174	£7,059	£9,226
2062	1,137	1,564	£37,705	£49,280	£7,011	£9,163
2063	1,137	1,564	£38,571	£50,412	£6,963	£9,101
2064	1,137	1,564	£39,419	£51,520	£6,909	£9,030
2065	1,137	1,564	£40,285	£52,652	£6,855	£8,959
2066	1,137	1,564	£41,165	£53,802	£6,801	£8,888
2067	1,137	1,564	£42,064	£54,977	£6,747	£8,818
2068	1,137	1,564	£42,982	£56,178	£6,693	£8,748
2069	1,137	1,564	£43,921	£57,405	£6,640	£8,679
2070	1,137	1,564	£44,880	£58,658	£6,588	£8,610
2071	1,137	1,564	£45,853	£59,930	£6,534	£8,540
2072	1,137	1,564	£46,847	£61,229	£6,482	£8,471
2073	1,137	1,564	£47,863	£62,557	£6,429	£8,403
2074	1,137	1,564	£48,901	£63,913	£6,377	£8,335
2075	1,137	1,564	£49,961	£65,299	£6,326	£8,268

Journey time savings (PCU-hrs)
With South Carlisle development

	AM	PM
2030	252	303
2040	1,137	1,564
2089	1,137	1,564

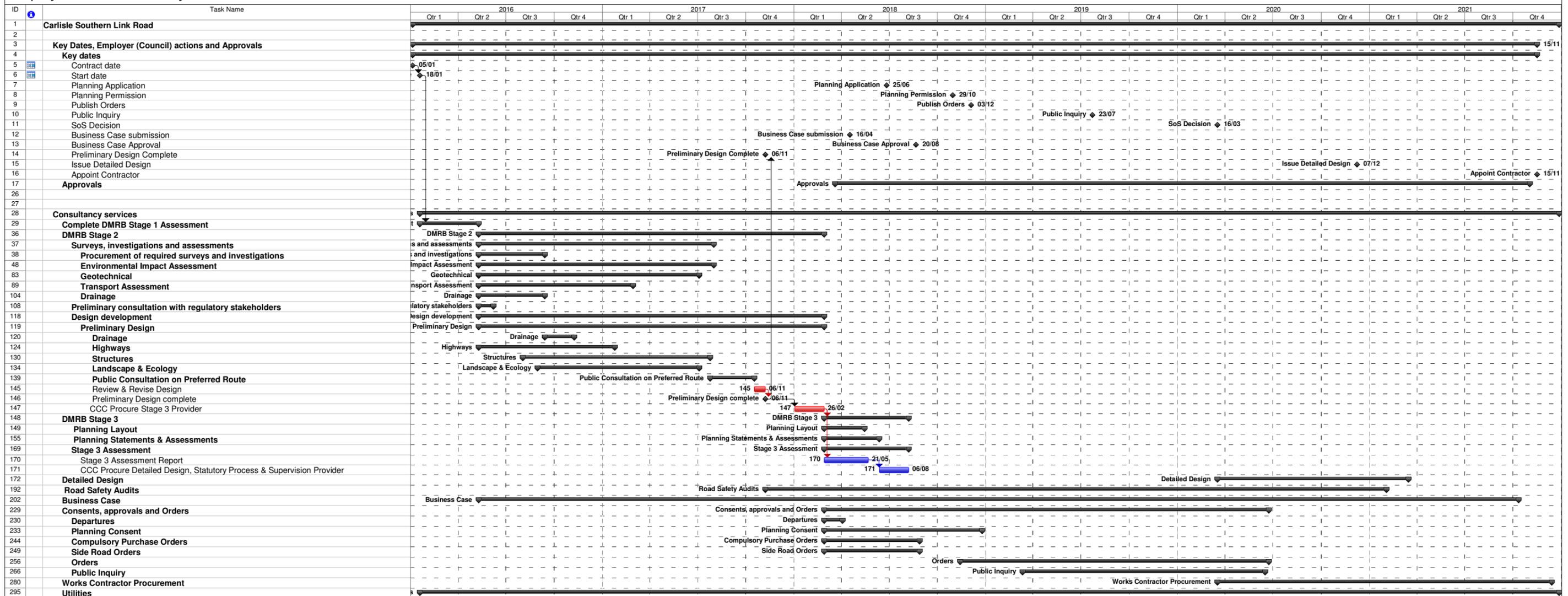
Factor	Annualisation	AM/PM -> IP/OP/Wkend
1,012	253	4

Benefits (£m)	Costs (£m)
£927	£82
BCR = 11.3	

TOTALS	63,353	86,904	£2,213,275	£2,888,635	£397,931	£518,234
	PCU-hrs		Monetised times		Discounted	
	AM	PM	AM	PM	AM	PM
2076	1,137	1,564	£51,043	£66,713	£6,275	£8,201
2077	1,137	1,564	£52,148	£68,158	£6,224	£8,134
2078	1,137	1,564	£53,278	£69,634	£6,173	£8,069
2079	1,137	1,564	£54,431	£71,141	£6,123	£8,003
2080	1,137	1,564	£55,610	£72,682	£6,074	£7,938
2081	1,137	1,564	£56,819	£74,262	£6,025	£7,875
2082	1,137	1,564	£58,054	£75,876	£5,977	£7,811
2083	1,137	1,564	£59,316	£77,526	£5,929	£7,749
2084	1,137	1,564	£60,606	£79,211	£5,881	£7,687
2085	1,137	1,564	£61,923	£80,933	£5,834	£7,625
2086	1,137	1,564	£63,273	£82,698	£5,816	£7,601
2087	1,137	1,564	£64,655	£84,504	£5,798	£7,578
2088	1,137	1,564	£66,067	£86,350	£5,780	£7,554
2089	1,137	1,564	£67,510	£88,236	£5,762	£7,531

Appendix I

Delivery Programme



Project: MSProj11 Date: Wed 16/09/15	Task: Summary (Blue bar)	Rolled Up Milestone (Black arrow)	External Tasks (Black diamond)	Inactive Task (Grey bar)	Manual Task (White bar)	Manual Summary (Light blue bar)	Progress (Black arrow)
	Critical Task (Red bar)	Rolled Up Task (Black arrow)	Project Summary (Black diamond)	Inactive Milestone (Grey bar)	Duration-only (White bar)	Start-only (Light blue bar)	Deadline (Black arrow)
	Milestone (Black diamond)	Rolled Up Critical Task (Black arrow)	Split (Red bar)	Inactive Summary (Grey bar)	Manual Summary Rollup (White bar)	Finish-only (Blue bar)	Down arrow (Green arrow)

Appendix J

Appraisal Specification Report

Capita Property and Infrastructure Ltd

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