

Carlisle Southern Link Road

Appraisal Specification Report
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1. Executive Summary

Capita has been appointed by Cumbria County Council to undertake the TAG Stage 1 assessment of the potential Carlisle Southern Link Road.

The Carlisle Southern Link Road is a proposed highways link between the M6/A6 and the A595 in the south of Carlisle. The route has a key role to play in supporting the proposed major mixed-use development identified in the Carlisle Local Plan. The development is currently forecast from approximately 2025, and it is anticipated it could accommodate up to 10,000 new homes alongside community facilities, schools and strategic employment opportunities.

The purpose of this Appraisal Specification Report is to inform decision makers and stakeholders on how the economic, environmental, social and operational impact assessments of the scheme will be undertaken.

This Appraisal Specification Report includes the proposed scope and methodology for the transport modelling to be undertaken to support the business case and scheme design. This includes producing a validated transport model, and the approach to forecasting the transport impacts of the scheme. This Appraisal Specification Report also includes the appraisal methodology for the scheme, including how the economic, environmental and social and distributional impacts will be assessed.

2. Introduction

2.1 Background

- 2.1.1 Capita has been appointed by Cumbria County Council to undertake the TAG Stage 1 assessment of the potential Carlisle Southern Link Road. The commission involved appraising options for the most appropriate scheme to achieve the council's objectives, outlining indicative route options for the road and identifying high-level constraints along the road. A strategic outline business case has also been produced for the scheme, identifying the need for the scheme by considering existing and forecast proposed and constraints, and starting to build the case that the scheme will provide value for money, is deliverable and commercially and financially viable.
- 2.1.2 The Carlisle Southern Link Road is a proposed highways link between the M6/A6 and the A595 in the south of Carlisle. The route has a key role to play in supporting the proposed major mixed-use development identified in the Carlisle Local Plan. The development is currently forecast from approximately 2025, and it is anticipated it could accommodate up to 10,000 new homes alongside community facilities, schools and strategic employment opportunities.

2.2 Scheme description

- 2.2.1 The Carlisle Southern Link Road is a proposed highways link between the M6/A6 to the southeast of Carlisle, and the A595 in the southwest. The indicative route would link the M6 Junction 42 with the A595/A689 junction at the southern end of the Carlisle Northern Development Route (CNDR). A plan showing the location and indicative routes of the scheme is provided in Appendix A as Figure 1.
- 2.2.2 The potential for a major transport scheme such as the Carlisle Southern Link Road is identified as part of the supporting infrastructure required for development in the Carlisle Local Plan submission draft in Policy SP3 *Broad location for growth: Carlisle South*.

2.3 Purpose of the report

- 2.3.1 The purpose of this Appraisal Specification Report (ASR) is to inform decision makers and stakeholders on how the economic, environmental, social and operational impact assessments of the scheme will be undertaken. The ASR also details what evidence will be used to support these assessments, such as traffic modelling work.
- 2.3.2 This report builds upon and supports the outcome of the TAG Stage 1 report and enables the project to move into the next stage of the decision-making process. The report will help the production of a robust business case to support the scheme.
- 2.3.3 The ASR also provides an early indication of significant risks and should be used to inform the development of the scheme by taking account of the identified constraints.
- 2.3.4 The report will:
- define the scope, methodology, assumptions and risks of the transport assessment, including transport modelling
 - define the scope and content of the scheme appraisal, including the economic appraisal and environmental assessment

3. Challenges and issues

3.1 Strategic case for the scheme

3.1.1 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.

3.1.2 To meet its longer term requirements, the Local Plan identifies the need for a major mixed-use urban extension in South Carlisle, the delivery of which would commence from 2025. Delivery of this scheme would extend beyond 2030 and would provide longer term continuity in the supply of development land to enable the growth of the City. When completed it is anticipated that this urban extension could accommodate as many as 10,000 new homes alongside new community facilities, schools and strategic employment opportunities.

3.1.3 This scale of development would create pressure on the existing road network. In particular, the only existing routes for traffic travelling west are via congested city centre junctions, or a long 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. Appropriate mitigation including alternative route options are therefore required to support the full realisation of the Carlisle South opportunity.

3.1.4 Aside from supporting the sustainable growth of the City, it must equally be recognised that Carlisle fulfils an important role as a strategic transport hub for the wider sub-region. The strategically important M6 passes through the District from south to north and links to Scotland beyond as well as important east and west connections to Newcastle and the Northeast and West Cumbria including the Port of Workington and Britain's Energy Coast. The provision of a good quality link between the east and west is especially important given the scale of the nationally significant and thus strategic energy and employment proposals along the west coast of Cumbria, and a need to link these with the labour pool and supply chain to support delivery and to ensure wider economic benefits are maximised. It is envisaged that a new road in this location would improve east to west connectivity, the need for which is echoed by the Cumbria Local Enterprise Partnership who identify improved connectivity within the sub-region as one of their four key priorities.

3.2 Scheme objectives

3.2.1 The key objectives of the Carlisle Southern Link Road scheme are provided below:

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

4. Transport modelling

4.1 Introduction

4.1.1 This section sets out the proposed scope and methodology for the transport modelling to be undertaken to support the business case and scheme design for the Carlisle Southern Link Road scheme.

4.2 Summary of existing models

4.2.1 This section considers existing models that have geographic coverage of the Carlisle Southern Link Road scheme. Further details on the below models are provided in relevant validation and model reports, and are detailed below.

Carlisle transport model

4.2.2 The Carlisle transport model is a highways assignment model covering the district of Carlisle using the SATURN software. The model considers the urban area of Carlisle in a good level of detail.

4.2.3 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.

4.2.4 The model covers the peak hourly morning and evening periods only. The model considers six user classes, which are as follows:

- Car commuting
- Car employer's business
- Car education
- Car other
- Light goods vehicles
- Heavy goods vehicles

4.2.5 The Carlisle transport model was used for forecasting the traffic impact of the Carlisle Local Plan proposals. The results of this forecasting informed a study to assess the infrastructure requirements of the local plan, and ultimately formed part of the evidence base for the local plan.

4.2.6 Further details on the validation of the Carlisle transport model and the forecasting of the local plan are provided in the Carlisle Transport Model Local Model Validation Report (LMVR) (Cumbria County Council, February 2015) and the Carlisle Local Plan Transport Modelling Report (Cumbria County Council, February 2015).

4.2.7 The validation statistics contained within the LMVR show that the model was suitable for use for assessing the impact of the local plan. However, further work is required to update the model to ensure it is fit for purpose

Highways England North Regional Model

4.2.8 The Highways England North Regional Model is a highway assignment model currently being developed by consultants on behalf of Highways England using the SATURN software.

- 4.2.9 The North Regional Model is part of a set of five highway assignment models being developed concurrently to cover the whole of England. The models are being developed with a common approach, with a single base network based on GIS datasets, and trip demand based on a combination of mobile phone data and synthetic matrices. The purpose of the models is to provide a consistent base for assessing schemes identified in the Road Investment Strategy 2015–2020 (RIS1) and to inform the strategy post-2020 (RIS2).
- 4.2.10 The model covers key links in Cumbria, but does not include Carlisle in detail. Further details are not available on the model as it is still in development. It is not recommended to use this model to support the appraisal of the Carlisle Southern Link Road.

4.3 Traffic data

- 4.3.1 There are a number of different existing traffic data sources available to Cumbria County Council to support the transport modelling for the proposed Carlisle Southern Link Road. A number of these were used in the validation of the Carlisle transport model and are detailed below.
- 4.3.2 Cumbria County Council maintains a network of permanent traffic counters across the county, known as the TRADS database. These counters are located on key routes in and around Carlisle, and are shown in Figure 2 in the Appendix. Highways England also maintains a network of counters on the strategic road network, and these include counters on the M6 and A69 in the vicinity of Carlisle.
- 4.3.3 Data is also being collected as part of the CNDR one-year and five-year post-opening evaluation studies. This data includes additional traffic surveys, ANPR surveys and household interview surveys.
- 4.3.4 Cumbria County Council has access to the Trafficmaster database. The Trafficmaster dataset provides journey data from internet-connected in-vehicle GPS devices. The data includes journey times for routes travelled by these vehicles, and aggregate anonymous origin-destination datasets segmented by vehicle type.
- 4.3.5 Further details on the available traffic datasets are provided in the Carlisle Transport Model Local Model Validation Report (Cumbria County Council, February 2015) and in the CNDR Post-Opening Evaluation Reports (Parsons Brinckerhoff, various dates).

4.4 Base model methodology

Summary

- 4.4.1 Based on the available models, the Carlisle transport model represents the best model for use for the forecasting and appraisal of the Carlisle Southern Link Road scheme. It is not considered appropriate to use the North Regional Model for transport modeling as part of the scheme appraisal of the Carlisle Southern Link Road. This is due to the network coverage in the Carlisle urban area, as this model is focussed on the strategic road network. In addition, the model is not yet completed and there has been no discussion or agreement with Highways England on the potential use of the model.
- 4.4.2 However, there are a number of weaknesses in the Carlisle transport model which would require resolving via a model update before it can be considered fit for purpose for this task. These issues are discussed below.

- 4.4.3 The origin-destination data used in model did not include recent survey information. The household surveys undertaken as part of the CNDR post-evaluation studies will provide more information, but there is still a lack of data for trips made within Carlisle, particularly from the south and east of Carlisle. The model update should include provision for surveys to capture origin-destination movements across screenlines to the southeast and southwest of Carlisle.
- 4.4.4 The model only currently considers the morning and evening peak periods. For the appraisal of the scheme, an additional time period covering the average inter-peak hour would also be required to allow benefits to be calculated throughout the working day. It may also be necessary to consider periods adjacent to the peak morning and evening periods, to allow the model to represent congestion that lasts longer than the peak period. This can be determined by analysing available traffic data.
- 4.4.5 The LMVR highlights that the trip demand and traffic flows generally validate reasonably well, but heavy goods vehicle flows are a weakness for the model. This is perhaps partially due to the lack of surveyed origin-destination movements. It would be necessary to produce new trip demand matrices as part of the update, using both the new survey data and refining and improving the techniques used for synthetic trip demand.
- 4.4.6 The journey time validation results for the model are weaker on routes to the south and east of the city. The update would be required to improve the model operation of these routes, as these are key routes which could be affected by the proposed scheme.
- 4.4.7 The Carlisle transport model will be updated following guidelines defined in the TAG Unit M3.1 *Highway assignment modelling*.
- Data collection*
- 4.4.8 It is envisaged that a new data collection exercise will be required to provide additional origin-destination and other traffic data to allow the update of the Carlisle Transport Model. The data required is outlined below and should be collected in a neutral month in line with TAG Unit M1.2 *Data sources and surveys*. The precise locations for data collection will need to consider the area of impact of the scheme
- 4.4.9 Roadside interview surveys will be needed to capture key traffic movements in the south, east and west of the model. The surveys would need to capture movements from the south of the city towards the city centre, as well as east-west traffic.
- 4.4.10 The precise location of the surveys needs careful planning and is also dependent on the available space on the highway network, and the likely impact of the surveys on congestion. The location of the surveys would need to be agreed between Cumbria County Council, the survey company and the police.
- 4.4.11 Traffic flows will be needed on key links and junctions throughout the model, and primarily in the simulation area. These will supplement the existing traffic data and will be used to calibrate and validate the model.
- 4.4.12 Automatic traffic counters should be arranged in screenlines and should capture flow data for a minimum of two weeks. The screenlines form the basis of matrix estimation, calibration and validation and it is vital these cover all key movements between sectors.
- 4.4.13 Manual classified link and turning counts should also be collected. These provide additional data on the split of different vehicle classes, and turning counts are useful for the calibration of the model. Where possible, automatic traffic counters should be placed nearby for a period of two weeks to ensure the flow captured by the turning count is representative of typical traffic conditions.

- 4.4.14 It is proposed to use Trafficmaster data to calibrate speeds in the model. Additional journey time data will also need to be collected to provide an independent dataset to validate the model along key routes, such as the southern radial routes. These should be collected either via in-car moving observer surveys, or using in-car GPS datasets.
- 4.4.15 It may be useful, although not essential, to also consider queue length surveys at key junctions in the model. These provide a useful source of calibration data. Queue length surveys should be undertaken on the same day as the junction turning count at any particular junction.
- 4.4.16 Further details on data collection will be provided in the Traffic Data Report.

Time periods

- 4.4.17 The time periods to be assessed in the model will be confirmed following analysis of the new traffic data. However, it is anticipated that the peak morning and evening time periods will be similar to those used in the current Carlisle transport model, which are:
- Morning peak hour of 08:00–09:00
 - Evening peak hour of 17:00–18:00

- 4.4.18 As part of the model update, it is proposed to also include an average inter-peak period of 10:00–16:00.

- 4.4.19 It is also proposed to calculate factors for shoulder peaks to assist in scheme appraisal in non-modelled time periods.

Network and zone structure

- 4.4.20 The network in the existing Carlisle transport model is presented in Figure 3 in Appendix A. The simulation area is that which considers turning delays at junctions in detail. The buffer area considers only link delays, often based on speed-flow relationships. The urban Carlisle area is wholly in the simulation area.
- 4.4.21 The network will be revalidated using a combination of digital datasets and site visits. Updated signal timing data will also be collected from both signal specifications and actual timings recorded from the Urban Traffic Control system.
- 4.4.22 The zone structure in the existing Carlisle transport model is presented in Figure 4 in Appendix A. The existing zone structure in the Carlisle area will be assessed for its suitability. Given the recent update of the model, it is likely that the majority of the zone system will be satisfactory. However, additional zones may be required in and around south Carlisle, particularly to capture precise traffic movements in and around the scheme area. Zones will typically be either a single or multiple output areas, except for relatively small sites with a unique land use, such as retail parks. Zones will be constructed such that they are wholly located in a single lower super output area.
- 4.4.23 The model zones will also be aggregated into sectors. These sectors will be created based on zone locations and barriers to travel, such as rivers and railways. Screenlines will be arranged across sector boundaries where possible, to allow the validation of broad traffic movements in Carlisle.
- 4.4.24 Further information on the network of the Carlisle Transport Model LMVR (Cumbria County Council, February 2015)

Trip demand

- 4.4.25 The origin-destination demand data from the Carlisle transport model was collected in 2012–13 and the model is validated to a base year of 2013.

- 4.4.26 The trip demand will be primarily based upon data collected from the roadside interview surveys. 12-hour production-attraction demand matrices will be produced from the roadside interview surveys to ensure consistency with variable demand modelling. Gaps in the demand data would be infilled using other data sources. It is anticipated that this will primarily rely on a synthetic gravity model, but options also include Trafficmaster origin-destination data and the 2011 census.
- 4.4.27 The roadside interview surveys will be grouped into appropriate screenlines, and merged following the variance weighting technique, which considers the index of dispersion of each trip between each origin and destination to prevent double counting of trips.
- 4.4.28 The 12-hour production-attraction matrices would then be converted to peak hour origin-destination demand using factors derived from the interview surveys so they can be assigned in the transport model.
- 4.4.29 Other data sources which could help in producing demand matrices include ANPR surveys, the National Trip End Model and the National Travel Survey. The ANPR surveys will allow validation of trip patterns, particularly for through trips. .
- 4.4.30 Further information on the trip demand in the Carlisle Transport Model Local Model Validation Report (LMVR) (Cumbria County Council, February 2015)

Calibration and validation methodology

- 4.4.31 Cordons and screenlines will be developed to assist in model calibration and validation. A roadside interview survey screenline will also be developed. Further calibration and validation screenlines will be developed using the traffic flow data collected from the permanent sites and the data collection exercise.
- 4.4.32 It is proposed to use Trafficmaster data to calibrate speeds in the model, and new journey time surveys will be used to validate the speeds and delays in the model.
- 4.4.33 The model update and revalidation will aim to follow the validation guidelines defined within TAG Unit M3.1 *Highway assignment modelling*.

4.5 Forecasting methodology

- 4.5.1 Forecasting the operation of the Carlisle Southern Link Road scheme will be undertaken following guidance in TAG Unit M4 *Forecasting and uncertainty*. Forecasts will be produced for the proposed year of opening (to be confirmed) and a design year 15 years hence.
- 4.5.2 An uncertainty log will be developed to record the central assumptions made as part of the forecasting process. The uncertainty log will summarise all known uncertainties in the modelling and forecasting approach, along with the likelihood of schemes or developments proceeding. The uncertainty log will be used to produce the core scenario, which is the central case of appraisal based on the most realistic set of assumptions. Development proposals will be included in the core scenario if they are assessed to be 'near certain' or 'more than likely'.
- 4.5.3 Other key highway improvements on the highway network in the vicinity of the scheme will also be considered. This will include committed improvements considered through the Carlisle Transport Improvements study.

- 4.5.4 Growth factors will be developed using assumptions in the National Trip End Model (NTEM) dataset via the TEMPRO software. This is currently version 6.2, although it is noted that new datasets may be made available for consultation in 2016. A decision on which dataset to use in forecasting will be made if/when a new dataset is released and further information on the programme for model forecasting is known. Whichever dataset is used, the growth will be constrained to NTEM figures, and will be adjusted for known developments that are specifically included in the core scenario using the alternative assumptions option within the TEMPRO software.
- 4.5.5 Known developments to be included in the core scenario will be detailed in the uncertainty log. It is anticipated that detail on these developments, such as size, access and traffic generation data will be obtained through the relevant planning applications. The list of developments will be collated in partnership with Cumbria County Council and Carlisle City Council.
- 4.5.6 In addition to the core scenario, two further alternative scenarios will be considered. These will be based on high and low trip demand assumptions and will be developed based on guidance contained within TAG Unit M4.
- 4.5.7 A key objective of the Carlisle Southern Link Road scheme is to support the delivery of the major mixed-use development at Carlisle South. The transport modelling evidence undertaken in support of the local plan suggests that major development would not be achievable without a significant deterioration in journey times in south Carlisle, along with associated impacts on air quality, noise and greenhouse gases.
- 4.5.8 As such, the guidance in TAG Unit A2.3 *Transport appraisal in the context of dependent development* will be used to assess the level of development at Carlisle South which is dependent on the provision of the Carlisle Southern Link Road scheme. The scale of likely development will be guided by the Carlisle South masterplan and the benefits accrued by dependent development will be reported in the economic appraisal following guidance in TAG Unit A2.3.
- 4.5.9 It is anticipated that the appraisal of the Carlisle Southern Link Road scheme will need to adopt a variable demand assessment in line with TAG Unit M2 *Variable demand modelling*. This is thought to be necessary due to the size of the scheme, and its potential impact on travel costs and effect on travel choices. The variable demand modelling would be undertaken using the DIADEM software in combination with the SATURN Carlisle transport model.
- 4.5.10 The model will use the incremental hierarchical logit model, with the do-minimum forecast year pivoting off the base year, and the do-something pivoting off the do-minimum. The model would consider changes in trip generation/frequency and trip distribution. It is not proposed to consider changes in trip timing at either the macro or micro level. The changes in trip timing at the macro level are not deemed necessary because strong cost differentials are not expected to develop or change between time periods. The changes in trip timing at the micro level are not deemed necessary because severe congestion is not expected in this scheme, and the implementation of this within DIADEM is currently not compatible with an incremental demand model.
- 4.5.11 TAG Unit M2 states that each variable demand response should be calibrated against local data wherever possible. However, producing locally calibrated parameter values would be costly, difficult and time consuming. The survey data is not representative of the whole trip matrix, so new survey data would be required. The variable demand model will therefore use the illustrative values and hierarchy presented in TAG Unit M2.
- 4.5.12 Given the inclusion of various key routes in the model, such as the M6, A69 and A689, and hence a number of long-distance through trips, the need to apply cost damping to this demand model will be investigated. If it is believed cost damping is necessary, further details will be provided.

- 4.5.13 It is assumed that bus services will not use the new route, although the reduction in congestion on other routes may result in journey time improvements for existing public transport services. There is no existing public transport model for the area which could provide costs. However, given the general low sensitivity of mode shift with changes in relative generalised cost between modes, it is unlikely that the scheme will produce a significant modal impact. To confirm this, a modal shift significance test will be undertaken and reported on in the Local Model Validation Report
- 4.5.14 As part of the variable demand methodology, realism and sensitivity testing will be undertaken as detailed in TAG Unit M2. The purpose of realism testing is to ensure that the demand model response to changes in fuel cost and journey time is appropriate and within expected limits. The purpose of sensitivity testing is to assess the impact of varying the various parameters selected for use within the demand model, and to ensure any uncertainty in the selection of these parameters does not unduly influence the appraisal of the scheme. Together, these tests provide evidence that the model is fit for purpose in its role in scheme appraisal.

5. Scheme appraisal

5.1 Introduction

- 5.1.1 This section considers the approach to scheme appraisal. The approach is summarised in the Appraisal Specification Summary Table in Appendix B.

5.2 Economic assessment

- 5.2.1 The assessment of economic impacts considers the scheme impacts on journey times and vehicle operating costs, as well as reliability, wider impacts on the economy and regeneration.

Business users and transport providers

- 5.2.2 The TUBA software will be used to assess the economic benefits of the Carlisle Southern Link Road scheme. This assessment will consider the impact of journey times on business users from the transport model. A 60-year assessment period will be used in the appraisal. The appraisal will follow the guidance in TAG Unit A1.3 *User and provider impacts*.

- 5.2.3 It is proposed to undertake a proportionate assessment of the impact of scheme construction and maintenance as part of the appraisal. This assessment will reflect the fact that the proposed route, when operational, will provide an alternative route to the city centre, which will mean that traffic can avoid the delays associated with the maintenance of both these routes.

Reliability impact on business, commuting and other users

- 5.2.4 The reliability impact of the scheme will be appraised using the methodology for urban roads derived in TAG Unit A1.3 *User and provider impacts*.

Regeneration

- 5.2.5 The proposed scheme will not affect travel to, from, or within a regeneration area. The scheme will be scored as 'neutral' with regards to regeneration impacts.

Wider impacts

- 5.2.6 The wider impacts of a scheme are those economic impacts which are additional to the transport user benefits. These impacts include agglomeration impacts, which refers to the concentration of economic activity over an area. Agglomeration impacts arise because businesses benefit from being closer both to each other and to the labour market.
- 5.2.7 The Department for Transport has identified areas across England, known as Functional Urban Regions (FURs), where agglomeration impacts are expected to be significant. Schemes which are located within a FUR are required to have the agglomeration impacts assessed as part of scheme appraisal, but schemes outwith a FUR may still have significant impacts.
- 5.2.8 Carlisle has not been identified as lying within a FUR. However, the scheme would provide direct access to the strategic road network for a major proposed employment site at south Morton, and there is the potential for further employment land at Carlisle South. It is therefore proposed to undertake an appraisal of agglomeration impacts. An appraisal of the output change in imperfectly competitive markets and the tax revenue from labour market impacts will also be undertaken.
- 5.2.9 The appraisal will follow the guidance in TAG Unit A2.1 *Wider impacts*.

5.3 Environmental assessment

5.3.1 The assessment of environmental impacts considers the environmental implications of the scheme as a result of changes in traffic flow and due to new or improved infrastructure. There are seven environmental factors to be assessed.

5.3.2 The approach to assessment will follow guidance outlined in *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 will be referred to and commentary provided in the relevant sections of the report.

5.3.3 The Stage 1 appraisal is primarily a desk-based exercise. Whilst site visits will be required to gain contextual understanding of the study area, it is not necessary to conduct detailed environmental surveys at this stage.

Noise

5.3.4 The noise impact assessment will be 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.*

5.3.5 Noise impact of different roads can be assessed using annoyance response relationships. For road traffic, the annoyance response relationship as defined in DMRB is used and converted into LA_{eq} 18hour allowing for a percentage annoyed to be predicted. Additionally, TAG has been designed to place a monetary value on a decibel change in noise.

Air quality

5.3.6 The impact of vehicle emissions on air quality will be 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 Section 3 *Air quality impacts*. The assessment will focus on concentrations of NO₂ and PM₁₀.

5.3.7 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.*

Greenhouse gases

5.3.8 The assessment methodology for greenhouse gases is based on the approach outlined in TAG Unit A3 *Environmental Impact Appraisal*. The methodology employs a four step process:

- Scoping
- Estimation of changes in energy consumption
- Estimation of changes in emissions of greenhouse gases
- Monetary valuation of changes in greenhouse gases

5.3.9 For the SSTC3 scheme, changes in greenhouse gas emissions will be proportionate to the number of litres of fuel burnt. Fuel consumption, and hence carbon dioxide equivalent emissions, are estimated using the formula and parameters given in the TAG Data Book and outputs from the transport modelling. The change in greenhouse gas emissions can also be monetised based on data given in the TAG Data Book.

- 5.3.10 The TUBA software will be used to calculate the net present value of the change in carbon dioxide equivalent emissions.

Landscape and townscape

- 5.3.11 The assessment of potential effects on the landscape and visual amenity of the area will be carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3 Part 5 *Landscape Effects* and TAG Unit A3 Sections 6 *Impacts on landscape* and Section 7 *Impacts on townscape*. 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.

- 5.3.12 The TAG assessment for townscape and landscape will be qualitative, describing the impacts on each resource.

Heritage of historic resources

- 5.3.13 To identify key historic environment resources, a desk based assessment will be undertaken to establish a baseline of information on designated and undesignated cultural heritage assets. The assessment of potential effects on the historic environment will be 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 Section 8 *Impacts on the historic environment*.

- 5.3.14 The methodology for appraising the impact of the scheme uses the following steps as defined in TAG Unit A3:

- Scoping and identification of the study area
- Identifying key environmental resources and describing their features
- Appraise environmental capital
- Appraise the proposal's impact
- Determine the overall assessment score

- 5.3.15 The evaluation of the assets will be 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.*

Biodiversity

- 5.3.16 The assessment of potential effects on nature conservation will be carried out in accordance with the guidance and techniques presented in DMRB Volume 11 Section 3, Part 4 *Ecology & Nature Conservation*, TAG Unit A3 Section 9 *Impacts on biodiversity*, Interim Advice Note 130/01 *Ecology & Nature Conservation Criteria for Impact Assessment* and CIEEM Guidelines for Ecological Impact Assessment in the United Kingdom.

- 5.3.17 A desk study will be 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 will involve 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)

5.3.18 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.

Water environment

5.3.19 The assessment of potential effects on road drainage and water environment will be 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 Section 10 *Impacts on the water environment*. 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.*

5.3.20 The steps are 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.

5.3.21 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 **Error! Reference source not found.**). A buffer off 500m was also applied around this corridor to identify any key features within close proximity.

5.3.22 To establish the baseline, site visits along with a desktop review of the following sources will be undertaken:

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

- Google Maps.

5.4 Social and distributional assessment

- 5.4.1 The assessment of social impacts considers the human experience of transport and the impact of social factors not considered as part of the economic or environmental impacts. There are eight social factors to be assessed. The appraisal will follow the guidance set out in TAG Unit A4.1 *Social impact appraisal* and TAG Unit A4.2 *Distributional impact appraisal*.

Commuting and other users

- 5.4.2 The TUBA software will be used to assess the economic benefits of the Carlisle Southern Link Road scheme. This assessment will consider the impact of journey times on commuting and other users from the transport model. A 60-year assessment period will be used in the appraisal. The appraisal will follow the guidance in TAG Unit A1.3 *User and provider impacts*.

Accidents

- 5.4.3 An assessment of safety benefits due to changes in the number of accidents will be undertaken using the COBALT spreadsheet. This analysis will use traffic flow outputs from the transport model. The existing accident rates in the area will be investigated, and local factors will be used if appropriate.

Physical activity

- 5.4.4 It is anticipated that the new route would also provide a shared-use route for pedestrians and cyclists, similar to that provided with the CNDR. Changes in the extent of walking and cycling would be estimated using forecasting methods detailed in TAG Unit A5.1 *Active mode appraisal* and the impacts calculated using TAG Unit A4.1 *Social impact appraisal*.

Security

- 5.4.5 The Security Impacts worksheet will be used to appraise the security impacts of the scheme on road users, pedestrians and cyclists and public transport users.

Severance

- 5.4.6 The assessment of potential effects on outdoor access and recreation will be 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”

- 5.4.7 The steps to be taken are 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.

5.4.8 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).

Journey quality

5.4.9 Due to the limited evidence of monetary valuations of journey quality for road users, a qualitative assessment of the journey quality impacts will be undertaken.

Option and non-use values

5.4.10 The scheme does not include measures which will substantially alter the availability of transport services within the study area. The scheme will be scored as 'neutral' with regards to option and non-use value impacts.

Accessibility

5.4.11 A screening exercise will be undertaken to understand how the scheme will impact accessibility. This will be primarily based on the existing settlements in the area. An assessment of how the road interacts with proposed development at Carlisle South will also be considered, although the masterplan would be designed to maximise accessibility. The screening exercise will identify the requirements of further appraisal.

Personal Affordability

5.4.12 A screening exercise will be undertaken to understand how the scheme will impact personal affordability. This may include the rerouting of services along the new route. The screening exercise will identify the requirements of further appraisal.

Distributional impacts

5.4.13 The assessment of distributional impacts considers the variance of transport intervention impacts across different social groups. Distributional impacts are to be assessed for eight indicators and following guidance in TAG Unit A4.2 *Distributional impact appraisal*.

- User benefits
- Noise
- Air quality
- Accidents
- Security
- Severance
- Accessibility
- Affordability

5.4.14 A screening process will be undertaken to assess each indicator proportionately, and to identify indicators that require further appraisal. At this stage, it is anticipated that the majority of indicators will need further appraisal.

5.5 Public accounts

Cost to broad transport budget

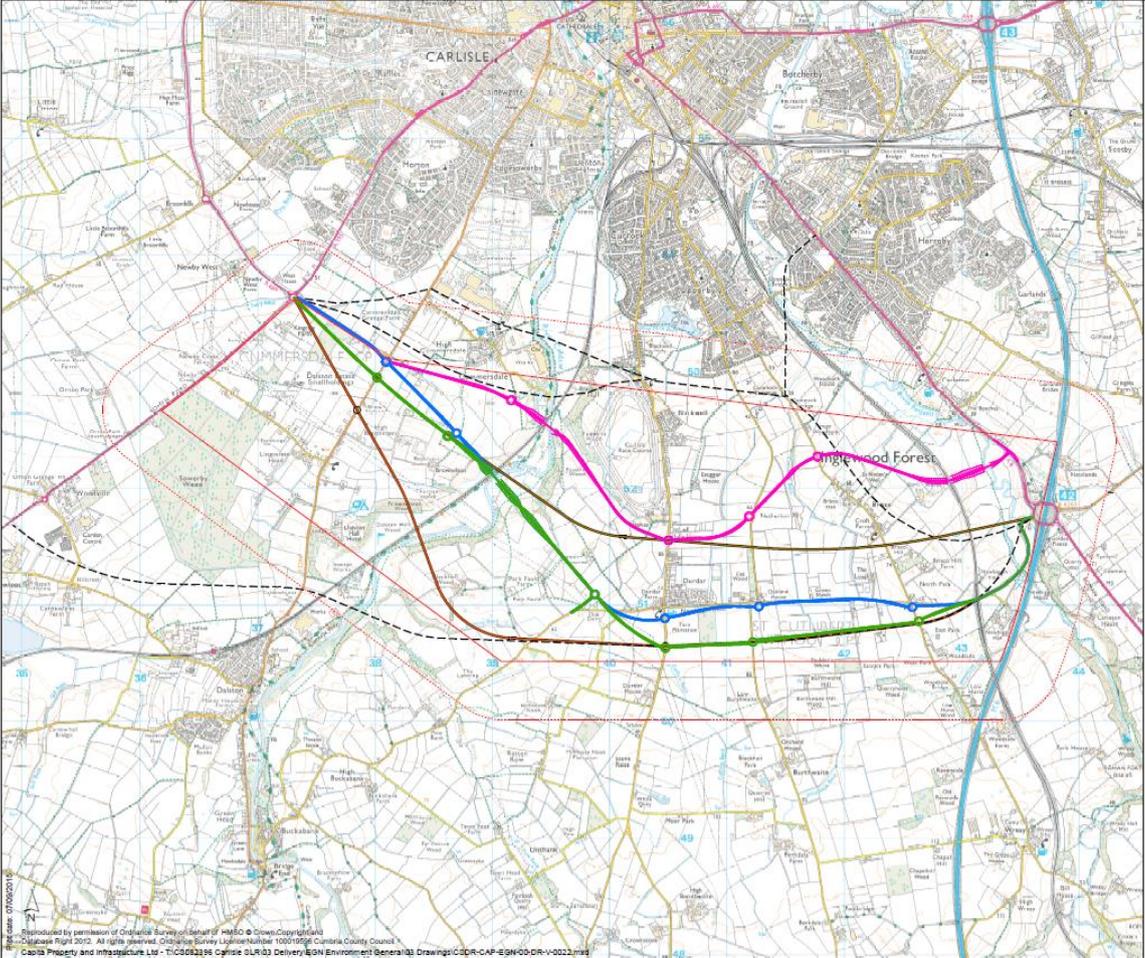
5.5.1 The scheme cost estimates will be derived based on the design work being undertaken and will follow guidance in TAG Unit A1.2 *Scheme costs*.

Indirect tax revenues

- 5.5.2 The assessment of the scheme impact on indirect tax revenues will be considered using the TUBA software as part of the transport economics assessment.

Appendix A Plans

Figure 1: Location plan and indicative routes



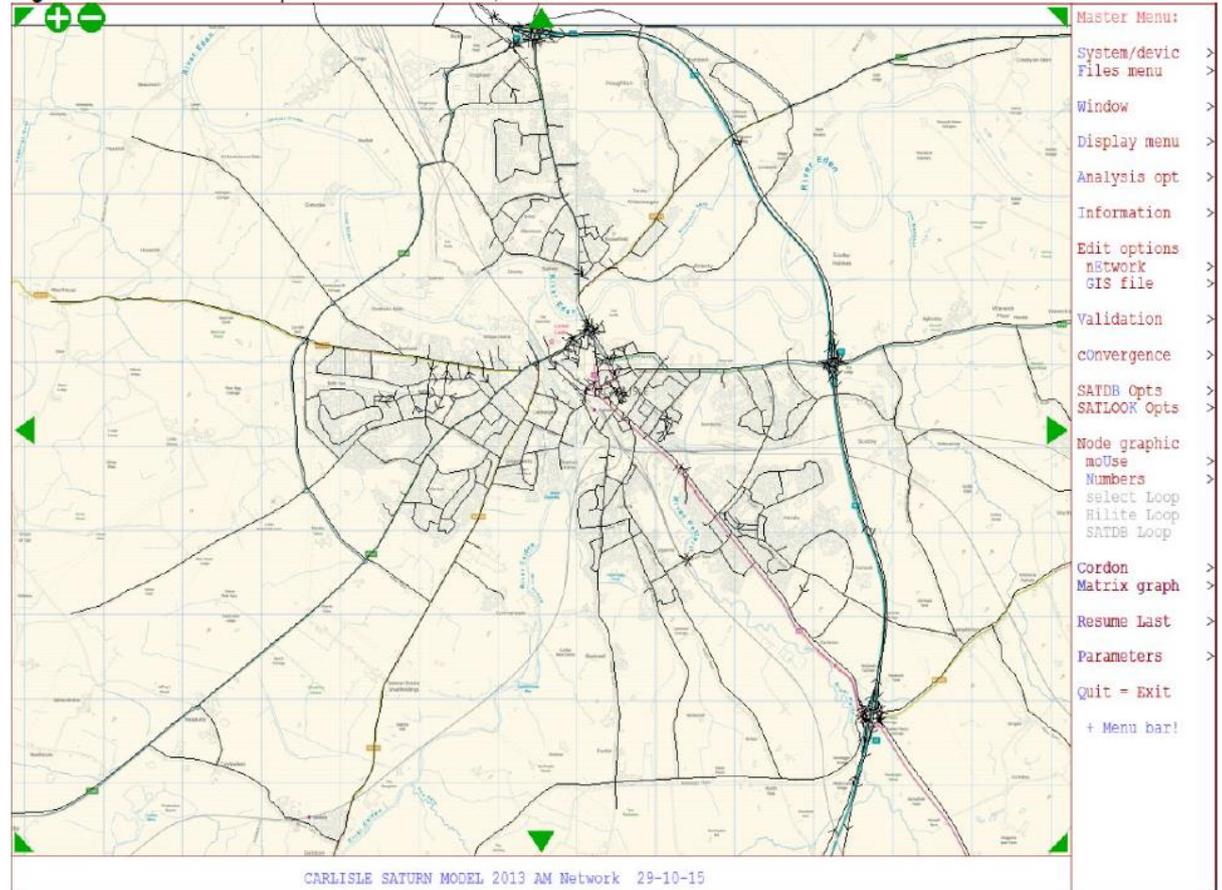
Map data: Carlisle Southern Link Road TAG Stage 1 Report, Capita

Figure 2: Permanent traffic count locations



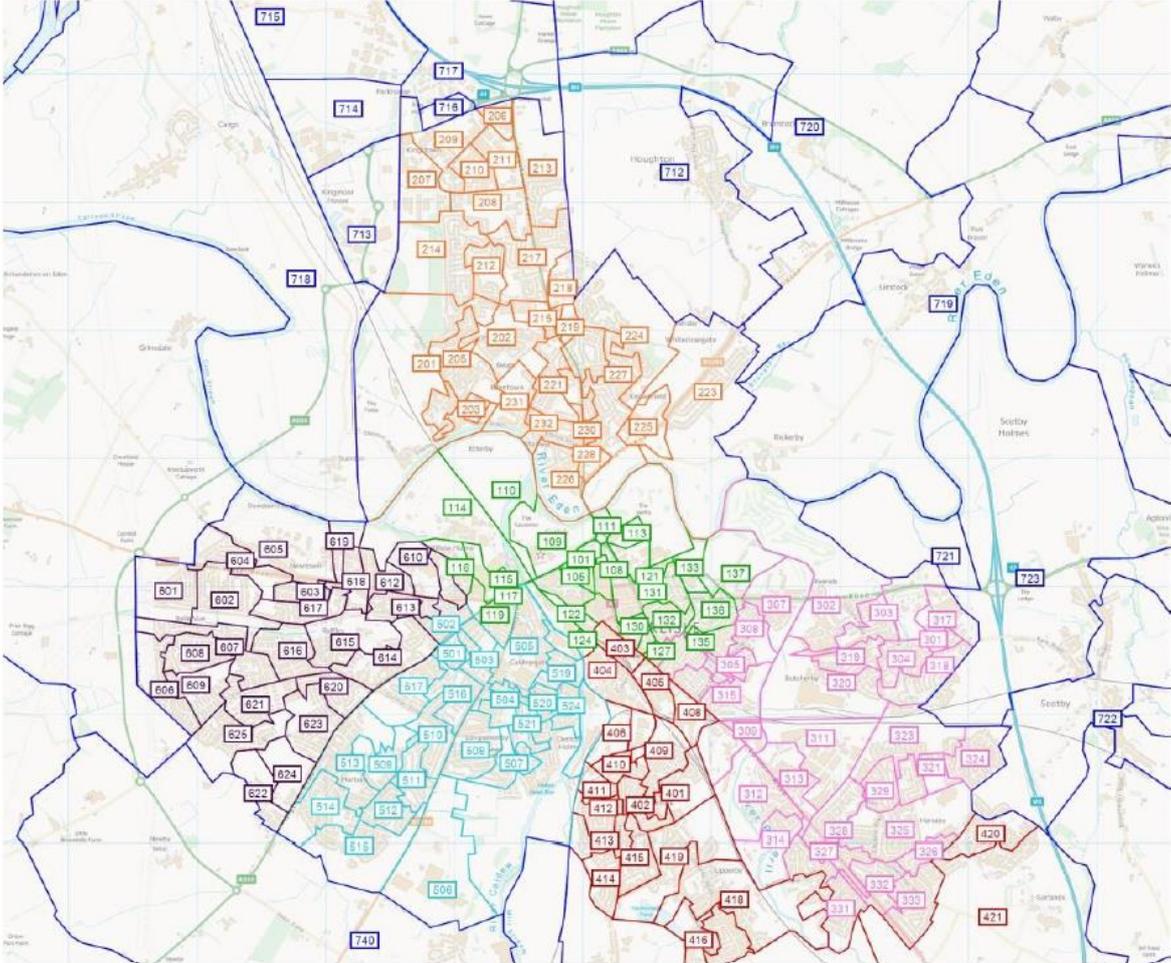
Map data: Cumbria County Council

Figure 3: Carlisle transport model network



Map data: Carlisle Transport Model LMVR, Cumbria County Council

Figure 4: Carlisle transport model zone structure



Map data: Carlisle Transport Model LMVR, Cumbria County Council

Appendix B Appraisal Specification Summary Table

Appraisal Specification Summary Table

Impacts	Sub-impacts	Estimated Impact in OAR	Level of uncertainty in OAR	Proposed proportionate appraisal methodology	Reference to evidence and rationale in support of proposed methodology	Type of Assessment Output (Quantitative/ Qualitative/ Monetary/ Distributional)
Economy	Business users & transport providers	Large positive	Low	Economic appraisal using highway assignment model outputs in line with TAG	TAG Unit A1.3	Quantitative / Monetary
	Reliability impact on Business users	-	-	To be appraised in line with TAG	TAG Unit A1.3	Quantitative / Monetary
	Regeneration	Assumed neutral	Low	N/A	Scheme will not affect travel in or near a regeneration area	-
	Wider Impacts	-	-	To be appraised in line with TAG, including dependent development	TAG Unit A2.1	Quantitative / Qualitative / Monetary
Environmental	Noise	Slight positive	Medium	xx and screening assessment for distributional impacts	TAG Unit A3 and Unit A4.2	Quantitative / Monetary
	Air Quality	Slight positive	Medium	To be appraised in line with TAG	TAG Unit A3 and Unit A4.2	Quantitative / Monetary
	Greenhouse gases	-	-	Economic appraisal using highway assignment model outputs	TAG Unit A3	Quantitative / Monetary
	Landscape	Large negative	Low	To be appraised in line with TAG	TAG Unit A3	Qualitative
	Townscape	-	-		TAG Unit A3	Qualitative
	Heritage of Historic resources	Slight negative	Low	To be appraised in line with TAG	TAG Unit A3	Qualitative
	Biodiversity	Moderate negative	Low	To be appraised in line with TAG	TAG Unit A3	Qualitative
	Water Environment	Large negative	Low	To be appraised in line with TAG	TAG Unit A3	Qualitative
Social	Commuting and Other users	Large positive	Medium	Economic appraisal using highway assignment model outputs in line with TAG	TAG Unit A1.3 and Unit A4.2	Quantitative / Monetary
	Reliability impact on Commuting and Other users	Moderate positive	Medium	To be appraised in line with TAG	TAG Unit A1.3	Quantitative / Monetary
	Physical activity	-	-	To be appraised in line with TAG	TAG Unit A4.1	Quantitative / Monetary
	Journey quality	-	-	To be appraised in line with TAG	TAG Unit A4.1	Qualitative
	Accidents	-	-	Assessment of change in accidents using highway assignment model outputs in line with TAG	TAG Unit A4.1 and Unit A4.2	Quantitative / Monetary
	Security	-	-	Security impacts worksheet in line with TAG	TAG Unit A4.1	Qualitative
	Access to services	-	-	Screening exercise to identify the requirements of further appraisal in line with TAG	TAG Unit A4.1 and Unit A4.2	Qualitative
	Affordability	-	-	Screening exercise to identify the requirements of further appraisal	TAG Unit A4.1 and Unit A4.2	Qualitative
	Severance	-	-	To be appraised in line with TAG	TAG Unit A4.1 and Unit A4.2	Qualitative
	Option values	Assumed neutral	Low	N/A	Scheme does not include measures to substantially change the availability of transport services	-
Public Accounts	Cost to Broad Transport Budget	-	-		TAG Unit A1.2	Quantitative / Monetary
	Indirect Tax Revenues	-	-	Economic appraisal using highway assignment model outputs in line with TAG	TAG Unit A1.3	Quantitative / Monetary

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