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HIGHWAYS AGENCY

Trans-Pennine Routes

Feasibility Study

Stage 3 Report

February 2015

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An Executive Agency of the Department for Transport

This report has been prepared for the Highways Agency and the Department for Transport by Mouchel Ltd.

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1 Executive Summary

1.1 Context and Background

1.1.1 The Department for Transport has commissioned a number of feasibility studies to investigate solutions to some of the most significant and longstanding congestion hotspots in the country. The aim of this feasibility study has been to identify the opportunities and understand the case for future investment on trans-Pennine routes that will improve connectivity between Manchester and Sheffield, and that are deliverable, affordable and offer value for money.

1.1.2 The study considered the current trans-Pennine road routes which include the A57, A628, A616 and A61 in terms of the strategic road network, as well as the A57, A6, A623, A624, A625, A6187 and A6103 on the local authority road network. The study also included the Hope Valley railway line.

1.1.3 The modal scope of the study has been predominantly road-based and considered potential investment proposals on both the strategic and local authority road networks. The study also aimed to understand the contributions that current rail investments plans may bring to trans-Pennine connectivity and be aware of and understand further potential proposals that may emerge from other related investment planning processes.

1.1.4 The study also reflects the Higgins report, "Rebalancing Britain", published in October 2014, which included a recommendation for HS3, a high speed link connecting the North's great cities alongside a recommendation for the formation of a joint body, Transport for the North. Further work, commissioned under the banner "One North", published in August 2014, also outlined proposals for better connections between northern cities.

1.1.5 The feasibility study has not considered specific issues or proposals in relation to other parts of the strategic road network in the vicinity, as the case for further future investment has or will be considered as part of the Highways Agency's South Pennines Route Strategy, or within other specific feasibility studies.

1.1.6 The feasibility study has proceeded through three stages. This report provides the outputs from Stage 3 and follows Step 10 of the WebTAG Transport Appraisal Process.

1.1.7 Stage 3 undertook work to assess the affordability, value for money and deliverability of prioritised proposals (WebTAG Step 10). It considered the benefits and the potential business cases for each of the prioritised packages (proposals) identified in stage 2 as well as the cumulative or additional benefits and impacts from investment in the network as a whole.

1.2 Summary of Stages 1 and 2

1.2.1 The evidence gathered and analysed as part of Stage 1 of this study provided the basis for identifying the issues and challenges which require addressing in order to improve the overall performance of the route. The identified issues and challenges were used to form a list of key objectives which this study would attempt to achieve, and it is this which formed the basis for the development of options.

1.2.2 Options, identified throughout this process, focussed on the strategic highway network but with an awareness of other complementary Highways Agency and local schemes. Throughout the option development process the views of stakeholders have been sought and feedback taken into account, with any suggested measures considered in the assessment process. In addition a number of historic schemes were considered as part of the process and assessed alongside previously un-explored options in order to provide a fully inclusive option assessment exercise.

1.2.3 The methodology adopted to conduct the sifting of options has been in line with WebTAG guidance. The process focused on assessing options against objectives and against deliverability. As a result, this study has prioritised proposals that could be delivered in the short to medium term, and therefore longer term solutions with wider reaching implications for Sheffield to Manchester connectivity fall outside of this current study remit. As well as assessing individual options, the study also tested packaging some of the options that were not progressed together to understand whether, if by combining options, greater benefits could be derived.

1.2.4 In Stage 2 of the feasibility study the assessment of the impacts of each of the packages of options was predominantly qualitative in nature as, at that stage, there was no suitable traffic model available which adequately covered the full study area and would therefore be fit for the purpose of quantifying / monetising all of the impacts.

1.2.5 Following the initial sift and second sift, the Early Appraisal Sifting Tool (EAST) assessment was conducted. EAST uses the ‘Transport Appraisal Process’ TAG Transport Business Case criteria Option Assessment, and the best performing individual options taken forward to Stage 3 were:

At the western end:

- **Bypass of Mottram, Hollingworth and Tintwistle**;
- **Mottram Moor Link Road**;
- **A57 Mottram One Way**;

At the eastern end:

- **Dualling the A61:** between junction 36 of the M1 and the Westwood roundabout on the A616.

1.2.6 Each of the best performing options identified had the potential to address the issue of congestion on the strategic route and were therefore expected to improve journey times and journey time reliability. Schemes at the western end were also be expected to address, to different extents, issues of community severance identified in the area of Mottram, Hollingworth and Tintwistle.

1.2.7 In addition, following the packaging of options that individually did not perform strongly across all sift criteria but were collectively assessed as delivering greater benefits, a central package of options was designed. The central package included:

- **A57(T) to A57 Link road**;
- **Safety measures:** focussed on accident cluster sites across the entire route and in areas of concern as identified in Stage 1;
- **Climbing lanes:** were considered feasible and appropriate to negate the impact of slow moving vehicles across the rural sections of the A628. This includes a proposed realignment of the A628 at Salter's Brook, which includes a climbing lane as part of the design;
- **Dualling the A61:** between junction 36 of the M1 and the Westwood roundabout at the junction with the A616;
- **Technology package:** applied across the route and the wider area, taking in the motorway network and local routes that feed into the strategic route; and
- **A maintenance strategy**.

1.2.8 The eastern end option and the western end options, which include the central package, are defined as follows:

- **Package 1:** Central package plus bypass of Mottram, Hollingworth and Tintwistle;
- **Package 2:** Central package plus Mottram Moor Link Road;
- **Package 3:** Central package plus A57 Mottram One Way;
- **Package 4:** Central package plus A61 Dualling.

1.2.9 The WebTAG Options Assessment Framework was used to assess options against the scheme objectives. A summary of how the options performed is outlined in Table 1-1.

Table 1-1 Performance of packages against objectives

Objective	Package 1	Package 2	Package 3	Package 4
Connectivity – improving the connectivity between Manchester and Sheffield through reduction in journey times and improved journey-time reliability;	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Environmental – avoiding unacceptable impacts on the natural environment and landscape in the Peak District National Park, and optimising environmental opportunities;	Moderate Adverse	Slight Adverse	Slight Adverse	Slight Adverse

Societal – improving air quality and reducing noise impacts, and addressing the levels of severance on the Trans-Pennine routes in urban areas;	Large Beneficial	Moderate Beneficial	Neutral	Neutral
Capacity – reducing delays and queues that occur during peak hours and improving the performance of junctions on the routes;	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Resilience – improving the resilience of the routes through reductions in the number of incidents and reduction of their impacts;	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Safety – reductions in the number of accidents and reductions in their impacts	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial

Seven point scale of impacts						
Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral	Slight Adverse	Moderate Adverse	Large Adverse

1.2.10 Stage 2 concluded by identifying the need to undertake further work on four options. Three of these are based around a common central package with a different western end intervention, as described below.

1.2.11 The central package comprised:

- A57(T) to A57 Link;
- Safety measures;
- Climbing Lanes (including a proposed realignment at Salter's Brook);
- Dualling the A61; and
- Technology measures.

The variants at the western end of the route were:

- Bypass of Mottram, Hollingworth and Tintwistle;
- Mottram Moor Link Road; and
- A57 Mottram One Way.

1.2.12 A fourth shortlisted option was for the proposed dualling of the A61 (at the eastern end of the route) which was assessed in isolation in addition to its inclusion within the above three packages.

1.2.13 Although the A61 Dualling scheme was assessed as a main option with central package during Stage 2, it was felt that the geographical remoteness between the A61 dualling option and the other elements of the central package meant that it should be assessed as a standalone intervention and also as an element within the central package.

1.2.14 During the stage 2 analysis, the central package included the introduction of an enhanced maintenance strategy, focusing on the core trunk route i.e. the A628 and A616. This was not taken forward into Stage 3 as the benefits, costs and impacts could not be assessed within the timescales of the study. Further work will need to be undertaken to assess this, which would be taken forward by the Highways Agency as part of their existing maintenance regime for the route(s).

1.3 Summary of Stage 3

1.3.1 Stakeholder engagement continued during Stage 3 and those who expressed a view were broadly supportive of the options being presented. Some concerns were raised about the impact that some of the schemes may have on traffic levels to the east of the Pennines and clarification was sought on the anticipated journey time benefits.

1.3.2 A traffic model has been used to make forecasts and assessments to support the environmental and economic assessments. Modelling of the economic case was undertaken using the Greater Manchester (GM) SATURN highway model. The modelling follows well established methodologies and has been considered appropriate for use in the feasibility study.

1.3.3 There was no suitable traffic model available which adequately covered the full study area and would therefore be fit for the purpose of quantifying / monetising all of the impacts. Therefore several approaches have been adopted to model and assess the different elements of the four options / packages.

1.3.4 In terms of monetised assessments, for the western end interventions, modelling of the economic case was undertaken using the Greater Manchester (GM) SATURN highway model. For the A61 dualling a project appraisal report (PAR) was used. For the climbing lanes and the Salter's Brook alignment an S-Paramics model was used. Non-monetised assessments, including environmental and social impacts, utilised a qualitative approach. It should be noted that technology was not appraised because, at the present time, there was no established methodology for assessing technology (VMS) on a single carriageway route.

1.3.5 The outputs from stage 3 identified that all four options / packages provide positive Benefit Cost Ratio (BCR) ranges.

- Package 1 – 1.94 to 2.80
- Package 2 – 2.74 to 3.96
- Package 3 – 2.87 to 4.09
- A61 Dualling – 2.08 to 2.93

1.3.6 Where possible, journey time savings have been identified. However, the results are indicative, and are intended to allow comparative assessment of the scale of the potential benefits for each option.

1.3.7 Package 1 delivers capacity and the greatest journey time saving benefits for local and trans-Pennine journeys.

1.3.8 Package 2 also delivers journey time benefits but not as large as package 1, however the cost of package 2 is significantly lower.

1.3.9 Package 3 delivers fewer benefits. The one-way system in isolation produces very limited journey time savings and this package is reliant on the A57(T) – A57 Link to generate benefits which delivers significant benefits on its own.

1.3.10 The climbing lane and Salter's Brook re-alignment provide benefit. The Salter's Brook re-alignment would involve major infrastructure improvements in the National Park and would result in loss and fragmentation of a triple designation habitat in an area of international and national importance.

1.3.11 The benefits of the safety measures broadly cover the investment costs.

1.3.12 VMS should provide reliability and journey quality benefits when implemented as part of the trans-Pennine packages.

1.3.13 The proposed alignment of the Mottram to Tintwistle bypass in Package 1 means that it is likely to have an adverse impact on biodiversity, landscape, historic environment and the water environment, particularly because around 1.5 km of the main section of the road lies within the Peak District National Park. Furthermore, with the provision of a bypass, traffic flows on the A628 passing through the Peak District National Park are forecast to increase, which could have adverse impacts on the environment and landscape.

1.3.14 All four packages have environmental benefits, most significantly package 1, with improvements to air quality and reduced severance for residents in the communities at the western end of the route in the area of Mottram, Hollingworth and Tintwistle.

1.3.15 Outturn cost ranges for the four packages are estimated as follows:

- Package 1 – £327 million to £470 million
- Package 2 – £196million to £283 million
- Package 3 – £120 million to £171 million
- A61 Dualling – £12 million to £17 million

1.3.16 At this stage the outturn costs include the capital cost for each option and exclude operational and maintenance costs.

1.3.17 For all four options / packages, the commercial and management case remains largely the same. Were proposals taken forward, they would be managed through the Highways Agency's (HA) Project Control Framework (PCF) and placed in PCF Stage 1 (Option Identification) of the Options Phase. The HA has recently awarded a new procurement framework for the delivery of major highway schemes known as the Collaborative Delivery Framework (CDF) and this could be used to deliver any of the proposed schemes.

1.3.18 Key milestones have been identified for all four packages. Indicative open for traffic dates are as follows:

- Package 1 – February 2024
- Package 2 – February 2023
- Package 3 – March 2022
- A61 Dualling – July 2018

1.3.19 It is anticipated that Development Consent Orders (DCOs) will apply to all of the recommended options, particularly packages 1, 2 and 3. Decision would need to be taken as to whether the DCO applies to a single parcel of land or whether the order will apply to multiple parcels or areas that are not continuous. The outline delivery programmes are based on the assumption of a single DCO.

1.3.20 The study has also highlighted the interest amongst stakeholders of potential longer term solutions, such as tunnels, to further improve connectivity, provide resilience and minimise the impact on the Peak District National.

2 Introduction and Purpose

2.1 Preamble

2.1.1 This report presents the outputs of the third stage of the trans-Pennine routes feasibility study and documents the further analysis that has been undertaken to understand the case for future investment solutions on trans-Pennine routes that will improve connectivity between Manchester and Sheffield, and that are deliverable, affordable and offer value for money.

2.1.2 Challenges identified in stage 1 of the study resulted in the development of objectives, as directed by the WebTAG Transport Appraisal Process.

2.1.3 The following intervention-specific objectives have been developed for the trans-Pennine routes and agreed in Stage 1:

- **Connectivity** – improving the connectivity between Manchester and Sheffield through reduction in journey times and improved journey-time reliability;
- **Environmental** – avoiding unacceptable impacts on the natural environment and landscape in the Peak District National Park, and optimising environmental opportunities;
- **Societal** – improving air quality and reducing noise impacts, and addressing the levels of severance on the trans-Pennine routes in urban areas;
- **Capacity** – reducing delays and queues that occur during peak hours and improving the performance of junctions on the routes;
- **Resilience** – improving the resilience of the routes through reductions in the number of incidents and reduction of their impacts; and
- **Safety** – reductions in the number of accidents and reductions in their impacts.

2.1.4 The second stage of the study focused on generating, assessing and sifting proposed options that could address the problems that have been identified along the route, including proposals for the strategic and local authority road networks.

2.1.5 The primary output of Stage 2 of the study was a report which clearly sets out the sifting criteria used to assess options and identify the best performing options to be investigated further in Stage 3.

2.1.6 Stage 3, of which this report and the associated annexes are the main output(s), sets out the work undertaken to assess the affordability, value for money and deliverability of prioritised proposals (WebTAG Step 10). It has considered the benefits and business cases for each of the transport investment proposals as well as the cumulative or additional benefits and impacts from investment in the network as a whole.

2.1.7 A suitable traffic model, which adequately covers the full study area, was not currently available and the study timescale has precluded development of a new model. Instead, the HA Smart Motorway model for the Greater Manchester area has been used to provide initial, indicative forecasts for the proposals. The short timescales of the study programme has also constrained the depth of the environmental assessment of options.

3 Assessment of Benefits and Business Cases

3.1 Introduction

3.1.1 Stage 2 of the study involved a process to generate and sift a range of proposals likely to achieve the objectives as refined following the completion of Stage 1. The process included discussions with a number of stakeholder organisations to ascertain views on the option selection and sifting.

3.1.2 The main output from that stage of the study was a report which included a short list of the best performing schemes in the form of packages to be investigated further in Stage 3.

3.1.3 Three of the preferred options / packages were based on the same central package supported by a variant scheme at the western end of the corridor (Mottram, Hollingworth and Tintwistle).

3.1.4 The central package comprised:

- A57(T) to A57 Link;
- Safety measures;
- Climbing Lanes (including a proposed realignment at Salter's Brook);
- Dualling the A61; and
- Technology measures.

The variants at the western end of the route were:

- Bypass of Mottram, Hollingworth and Tintwistle;
- Mottram Moor Link Road; and
- A57 Mottram One Way.

3.1.5 A fourth shortlisted option was for the proposed dualling of the A61 which was assessed in isolation in addition to its inclusion within the above three packages.

3.2 Refinement of Options

3.2.1 During stage 2 the proposed central package included the introduction of an enhanced maintenance strategy, focusing on the core trunk route i.e. the A628 and A616. This was not taken forward for inclusion in the relevant business case assessment as the benefits, costs and impacts could not be assessed within the timescales of the study. Further work will need to be undertaken to assess this, which will be taken forward by the Highways Agency as part of their maintenance regime / strategy for the route(s).

3.2.2 The following sections outline the methodology for undertaking further analysis of each of the options / packages. The assessment during this stage followed step 10 of WebTAG and were based on the business case framework of strategic, economic, financial, commercial and management cases.

3.3 Approach and Methodology

Purpose

3.3.1 In line with Her Majesty's Treasury (HMT) appraisal requirements, the economic, environmental, social and distributional impacts of each of the packages were all examined, using qualitative, quantitative and monetised information. This provided a brief and consistent summary of expected qualitative, quantitative and monetised impacts.

3.3.2 For all four options / packages two scenarios have been assessed as part of this appraisal:

- Do Minimum (DM) scenario; and
- Do Something Package 1 (DSP1) scenario.

3.3.3 These scenarios have been modelled using the Greater Manchester (GM) SATURN model and a purpose built S-Paramics model with monetised and non-monetised benefits derived from model outputs.

3.4 Methodology – Benefits Identification

3.4.1 The following monetised benefits have been modelled and used to generate an initial Benefit Cost Ratio (BCR).

- User travel time savings:
  - Business; and
  - Consumer.
- Accidents;
- Greenhouse Gases; and
- Indirect Taxes.

3.4.2 The following benefits have been appraised but not monetised and appear in the key findings as qualitative assessments:

- Air Quality;
- Noise;
- Reliability;
- Regeneration;
- Wider Economic Impacts;
- Landscape;
- Townscape;
- Historic Environment;
- Biodiversity;
- Water Environment;
- Journey quality;
- Physical activity;

- Affordability;
- Severance;
- Security; and
- Access to Services.

3.5 Initial Financial Model Methodology

3.5.1 Monetised benefits were assessed using the Greater Manchester (GM) SATURN highway model and a purpose built S-Paramics model. A qualitative approach has been adopted to assess non-monetised benefits.

GM SATURN Model

3.5.2 The SATURN model is the highway component of a suite of models developed by and for Transport for Greater Manchester (TfGM), which also includes public transport and a variable demand model (VDM). The model was previously used for testing of the HA's M60 Smart Motorways proposal at which stage it was re-validated to the 2013 base year. The assessment of trans-Pennine options makes use of this version of the model, specifically Do Something networks and demand generated for the assessment of M60 Smart Motorways Phase 1 (M62 J18-20) proposals.

3.5.3 The modelling employs an opening year of 2020 and a design year of 2035 and 3 average hour time periods – AM (07:00-10:00), Inter-Peak (10:00-16:00) and PM (16:00 – 19:00).

3.5.4 The following options have been appraised using the model.

3.5.5 **Do Minimum (DM):** Scenario made up of 'committed' transport schemes and development growth. Do Something networks from the M60 Smart Motorways Phase 1 assessment were adapted for use as the DM for trans-Pennine modelling.

3.5.6 The following highway schemes are identified in the M60 uncertainty log as "near certain" or "more than likely" and are therefore included in trans-Pennine modelling:

- WGIS (Western Gateway Infrastructure scheme) Port Salford;
- A556 Knutsford-Bowden;
- Heywood Link Road;
- Wigan IRR; and
- SEMMMS (South East Manchester Multi Modal strategy).

3.5.7 In addition to these schemes Smart Motorways Phase 1 (M62 J18-20) is also included in the Do Minimum scenario.

3.5.8 Modelling of trans-Pennine packages employed modified (to take account of base year manipulation) fixed demand SATURN assignments originally generated for the M60 Smart Motorways project. These include travel demand growth from the following sources:

- The general growth in travel demands due to changes in population, employment, income and car ownership;

- The specific changes in travel associated with new developments; and
- Changes in goods vehicle movements relating to future land use patterns and economic activity.

3.5.9 **Do Something Package 1 (DSP1):** The DSP1 network includes the following interventions from package 1, which together are the Western End Interventions:

- A57(T) to A57 Link; and
- Mottram, Hollingworth and Tintwistle Bypass.

3.5.10 **Do Something Package 2 (DSP2):** The DSP2 network includes the following interventions from package 2, which together are the Western End Interventions:

- A57(T) to A57 Link; and
- Dual Carriageway Link Road M67 to A57 Mottram Moor (Mottram Moor Link)

3.5.11 **Do Something Package 3 (DSP3):** The DSP1 network includes the following interventions from package 3, which together are the Western End Interventions:

- A57(T) to A57 Link; and
- A57 Mottram One Way

3.5.12 Coding was based on descriptions and plans of these interventions as described in the stage 2 report. It also follows standard attribute values and conventions used throughout the GM SATURN model. Demand is the same as that used in the DM scenario.

3.5.13 Following the initial assignment, checks were made and refinements to network coding (such as signal timings) were carried out to reflect changes in traffic routeings and flow. Assignments were re-run and then appraised in TUBA.

Values of Time / Vehicle Operating Costs

3.5.14 Value of time and vehicle operating costs used in the model's generalised cost calculation were derived from WebTAG Unit 3.5.6 and are set out in Table 3-1.

Table 3-1 – Model PPM / PPK values

Model Year	User Class	Value of Time (pence per minute)			Vehicle Operating Costs (pence per km)		
		AM	IP	PM	AM	IP	PM
2020 Opening Year	Commute	14.74	14.63	14.44	6.23	6.23	6.23
	Employer's business	50.02	48.93	48.10	12.64	12.64	12.64
	Other	18.59	19.32	19.93	6.23	6.23	6.23

Model Year	User Class	Value of Time (pence per minute)			Vehicle Operating Costs (pence per km)		
	LGV	22.60	22.60	22.60	14.90	14.90	14.90
	OGV	22.90	22.90	22.90	49.21	49.21	49.21
2035 Design Year	Commute	19.49	19.37	19.17	5.09	5.09	5.09
	Employer's business	66.31	65.02	63.78	11.54	11.54	11.54
	Other	23.96	24.88	25.80	5.09	5.09	5.09
	LGV	30.24	30.24	30.24	14.29	14.29	14.29
	OGV	30.65	30.65	30.65	54.36	54.36	54.36

A61 Dualling Project Appraisal report (PAR) Assessment

3.5.15 Packages 1, 2 and 3 also includes the dualling of the A61 between M1 J36 and the Westwood roundabout although this has not been appraised using the GM model due to the intervention falling well outside the fully modelled area.

3.5.16 However, the value for the Present Value Benefit (PVB) has been derived from appraisal for a Pinch Point Scheme for the A61 Dualling scheme and the associated HA PAR worksheet. The PAR states that the project is at the 'Conception' stage and that a 'Foundation' PAR type has been used.

3.5.17 Information supplied by the HA outlines that the traffic modelling informing the economic assessment was produced using a VISSIM model, which in turn, used traffic flows (circa 2012) taken from a SATURN model for the area. It should be noted that the base models were not fully calibrated or validated. In addition, the appraisal was undertaken using the base year and a base year with scheme version of the model: future year forecasts were not produced.

3.5.18 Each VISSIM model includes the proposal for the Westwood Roundabout (signal controlled hamburger arrangement junction) but does not include the A61 Birdwell Roundabout proposals or the full signalisation at M1 J36 that was completed recently.

3.5.19 The PVB value is based on an assessment of the journey time impacts on Business Users and Commuting and Other Users, together with an assessment of the accident savings, both of which are appraised over a 60 year period.

3.5.20 The user benefits calculated assume a level of congestion relief based on an increase in the link capacity of 3,600 vehicles (2-way).

PARAMICS – Climbing Lanes and Salter's Brook re-alignment

3.5.21 The proposals for climbing lanes and the re-alignment of the A628 at Salter's Brook could not be modelled using the SATURN model. Instead the assessment was undertaken using the micro simulation software S-Paramics 2014.1 and economic assessment package PEARS 2014.1. S-Paramics allows detailed modelling of overtaking and the effects of gradient on vehicle speeds and acceleration. The Paramics model consisted of scenarios based on those used in the trans-Pennine packages modelling. Although there was only one set of network changes tested as part of the climbing lanes / Salter's Brook scheme, there are three sets of flows from the SATURN model (interventions at the western end) in the SATURN model which are assigned in both the with and without scheme networks in Paramics.

Safety Measures

3.5.22 The initial step of this assessment looked at observed accident rates and identified stretches of the A628 where the accident rate over a 5 year period (2007 - 2011) exceeded the national average (DfT statistics RAS10002 statistics). Where the observed rate exceeded the national average it was assumed the proposed safety measures would reduce the accident rate to the national level for the road type in the future. The benefits of these savings were appraised over a 30 year period. The assumption that casualties would reduce to the national level has been used to give an illustration of possible benefits only.

3.5.23 A reduction in the 60mph speed limit to 50mph proposed in the option has been assessed to have no direct impact on journey times because, due to the alignment of the A628, typical speeds are already significantly lower than 60mph.

Technology

3.5.24 It has not been possible to quantitatively assess the benefits of technology (VMS) because at the current time there is no established methodology for assessing technology on a single carriageway route. An evidence-based approach was also unable to be adopted due to a lack of similar case studies. It has been assumed that technology will generate reliability and journey quality benefits across the 60 year appraisal period, with such benefits likely to exceed the relatively small investment costs. As with the safety measures the assumption adopted here is for illustrative purposes.

3.6 Environmental Assessment Methodology

Traffic Related Environmental Topics

3.6.1 A screening exercise was undertaken to identify affected links according to the Design Manual for Road and Bridges Volume 11, Section 3, Part 1. This is line with Step 1 of the WebTAG Unit A3 guidance for appraising Air Quality Impacts. Following Step 1, a count of receptors within 200m of the affected links was undertaken to identify sensitive receptors potentially exposed to changes in pollutant concentrations as a result of changes in traffic. An assessment of annual mean concentration of NO2 and PM10 was not undertaken for the affected links. A qualitative assessment of potential number of properties that could experience improvement or worsening in air quality was undertaken considering the location of affected links, number of receptors within 200m of said affected links, direction of traffic data changes in line with the DMRB qualifying criteria and presence of Air Quality Management Area. Modelling will be required to assess potential air quality impact quantitatively.

Non-Traffic Related Environmental Topic

3.6.2 These appraisals have been carried out from existing available information, through desk based research and awareness of the existing corridor.

3.7 Assumptions for Economic Cost Benefit Analysis

Cost Assumption

3.7.1 Outturn and present value scheme costs (PVC) were supplied by the HA's cost consultant (Benchmark). A range of outturn costs were made available but only a single PVC. Outturn cost ranges were converted to ratios and applied to PVC to give a cost range reflecting cost uncertainties. The outturn cost include the technology package.

3.7.2 The PVC value was used in the initial BCR value. The PVC values and the initial BCR excludes the technology package. The lower and higher PVC values were used to present a range in the adjusted BCR values.

Appraisal

3.7.3 TUBA version 1.9.4 was used to generate user benefits over the 60 year appraisal period from the GM model, PEARS 2014.1 was used in the appraisal of model outputs from S-PARAMICS. Accident benefits were calculated separately using the DfT's COBA spreadsheets.

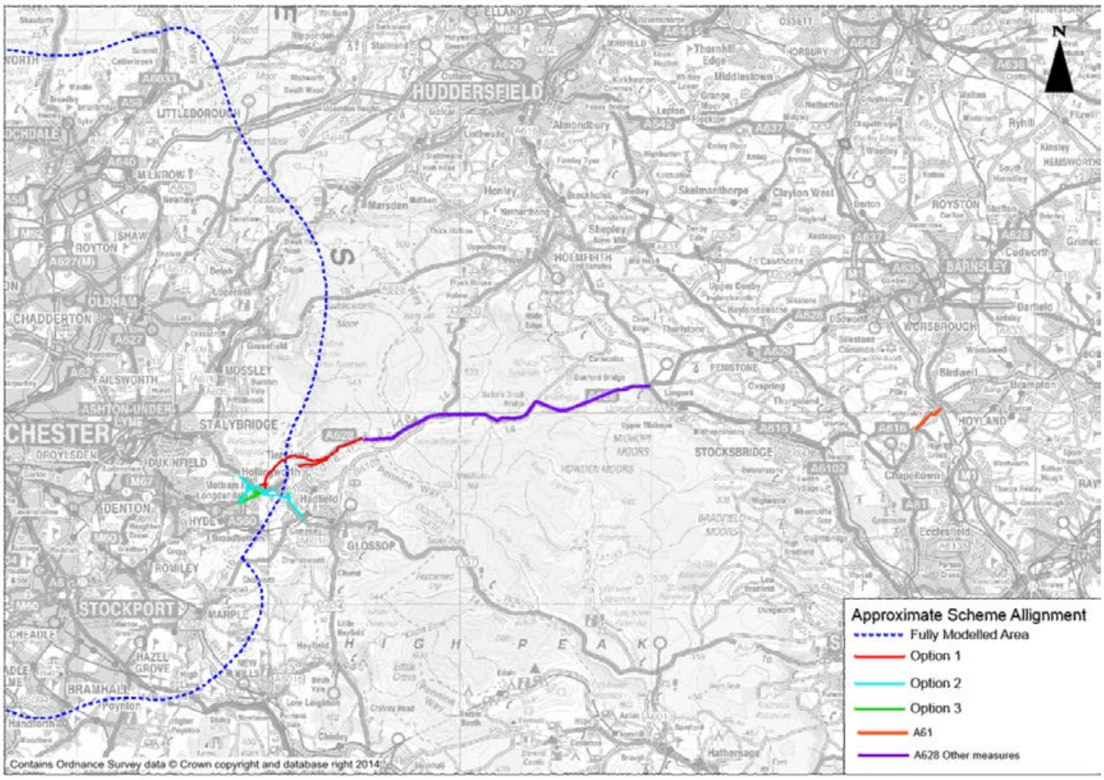
3.7.4 For the A61, the value for benefits have been taken from the PAR document.

3.7.5 Due to the study timescales benefits from noise and air quality have not been monetised.

Sensitivity

3.7.6 The key risk associated with this assessment was that the model used for appraising the packages was designed to assess transport schemes in Greater Manchester and therefore the fully modelled area does not extend to cover the whole of the trans-Pennine area of interest. This is illustrated in Figure 3-1.

Figure 3-1 – Fully Modelled Area



3.7.7 The fully modelled area should ideally cover an “area over which proposed interventions have influence” (TAG Unit M3.1, Page 3) and within this area all trips should be modelled and the network should be simulated or coded as buffer network with speed / flow relationships”. As this is not the case there is significant risk that:

- Journey times are unreliably modelled due to lack of capacity constraint and delay on a fixed speed network; and
- A high proportion of demand in the study area is unobserved and it could be incomplete.

3.7.8 The model is also not validated to a WebTAG compliant level in the area of interest, although steps have been taken to calibrate the model and improve detail within this area.

3.7.9 These factors clearly have an impact on the robustness of any results emerging from the model. In order to reflect this uncertainty, BCR values have been presented as ranges.

3.7.10 There are also several other limitations of the methodology which stem from not employing the full suite of GM models (variable demand and public transport models) at this stage of modelling:

- Highway only model – no mode choice response; and
- Fixed demand matrices – route choice but no demand response mechanism.

3.7.11 It is acknowledged that further work will be required to build a WebTAG compliant trans-Pennine model for preparation of any full business cases for the investment proposals.

3.7.12 Given the early stages of assessment, further work would be required to understand the key risks, sensitivities and uncertainties.

3.7.13 The cost estimates only include investment costs and do not include operating and maintenance costs.

Initial BCR

3.7.14 The initial BCR calculation used PVC, cost estimates only include investment costs and do not include operating and maintenance costs.

3.7.15 A number of other uncertainties and sensitivities were identified during the course of forecasting and adjustments were made to these parameters in the initial BCR figures and are summarised below:

- **Cost:** In addition to PVC a range of outturn costs were also supplied. These ranges were converted to ratios and applied to PVC to give a cost range reflecting cost uncertainties. BCRs are therefore presented as a range of values;
- **DM model time period inconsistencies:** As part of the checks undertaken following TUBA runs it was noted the PM period consistently returns greater journey time benefits than the AM period across all packages and model years. Following investigation it was discovered a large proportion of this discrepancy stemmed from a coding error in the DM model inherited from the previous model version. This error excessively constrained eastbound traffic capacity (relative to AM and IP periods) on the M67 in the DM. In order to gauge the impact of this error a sensitivity test was undertaken which looked at the PM DM with the constraint removed and the level of benefits generated when the DM is compared to the Do Something packages. From this it was calculated that approximately £25m of additional benefits were being accrued in the PM period. An adjustment was applied to the benefits to reflect this sum; and
- **Cordoned benefits:** Checks undertaken on TUBA outputs at a sector level showed quite large benefits were being generated in model sectors which are a long distance from the study area. These benefits are not deemed to be realistic and can be attributed to 'model noise'. To get a more accurate interpretation of benefits resulting from scheme interventions, benefits were cordoned in this way.

Adjusted BCR

3.7.16 An adjusted BCR has not been calculated. Guidance contained in the DFT's Value for Money Assessment: Advice Note for Local Transport Decision Makers was reviewed and it was concluded that the BCR could not be adjusted with any certainty, given the stage of the study (feasibility) and the confidence in the tools available.

3.7.17 *Environment*

- **Traffic Related Environmental Topics:** These appraisals do not take into account modelled changes in noise levels or pollutant concentrations as a result of changes in traffic flow, speed and compositions brought on by this package and other natural influences such as screening from landforms, buildings, barriers, wind speed etc.;
- **Non Traffic Related Environmental Topics:** These appraisals have been carried out from existing available information, through desk based research and awareness of the existing corridor. Site based surveys are required to assess the potential impacts. The level of uncertainty of these appraisals is high; and
- **Key Sensitivities:** These include 11 Defra Noise Important Areas, 4 Air Quality Management Areas, Peak District National Park, 3 Conservation Areas, Listed Buildings, Scheduled Monuments, The Peak District Moors Special Protection Area, South Pennine Moors Special Area of Conservation and The Dark Peak Site of Special Scientific Interest. For the A61, in isolation, there are 2 Air Quality Management Area and the Potter Holes Local Nature Reserve.

3.8 Stakeholder Engagement

3.8.1 A stakeholder reference group meeting took place on the 5th November 2014 where the opportunity was taken to set out and discuss the methodology adopted during Stage 3 of the study. The emerging results to assess the value for money, affordability and deliverability of prioritised options were outlined and feedback was gathered.

3.8.2 Feedback from stakeholders at this session included a view were broadly supportive of the options being presented. Some concerns were raised about the impact that some of the schemes may have on traffic levels to the east of the Pennines. Also clarification was sought on the anticipated journey time benefits.

4 Package 1 – Central Package plus Bypass of Mottram, Hollingworth and Tintwistle

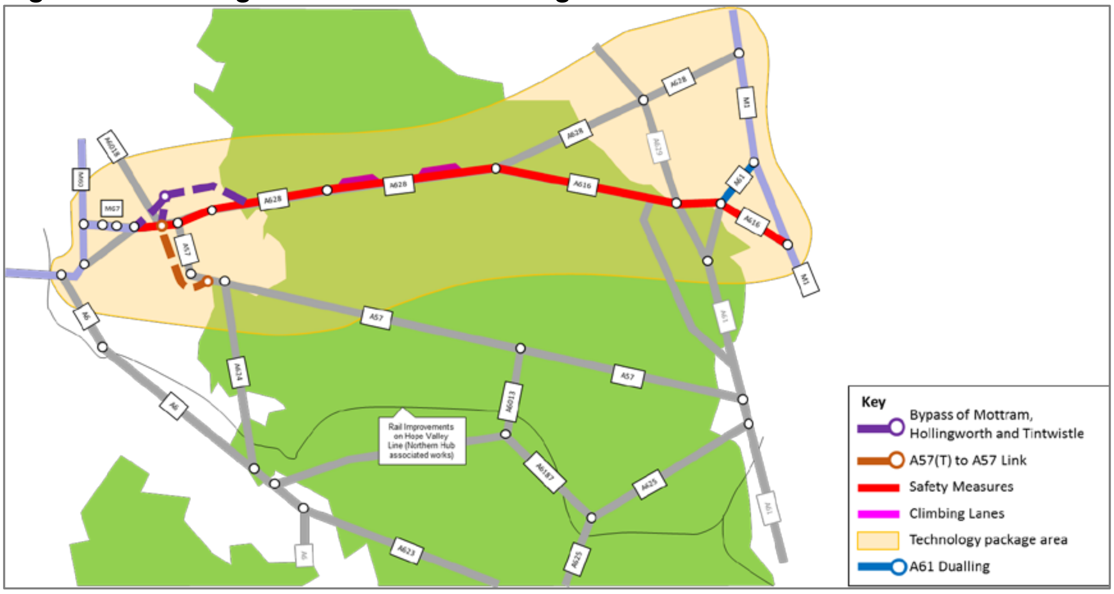
4.1 Package Overview

4.1.1 Trans-Pennine Route Package 1 consists of the following elements:

- **Bypass of Mottram, Hollingworth and Tintwistle** – Construction of a 5.7km dual carriageway link from the M67 terminal roundabout to a new 'Showground roundabout', including a tunnelled section under Roe Cross Road, Old Road and Old Hall Lane in Mottram. Construction of a new single carriageway link between the 'Showground roundabout' and the A628 east of Tintwistle, near Townhead Farm;
- **A57(T) to A57 Link** – Construction of a new single carriageway link road from the A57(T) at Mottram Moor to a new junction on the A57 at Brookfield, bypassing the existing A628 / A57 and A57 Woolley Lane/Hadfield Road junctions (this element of the package would be located on the local authority highway network);
- **A61 Dualling** – Conversion of the existing single carriageway A61 to dual carriageway between the A616 roundabout and M1 junction 36;
- **Route Safety Improvements** – Introduction of a range of safety improvements focussed on identified accident clusters and junctions with high numbers of accidents. Measures include a review of the existing signing and road marking provision together with appropriate targeted improvements, enhanced crossing facilities at appropriate points of demand and speed limit reductions;
- **Climbing Lanes (including a proposed realignment at Salter's Brook)** – Provision of three separate eastbound climbing lanes on the A628, focused on sections with significant gradients. The first location commences approximately 200m east of Woodhead Bridge and continues in an easterly direction for 1.3km. The second location commences 1.5km west of Salter's Brook Bridge and continues in an easterly direction for approximately 1.1km. The third climbing lane is part of a wider realignment of the A628 including the replacement of the viaduct / bridge at Salter's Brook. The climbing lane itself commences 500m west of Salter's Brook and continues in an easterly direction for approximately 1.6km; and
- **Technology Package** – Installation of Variable Message Signing (VMS) on strategic routes and the surrounding local road network to inform motorists of incidents, closures and/or severe weather. Use of average speed cameras to enforce speed limits and red light camera compliance technology at traffic signalised junctions. Use of Vehicle Activated Signing (VAS) at appropriate locations to re-enforce safe speeds and highlight potential hazards on routes.

4.1.2 The following schematic drawing highlights the location of the different elements of Package 1 in relation to the trans-Pennine study area.

Figure 4-1 Package 1 Schematic Drawing



4.2 Strategic Case

Case for Change

4.2.1 The strategic case is broadly similar for packages 1, 2 and 3 therefore, to avoid repetition it has been included in this chapter only. Only risks and constraints unique to packages 2, 3 are highlighted in the subsequent relevant chapters.

4.2.2 Stakeholders generally accept that poor connectivity between the Greater Manchester and Sheffield city regions is currently suppressing economic activity. Therefore a failure to implement any significant improvements to the corridor will result in a continuation of the numerous problems and issues that were identified during this stage. Journey times and reliability will continue to be adversely impacted on, placing a constraint on the connectivity between Manchester and Sheffield and subsequently constraining economic growth.

4.2.3 In addition, the city regions, with their component local authorities, have very significant plans for growth in houses and employment over the coming decade and beyond, with 220,000 homes and 265,000 jobs planned. This level of development is likely to increase demand for travel across the Pennines.

Investment Aims

4.2.4 A number of key objectives were established as part of Stage 1 of the trans-Pennine Route feasibility study. These are summarised in Table 4-1, together with an overview of how each objective aligns with the strategic objectives of the HA.

Table 4-1 – Objectives

Objective	Alignment with HA Strategic Objectives
Connectivity – improving the connectivity between Manchester and Sheffield through a reduction in journey times and improved journey-time reliability.	Enhanced connectivity through reduced journey times and improved reliability will not only '*support and facilitate economic growth*' but contribute to ensuring that the trans-Pennine network is '*operated efficiently and effectively'*.
Environmental – avoiding unacceptable impacts on the natural environment and landscape in the Peak District National Park, and optimising environmental opportunities.	This Environmental objective aligns with the strategic aims to both '*minimise the negative impacts on users, local communities and the environment'* and '*balance the needs of individuals and businesses who rely on it'*.
Societal – improving air quality and reducing noise impacts, and addressing the levels of severance on the Trans-Pennine routes in urban areas.	Reducing noise levels, air pollution and severance aligns with the strategic objectives to both '*minimise the negative impacts on users, local communities and the environment*' and '*balance the needs of individuals and businesses who rely on it'*.
Capacity – reducing delays and queues that occur during peak hours and improving the performance of junctions on the routes.	Reducing peak hour delays/queues and improving junction performance will contribute to ensuring that the strategic network '*is operated efficiently and effectively*' thus '*supporting and facilitating economic growth*'.
Resilience – improving the resilience of the routes through reductions in the number of incidents and reduction of their impacts.	Improved resilience aligns closely with a number of the strategic objectives such as ensuring that the network is '*operated efficiently and effectively*', and '*maintained to a safe and serviceable condition*', '*minimising negative impacts on users, local communities and the environment*' and therefore '*supporting and facilitating economic growth*'.
Safety – reductions in the number of accidents and reductions in their impacts.	Improving the safety of the trans-Pennine route accords well with the HA's strategic aims for the network, ensuring that it is '*maintained to a safe and serviceable condition*' and '*minimises its negative impacts on users, local communities and the environment*'.

Policy Fit

4.2.5 There are a number of committed and emerging schemes on the strategic and local highway network and the rail network. These were identified in stage 1 and discussed in relation to option generation and development in stage 2. Whilst these schemes will deliver some benefits to users of the route, there remains a need for significant further improvements to the trans-Pennine corridor to address the problems that have been identified during Stage 1 of the feasibility study and to meet the stated objectives of the study.

Contribution to DfT Objectives and Wider Government Aims

4.2.6 The package aligns with the work undertaken within the Higgins report "Rebalancing Britain" (2014 DfT) which includes proposals for improved east-west connections, not just on the railways but on the whole transport system. The key recommendation of this work is HS3, a high speed link connecting the North's great cities.

4.2.7 The package strongly aligns with the 'Investing in Britain's Future, (2013, HMT)' and 'Action for Roads (2013, DfT)' documents, aiming to address some of the most significant locations of highway congestion in the country.

4.2.8 Furthermore, the Consultation on a Draft National Policy Statement for the National Road and Rail Networks cites transport as "an engine for growth", delivering the countries long term needs by supporting a prosperous and competitive economy and improving overall quality of life. Package 1 strongly aligns with this policy.

4.2.9 In relation to the 'Creating Growth, Cutting Carbon - Making Sustainable Local Transport Happen (2011, DfT) White Paper, the package is anticipated to lead to some reduction in carbon emissions (emissions are expected to reduce as a result of less congestion, however, traffic levels increase due to the increased attractiveness of route), the forecasted reduction in congestion is expected to lead to reduced journey times and improved reliability and connectivity, helping to facilitate economic growth. Public transport journey times and reliability are also expected to improve which may increase passenger numbers. Furthermore, the bypass element is expected to lead to a reduction in traffic within Mottram, Hollingworth and Tintwistle, which may increase walking and cycling in these localities.

4.2.10 The package is forecast to improve journey times, reliability and connectivity both for strategic journeys across the trans-Pennine corridor and for local journeys using the network. These impacts of the scheme align with the objectives of the Strategic Economic Plans for the Greater Manchester and Sheffield City Regions and the Derby, Derbyshire, Nottingham, Nottinghamshire regions which all aim to develop infrastructure that will improve connectivity and resilience locally, regionally and nationally. Connectivity to international markets would be improved through stronger links to ports and airports. These improvements aim to help deliver increased economic growth and employment opportunities.

4.2.11 The English National Parks and the Broads circular which was published in March 2010, providing updated policy guidance, outlining that environmental quality should be the primary criterion in the planning of road and traffic management. However, the assessment of the package indicates that there may be a moderate adverse impact on the landscape and a large adverse impact on biodiversity which will require mitigation.

External Business Drivers

4.2.12 At the same time as conducting the trans-Pennine route feasibility study, the HA is also developing a Route Strategy programme, considering current and future performance of the entire strategic network in order to inform future investment decisions.

4.2.13 In addition to this latest feasibility study, a number of other studies have previously been commissioned, both by the HA and other stakeholders to investigate issues on the strategic and local trans-Pennine network. These other studies include:

- South Pennines Route Strategy Evidence Reports (HA, 2014);
- Trans Pennine Connectivity Study (Derbyshire County Council, 2012);
- National Networks Trans-Pennine Connectivity Study (DfT & The Northern Way, 2011);
- Greater Manchester Local Transport Plan 3 (TfGM, 2011);
- Derbyshire Local Transport Plan 3 (DCC, 2011);
- South Yorkshire Local Transport Plan 3 (SYPTE, 2011); and
- Longdendale Integrated Transport Strategy (LITS) (Tameside MBC, 2010).

Risks

4.2.14 There are a number of risks to the delivery of the proposed package of options and these are outlined in the following paragraphs.

Programme

4.2.15 It is understood that any potential government funding for the package would be for the period up to 2021. Therefore, there is clearly a constraint on the delivery of the package, requiring both the statutory procedures to have been completed and a start on site made by this date. An indicative programme for the package has been developed and demonstrates that delivery to this timescale is achievable.

Availability of Funding

4.2.16 At this stage of the study work it has been assumed that proposed investment would be solely government funded.

Traffic Modelling and Appraisal

4.2.17 A suitable traffic model which adequately covers the full study area is not currently available and the study timescales for the development of the study precludes the development of a new model. Instead, the HA Smart Motorway model for the Greater Manchester (GM) area has been updated and used to provide initial, indicative forecasts for elements of the proposed package. The assumptions and associated risks and sensitivities associated with this approach are documented in detail in the Economic Case. Moving forward it would be necessary to develop a new traffic model that covers the study area and allows for improved forecasting of the impacts of the proposed package. As such, there is also a risk that forecasts developed using a new traffic model may differ from those produced as part of this assessment.

Governance Arrangement

4.2.18 The ‘Action for Roads: A network for the 21st century’ command paper published by the Government in July 2013 set out a plan to radically change the way strategic roads are funded and managed, including plans to transform the HA into a government-owned company.

Stakeholder Support

4.2.19 During the trans-Pennine Route Feasibility Study process, a significant amount of engagement has taken place with stakeholders, both through the identification of issues affecting the study area, option generation and sifting process and in terms of the emerging packages of options. In particular a number of stakeholder reference group presentations and discussions have taken place at key milestones during the study. As highlighted in the stage 2 report, stakeholders were broadly supportive of the approach adopted for Stage 2 of the study and the emerging options, noting that any measures that could improve conditions at the western end of the corridor would be welcomed. The A61 Dualling option was also seen as being important, benefiting areas of forecast employment and population growth.

4.2.20 Whilst public consultation has not taken place regarding the full package of measures, previous consultation on a Bypass of Mottram, Hollingworth and Tintwistle and a link road between the A57(T) and A57 was undertaken in 2010 as part of the Longdendale Integrated Transport Study (LITS) produced by Tameside Metropolitan Borough Council. The results of this consultation demonstrated that 81% of respondents were in favour of the bypass, whilst there was 73% support for an A57(T) to A57 Link.

Planning Process

4.2.21 At present, it is assumed that the package of measures will be progressed as a whole and that as a result one Development Consent Order (DCO) will be pursued for the entire package. However, this approach would need investigating further. There is a risk that given the geographic extents of the package of improvements separate DCO’s will be required.

Connectivity during Construction

4.2.22 The construction of the package of options will need to give careful consideration to impacts on traffic movements on the existing network. In particular, at the eastern end of the route traffic management associated with the A61 Dualling will need to be carefully planned so as not to impact on M1, whilst at the western end of the route, tie-ins with the existing carriageway for the Bypass and the A57(T) to A457 Link will need avoid unnecessary delays on the already congested routes, or any delays that may impact on the operation of the M67/A57/A560 junction.

Air Quality and Environmental Mitigation Impact

4.2.23 The study timescales has meant that the scope of any environmental assessment of the package has been constrained. This is outlined in more detail in the Economic Case.

Constraints

4.2.24 There are a number of constraints that could impact on the proposed package of options.

Deliverability / Buildability

4.2.25 The delivery of the package of measures is considered to be highly complex and is anticipated to require the involvement of a wide range of delivery agents.

4.2.26 The topography of the study area is likely to be a key factor affecting buildability issues, with steep gradients on some sections of the route that will be a factor both for the detailed design of the scheme and the access arrangements for construction. Elements such as the Mottram, Hollingworth and Tintwistle Bypass, A57(T) to A57 Link, Climbing Lanes on the A628 and carriageway realignment proposals will be particularly affected by topographical challenges.

4.2.27 Whilst land requirements for elements of the package have been established, it is likely that issues resolving third party land requirements would need resolution, in particular, the elements of the proposal that involve construction in the National Park (bypass, climbing lanes, carriageway realignment at Salter's Brook) may be problematic.

4.2.28 Elements of the Route Safety Improvements and Technology Package will need to overcome issues associated with the siting of signs and power supply.

Environmental

4.2.29 There are a number of direct environmental constraints which need to be considered, both in terms of the actual design of the package of options, but also in terms of the anticipated impact of any measures. Initial environmental analysis has indicated that there are a number of important environmental features in the vicinity of the trans-Pennine corridor, including:

- Peak District National Park;
- Important Areas for Noise and sensitive receptors;
- Air Quality Management Areas and sensitive receptors;
- Conservation Areas;
- Grade II Listed Buildings;
- Peak District Moors Special Protection Area;
- South Pennine Moors Special Area of Conservation;
- Dark Peak Site of Special Scientific Interest; and
- Ancient Woodland

4.2.30 The current guidance on road building in National Parks is set out in the UK Government Vision and Circular for English National Parks and the Broads 2010 which states that there is a strong presumption against any significant road widening or the building of new roads through a Park, unless it can be shown there are compelling reasons for new or enhanced capacity and with any benefits outweighing the costs very significantly.

4.3 Economic Case

4.3.1 The key findings from the analysis relating to the strategic and economic case for package 1 are outlined below.

Monetised benefit

4.3.2 PVB, PVC and BCR are presented in Table 4-2.

Table 4-2 – Monetised Benefit Summary

	Initial BCR
Present Value Benefits (PVB) (£m)	£623m
Present Value Costs (PVC) (£m)	£223m - £321m
Benefit Cost Ratio (BCR)	1.94 – 2.80

4.3.3 Package 1 is shown to offer a range of BCR values depending on the scheme cost assumptions. Note that BCR excludes technology.

4.3.4 Tables 4-3 and 4-4 present journey times for two routes for 2020 and 2035. These results are indicative and are intended to allow comparative assessment of the scale of the potential benefits for the package.

- **Route 1** between the M1 Junction 36 and M67 Junction 4. This routes follows the A61, A616 and A628 (via the bypass in the case of the with scheme scenario).
- **Route 2** from Sheffield Inner Ring Road (Brook Hill) to M67 Junction 4. This route follows the A57, and is included as the A57(T) to A57 Link affects travel times along this alternate Trans-Pennine route.

4.3.5 The climbing lanes with Salter's Brook were modelled separately in Paramics and are therefore recorded separately in the table. The A61 was appraised using a model developed by others and estimates of time savings, which exclude technology measures, are presented separately.

Table 4-3 – Approximate Journey Times by Intervention (minutes) – AM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings A61 dualling	Additional time savings Climbing lanes / Salter's Brook)	Total Change	
		2020			2035						
		DM	DS P1	Change	DM	DSP1	Change			2020	2035
Route 1 EB	42	43	36	-7	44	37	-7	-0.5 to -1	-5	-13	-13
Route 1 WB	47	49	38	-11	51	40	-11	-0.5 to -1	-0.5	-12.5	-12.5
Route 2 EB	50	51	47	-4	53	48	-5	n/a	n/a	-4	-5
Route 2 WB	55	57	54	-3	60	56	-4	n/a	n/a	-3	-4

Table 4-4 – Approximate Journey Times by Intervention (minutes) – PM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings A61 dualling	Additional time savings Climbing lanes / Salter's Brook)	Total Change	
		2020			2035						
		DM	DS P1	Change	DM	DSP1	Change			2020	2035
Route 1 EB	45	44	36	-8	46	37	-9	-0.5 to -1	-5	-14	-15
Route 1 WB	43	45	37	-8	49	41	-8	-0.5 to -1	-0.5	-9.5	-9.5
Route 2 EB	56	55	47	-8	57	49	-8	n/a	n/a	-8	-8
Route 2 WB	51	52	48	-4	56	51	-5	n/a	n/a	-4	-5

4.3.6 Tables 4-3 and 4-4 indicate that if all interventions in the package are implemented then, indicatively, journey time benefits on the key strategic route (A628 and A616) could be up to 13 minutes in the morning peak and up to 15 minutes in the evening peak.

Non Monetised Benefits

4.3.7 Due to time constraints and the level of uncertainty surrounding the monetised benefit calculations (both cost estimates and accuracy of modelled benefits) it was decided that other benefits would be considered using a qualitative approach. Benefits which have a moderate or large impact are summarised in Tables 4-6 and 4-7. The table uses the seven-point scale as set out in in line with TAG guidance and summarised in Table 4-5.

Table 4-5 – 7 Point Scale of impact

Seven point scale of impacts						
Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral	Slight Adverse	Moderate Adverse	Large Adverse

Table 4-6 – Positive Non-monetised Benefits

Impacts	Positive Non-monetised benefits	Scale of impact
Reliability	• Improved reliability – Bypass, A57(T) Link and A61 Dualling reduce congestion at western and eastern ends of route. Climbing Lanes and Safety Improvements will reduce incidents. Better route choice through technology measures (VMS).	Large
Regeneration	• Forecast improved connectivity likely to provide opportunities for regeneration.	Moderate
Wider Impacts	• Forecast improved connectivity will deliver wider economic benefits.	Moderate
Noise	• Reduction in noise with shift in traffic on the bypass	Moderate
Air Quality	• Improvement in air quality due to reduction in receptor exposure to road traffic emission with the bypass.	Large
Townscape	• Removal of traffic from the centres of Mottram, Hollingworth and houses along the existing A57	Moderate
Physical Activity	• Reduced traffic through urban areas likely to increase levels of walking and cycling, supported by safety improvements.	Moderate
Journey Quality	• Reduced traveller stress resulting from reduced congestion and number of incidents. • Improved traveller views for bypass users.	Large
Affordability	• Reduced vehicle operating costs resulting from reduction in congestion.	Moderate
Severance	• Reduce severance in Mottram, Hollingworth and Tintwistle.	Moderate

Table 4-7 – Negative Non Monetised Benefits

Impacts	Negative Non-monetised benefits	Scale of impact
Landscape	• New perceptible feature set on the high ground to the north of Hollingworth, adversely affecting landscape character.	Moderate
Historic Environment	• Impact to Listed Buildings from loss of rural context	Moderate
Biodiversity	• Loss and fragmentation of habitat with a site with two international and one national nature conservation designated. Impact to local nature conservation site	Large
Water Environment	• Impact to groundwater, Increased discharge and flood risk	Moderate

4.3.8 There are a range of both beneficial and adverse environmental impacts anticipated to result from implementation of the package. Noise levels are expected to reduce as vehicles are diverted around Mottram, Hollingworth and Tintwistle, whilst speed reductions on other sections of the route may also reduce noise levels. In terms of air quality, the majority of receptors are expected to experience an improvement, although a significant number of receptors on the A628 and close to the bypass could experience a deterioration. Safety and pedestrian permeability at the western end of the corridor is expected to improve as a result of reduced traffic flows, delivering an improved townscape for local residents.

4.3.9 However, significant adverse impacts are also anticipated. Construction of the bypass element of the package would create a readily perceptible feature, set on high ground north of Hollingworth, adversely affecting the landscape, one of the defining features associated with the Pennines. In relation to biodiversity, some adverse impact on species in the study area can be expected and the Salter's Brook realignment would result in loss and fragmentation of a triple designation habitat (Peak District Moors Special Protection Area, South Pennine Moors Special Area of Conservation and The Dark Peak Site of Special Scientific Interest), an area of international and national importance. Swallows Wood, near Hollingworth, would also be adversely impacted. Finally, groundwater quality may also be adversely affected in addition to increased discharge into a number of watercourses and increased flood risk to the River Etherow.

4.3.10 Table 4-8 presents the carbon impact of this package.

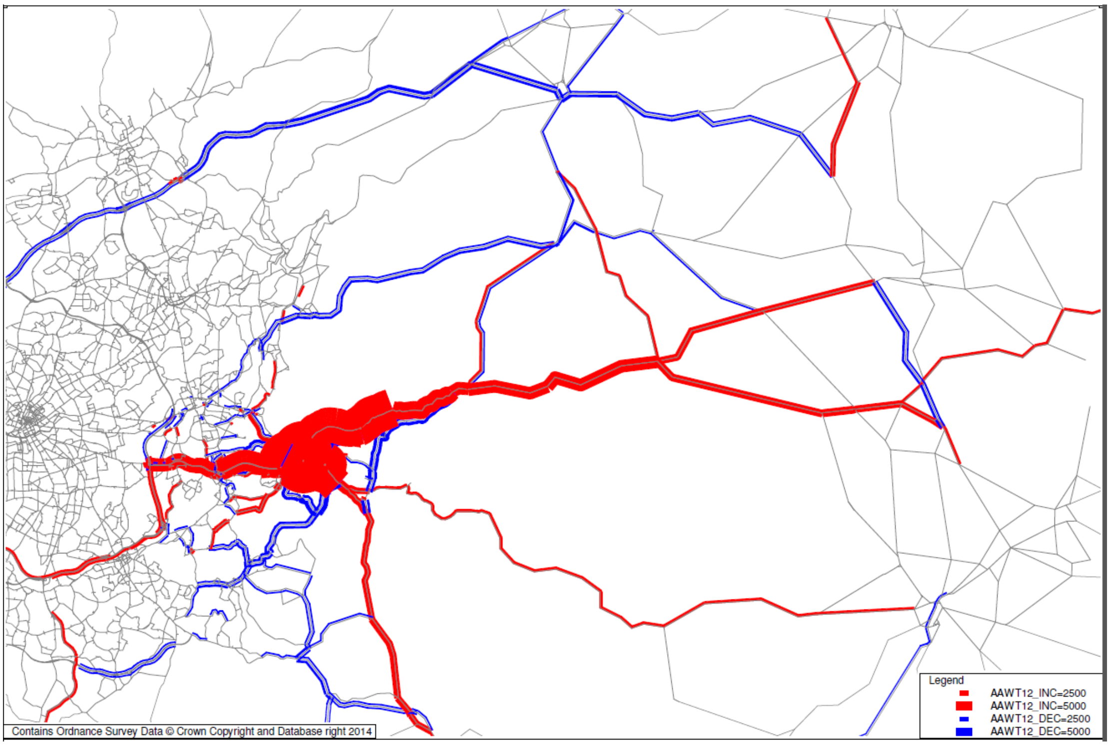
Table 4-8 – Carbon Impact

Carbon impact (tCO_2e) for budget period	2020-2024	2025-2029	2030-2034	2035-2039
Traded sector	9	13	10	5
Non-traded sector	-3,486	-4,648	-5,742	-6,430

Key Objectives and Traffic Analysis

4.3.11 Figure 4-2 compares modelled flows in the DM scenario with those in Package 1. Significant daily increases in DSP1 flows are shown in red, with decreases in blue.

Figure 4-2 – Flow Difference Plot Comparing DM and DSP1 flows



4.3.12 Package 1 has a number of impacts on flows and delays in the study area:

- Large increases in traffic flow in both directions on the A628 between the M1 and eastern end of the Mottram, Hollingworth and Tintwistle route , with a smaller increase in traffic flow on the A57;
- Traffic flow decreases on other trans-Pennine routes, notably the M62 and A635;

- Reduced traffic flow on the A628 / A57(T) through the villages of Tintwistle, Hollingworth and Mottram; and
- Reductions in delays, particularly at the A628 / A57 junctions and M67 J4.

4.4 Financial Case

4.4.1 Present Value Costs (PVC) discounted to 2010 for Package 1 range from £223m to £321m.

4.4.2 The total estimated outturn costs for Package 1 range from £327m to £470m. Table 4-9 summarises the financial costs of the scheme in nominal (outturn) prices.

Table 4-9 – Outturn Project Costs

Option	Outturn Cost Range (£m)
Mottram to Tintwistle Bypass	223 to 323
A57(t) to A57 Link	18 to 26
Salter's Brook	50 to 71
A61 Dualling	12 to 17
Safety Measures	4 to 6
A628 Climbing lanes	15 to 20
Technology Scheme	5 to 7
Total £'m	**327 to 470**

4.5 Commercial Case

4.5.1 Both the commercial and management case for all four packages are the same therefore to avoid repetition a summary has only been included in this chapter. The only difference is the identification of key milestones which are highlighted in the relevant chapter.

4.5.2 If the investment proposals were to enter the next stage of assessment, it will be managed by the Project Control Framework (PCF). The scheme will be placed in PCF Stage 1 (Option Identification) of the Options Phase Costs.

4.5.3 The HA project team and delivery specialists have the necessary skills and experience to deliver client side activities of the scheme.

4.5.4 The PSF (Project Support Framework) has on board consultants that are highly experienced with multi-disciplinary teams which have substantial experience of working on Major Highways Projects for the HA. If the proposals enter the next stage, a procurement exercise would be carried out to appoint respective consultants

4.5.5 The contract will be managed through the HA contract Terms and Conditions and suppliers will be measured against the Measuring Success Toolkit (MST) and will be measured and evaluated on a bi-monthly basis.

4.5.6 The HA is currently in the process of developing a new procurement framework for the delivery of major highway schemes known as the Collaborative Delivery Framework (CDF).

4.6 Management Case

4.6.1 The project will be governed by a Project Board. The Project Board includes the Senior Responsible Owner, Senior User and Senior Supplier. The board will be supported by the Project Manager and various technical specialists from the HA and supply chain at the request of the SRO. The Project Board will be appointed as part of starting up the project. Assurance for the project will be carried out under the HA ICF processes.

4.6.2 At this stage the following have not been produced and will need to be developed as part of PCF Stage 1:

- Detailed Programme;
- Governance Arrangements;
- Project Reporting;
- Contract Management;
- Risk Management Plan;
- Benefits Realisation Plan; and
- Communications and Stakeholder Engagement Plan

4.6.3 Due to the sensitivity and importance of the project, the successful delivery of the project is dependent on communication and stakeholder management. There are a number of interfaces with stakeholders who will have involvement in the project or will need to be engaged throughout the development of the project.

4.6.4 There will be a requirement to conduct formal consultation with the public to confirm the preferred route. Further consultation with statutory bodies will also be required at key milestones in line with best practice and statutory procedures. Consultation with statutory undertakers has not been undertaken as part of the feasibility study and will be carried out in PCF Stage 1.

4.6.5 PCF Stage 1 includes the "identification of options to be taken to public consultation." Public consultations and exhibitions are then carried out as part of PCF Stage 2.

4.6.6 A detailed project plan for the overall scheme would be generated in PCF stage 1. Indicative key milestones are identified in table 4-10.

Table 4-10 – Indicative Project Plan

Stage	Anticipated Completion Date
PCF Stage 1: Options Identification	March 2017
PCF Stage 2: Options Selection	March 2018
PCF Stage 3: Preliminary design	September 2019
PCF Stage 4: Statutory Procedures and Powers	February 2020
PCF Stage 5: Construction Preparation	February 2021
PCF Stage 6: Construction, Commissioning and Handover Open for Traffic	January 2024
PCF Stage 7: Closeout	February 2024

4.7 Summary

4.7.1 A summary of the key findings for Package 1 is as follows:

- Package 1 brings journey time benefits for both trans-Pennine trips and local trips from in and around the Mottram / Tintwistle / Glossop area and should improve reliability for all users;
- Journey times on both the A628 and A57 will decrease as a result of reduced delays at the western end. Eastbound traffic on the A628 will also benefit from climbing lanes and the re-alignment at Salter's Brook;

- The package is effective in improving connectivity between Manchester and Sheffield by increasing capacity at the western end of the route. This also allows traffic growth to be accommodated in the future;
- The inclusion of the full bypass is forecast to move traffic out of Mottram, Hollingworth and Tintwistle which brings benefits for local residents in the form of improved air quality, less noise, accident benefits and reduced severance;
- The proposed alignment of the bypass is likely to have an adverse impact on biodiversity, landscape, historic environment and the water environment;
- As a result of the bypass, traffic flows on the A628 passing through the Peak District National Park are forecast to increase which could bring adverse impacts on the environment and landscape;
- The overall outturn cost of the scheme ranges from £327m to £470m. At this stage the budget is unknown and the contingent liabilities will be unknown;
- If a start is made in March 2015 then it is anticipated that package 1 could achieve start of works by early 2021 and open to traffic by early 2024.

5 Package 2 – Central Package plus Mottram Moor Link Road

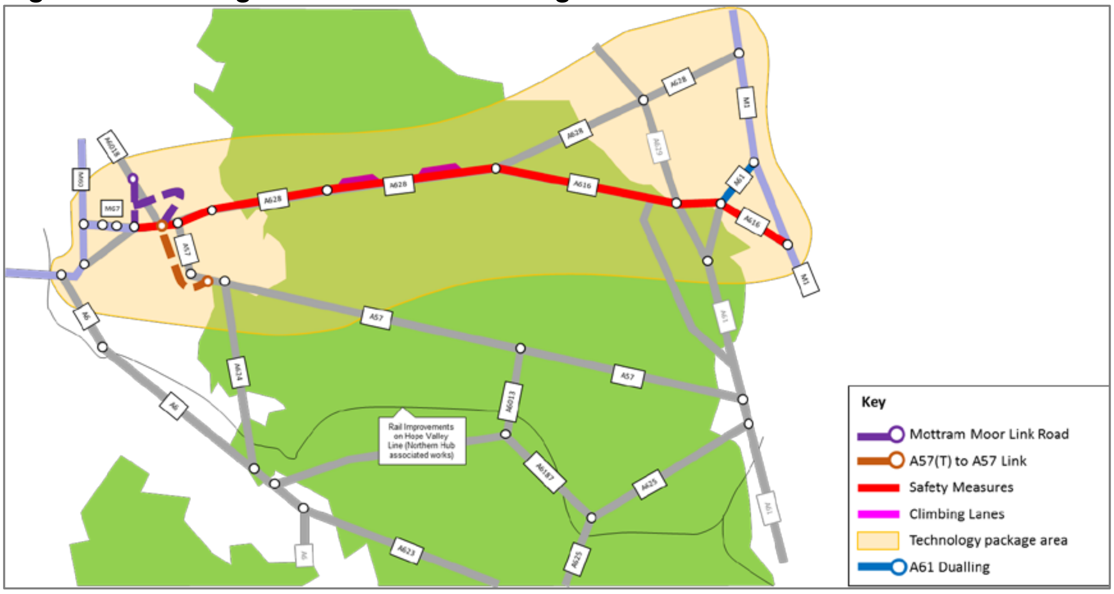
5.1 Package Overview

5.1.1 Trans-Pennine Route Package 2 consists of the following elements:

- **M67 to A57 Mottram Moor Link** – Construction of a new dual-carriageway link road from the M67 terminal roundabout passing beneath Roe Cross Road through a tunnelled section and linked to a new junction at A57(T) Mottram Moor. A new single-carriageway link to Roe Cross Road to the north of the new dual-carriageway including a roundabout junction with the new link road to the west of Roe Cross Road would also be constructed;
- **A57(T) to A57 Link** – Construction of a new single carriageway link road from the A57(T), at Mottram Moor to a new junction on the A57 at Brookfield bypassing the existing A628/A57 and A57 Woolley Lane/Hadfield Road junction (this element of the package would be located on the Local Authorities network);
- **A61 Dualling –** Conversion of the existing single carriageway A61 to dual carriageway between the A616 roundabout and M1 junction 36;
- **Route Safety Improvements** – Introduction of a range of safety improvements focussed on identified accident clusters and junctions with high accident numbers. Measures include a review of the existing signing and road marking provision together with appropriate targeted improvements, enhanced crossing facilities at appropriate points of demand and speed limit reductions;
- **Climbing Lanes (including a proposed realignment at Salter's Brook)** – Provision of three separate eastbound climbing lanes on the A628, focused at sections with significant gradients. The first location commences approximately 200m east of Woodhead Bridge and continues in an easterly direction for 1.3km. The second location commences 1.5km west of Salter's Brook Bridge and continues in an easterly direction for approximately 1.1km. The third climbing lane is part of a wider realignment of the A628 including the replacement of the viaduct / bridge at Salter's Brook. The climbing lane itself commences 500m west of Salter's Brook and continues in an easterly direction for approximately 1.6km; and
- **Technology Package** – Installation of Variable Message Signing (VMS) on strategic routes and the surrounding local road network to inform motorists of incidents, closures and / or severe weather. Use of average speed cameras to enforce speed limits and red light camera compliance technology at traffic signalised junctions. Use of Vehicle Activated Signing (VAS) at appropriate locations to re-enforce safe speeds and highlight potential hazards on routes.

5.1.2 The following schematic drawing highlights the location of the different elements of the Package 2 in relation to the trans-Pennine study area.

Figure 5-1 Package 2 Schematic Drawing



5.2 Strategic Case

5.2.1 The strategic case for package 2 is as presented for package 1 and provides a good strategic fit, meeting many stakeholders' aspirations and policy aims with a positive impact on the economy. Therefore, as this has already been documented this section of the report will only record key differences from the strategic case presented in chapter 4.

5.2.2 The key difference between package 2 and package 1 is the reduced land take required, particularly with regard to the National Park.

5.2.3 This package impacts on fewer environmental features / locations than package 1.

5.2.4 This results in this package being less complex and potentially easier to build and deliver.

5.3 Economic Case

Monetised Benefits

5.3.1 PVB, PVC and BCR are presented in Table 5-1.

Table 5-1 – Monetised Benefit Summary

	Initial BCR
Present Value Benefits (PVB) (£m)	£532m
Present Value Costs (PVC) (£m)	£134m - £194m
Benefit Cost Ratio (BCR)	2.74 – 3.96

5.3.2 Package 2 is shown to offer a range of BCR values depending on the scheme cost assumptions. Note that the BCR excludes technology.

5.3.3 Table 5-2 and 5-3 present journey times for 2 routes for 2020 and 2035. These results are indicative and are intended to allow comparative assessment of the scale of the potential benefits for the package.

- **Route 1** between the M1 Junction 36 and M67 Junction 4. This routes follows the A61, A616 and A628 (via the Mottram Moor Link in the case of the with scheme scenario).
- **Route 2** from Sheffield Inner Ring Road (Brook Hill) to M67 Junction 4. This route follows the A57, and is included as the A57(T) to A57 Link affects travel times along this alternate trans-Pennine route.

5.3.4 The climbing lanes with Salter's Brook were modelled separately in Paramics and are therefore recorded separately in the table. The A61 was appraised using a model developed by the HA and estimates of time savings, which exclude technology measures, are presented separately.

Table 5-2 – Approximate Journey Times by Intervention (minutes) – AM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings	Additional time savings	Total Change	
		2020			2035						
		DM	DS P2	Change	DM	DSP2	Change	A61 dualling	Climbing lanes / Salter's Brook)	2020	2035
Route 1 EB	42	43	40	-3	44	41	-3	-0.5 to -1	-5	-9	-9
Route 1 WB	47	49	48	-1	51	50	-1	-0.5 to -1	-0.5	-2.5	-2.5
Route 2 EB	50	51	47	-4	53	48	-5	n/a	n/a	-4	-5
Route 2 WB	55	57	55	-2	60	56	-4	n/a	n/a	-2	-4

Table 5-3 – Journey Times by Intervention (minutes) – PM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings	Additional time savings	Total Change	
		2020			2035						
		DM	DS P2	Change	DM	DSP2	Change	A61 dualling	Climbing lanes / Salter's Brook)	2020	2035
Route 1 EB	45	44	41	-3	46	43	-3	-0.5 to -1	-5	-9	-9

Route 1 WB	43	45	43	-2	49	47	-2	-0.5 to -1	-0.5	-3.5	-3.5
Route 2 EB	56	55	48	-7	57	50	-7	n/a	n/a	-7	-7
Route 2 WB	51	52	47	-5	56	50	-6	n/a	n/a	-5	-6

5.3.5 Tables 5-2 and 5-3 indicate that if all interventions in the package are implemented then, indicatively, journey time benefits on the key strategic route (A628 and A616) could be up to 9 minutes in the morning peak and up to 9 minutes in the evening peak.

Non Monetised Benefits

5.3.6 Due to time constraints and the level of uncertainty surrounding the monetised benefit calculations (both cost estimates and accuracy of modelled benefits) it was decided that other benefits would be considered using a qualitative approach. Benefits which have a moderate or large impact are summarised in Table 5-5. The table uses the seven-point scale as set out in in line with TAG guidance and summarised in Table 5-4.

Table 5-4 – 7 Point Scale of impact

Seven point scale of impacts						
Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral	Slight Adverse	Moderate Adverse	Large Adverse

Table 5-5 – Non-monetised Benefits

Impacts	Positive Non-monetised benefits	Scale of impact
Reliability	• Improved reliability – Mottram Link and A57(T) Link reduce congestion at western end of route. A61 Dualling reduces congestion on eastern section. • Climbing Lanes, Route Safety Improvements, Maintenance Strategy and Technology Package will reduce number of incidents, improving reliability across the route. • Better route choice through technology measures (VMS).	Moderate
Air Quality	• Reduction in receptor exposure to road traffic emission with traffic diversion.	Moderate
Journey Quality	• Reduce traveller stress – Route Safety Improvements reduce fear of accidents; Climbing Lanes, A57(T) Link, A61 Dualling and Mottram Link reduce frustration for users who are either be inhibited by slower moving vehicles or are travelling on congested sections of the route.	Moderate

5.3.7 There are a range of both beneficial and adverse environmental impacts anticipated to result from construction of the package. In terms of air quality, the majority of receptors are expected to experience an improvement, although a significant number of receptors on the A628 and close to the Mottram Moor Link alignment could experience a deterioration. Safety and pedestrian permeability in Mottram and along the A57 is expected to improve as a result of reduced traffic flows, delivering an improved townscape for local residents. However, significant levels of traffic are still anticipated to pass through Hollingworth and Tintwistle.

5.3.8 Significant adverse impacts are also anticipated, such as an overall adverse impact on noise levels, despite a reduction in the number of receptors affected and the potential for reduced noise levels as a result of speed reductions on other sections of the route. The package is expected to result in the erosion of some of the open countryside, adversely affecting the landscape, one of the defining features associated with the Pennines. In relation to biodiversity, some adverse impact on species in the study area can be expected and the Salter's Brook realignment would result in loss and fragmentation of a triple designation habitat (Peak District Moors Special Protection Area, South Pennine Moors Special Area of Conservation and The Dark Peak Site of Special Scientific Interest), an area of international and national importance. Finally, groundwater quality may also be adversely affected in addition to increased discharge into a number of watercourses and increased flood risk to the River Etherow.

5.3.9 Table 5-6 presents the carbon impact of this package.

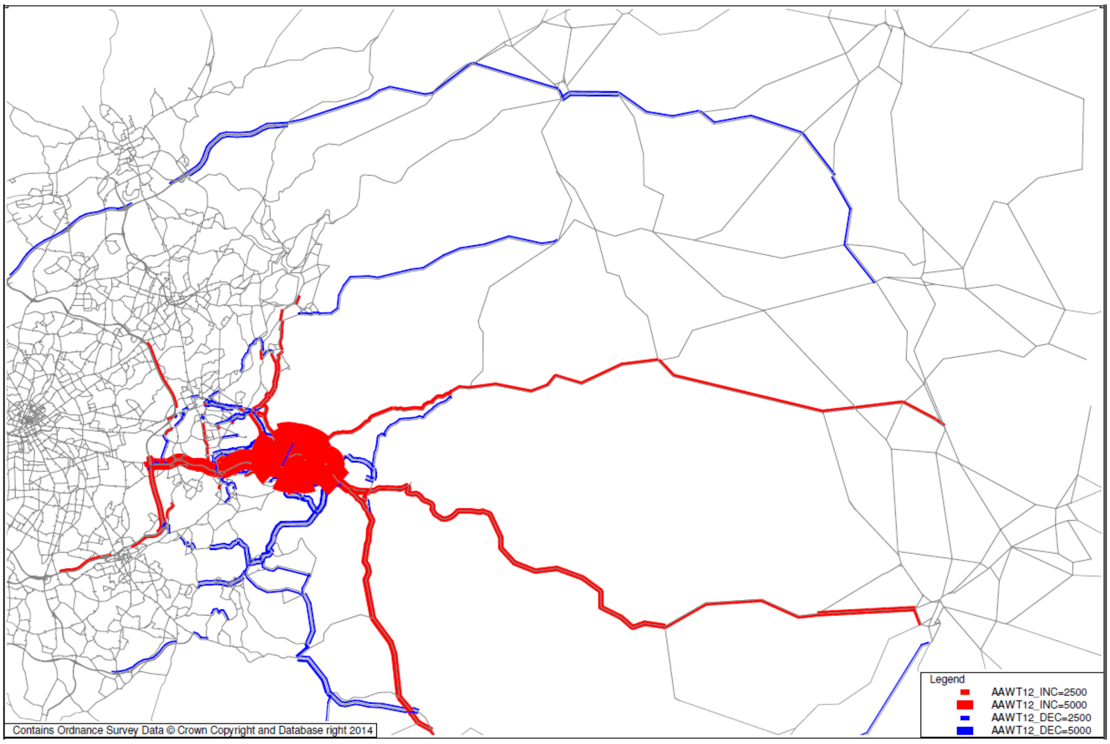
Table 5-6 – Carbon Impact

Carbon impact (tCO_2e) for budget period	2020-2024	2025-2029	2030-2034	2035-2039
Traded sector	11	15	11	7
Non-traded sector	-1,186	-2,185	-3,125	-3,705

Key Objectives and Traffic Analysis

5.3.10 Figure 5-2 compares modelled flows in the DM scenario with those in Package 2. Significant daily increases in DSP1 flow are shown in red, with decreases in blue.

Figure 5-2 – Flow Difference Plot Comparing DM and DSP2 flows



5.3.11 Package 2 has a number of impacts on flows and delays in the study area:

- Increases in traffic flow on A57 and A624. This is due to the reduction in congestion at the A57 / A628 junction which traffic using the A57(T) - A57 link will bypass. A smaller increase in traffic flow on the A628;
- Traffic flow decreases on other trans-Pennine routes, notably the M62 and A635;
- Traffic flow decrease on the Monks' Road / A626 (route parallel to the A624);
- Large traffic flow decrease on A57 (T) Mottram Moor through the village of Mottram;
- Traffic flows on the A628 through Hollingworth and Tintwistle remain relatively stable;
- Increased flow on M67 and reductions in traffic flow on some alternative more minor roads such as A57 (Mottram Road) and Victoria Street / Matley Lane; and
- Reductions in delays, particularly at the A628 / A57 and A57 / B6174 junctions.

5.4 Financial Case

5.4.1 Present Value Costs (PVC) discounted to 2010 for Package 2 range from £134m to £194m.

5.4.2 The total estimated outturn costs for Package 2 range from £196m to £283m. Table 5-7 summarises the financial costs of the scheme in nominal (outturn) prices.

Table 5-7 – Outturn Project Costs

Option	Outturn Cost Range (£m)
Mottram Moor Link	92 to 136
A57(t) to A57 Link	18 to 26
Salter's Brook	50 to 71
A61 Dualling	12 to 17
Safety Measures	4 to 6
A628 Climbing lane	15 to 20
Technology Scheme	5 to 7
Total £'m	**196 to 283**

5.5 Management Case

5.5.1 A detailed project plan for the overall scheme would be generated in PCF stage 1. Indicative key milestones are identified in table 5-8.

Table 5-8 – Indicative Project Plan

Stage	Anticipated Completion Date
PCF Stage 1: Options Identification	March 2017
PCF Stage 2: Options Selection	March 2018
PCF Stage 3: Preliminary design	September 2019
PCF Stage 4: Statutory Procedures and Powers	February 2020
PCF Stage 5: Construction Preparation	February 2021

PCF Stage 6: Construction, Commissioning and Handover Open for Traffic	January 2023
PCF Stage 7: Closeout	February 2023

5.6 Summary

5.6.1 A summary of the key findings for package 2 is as follows:

- Package 2 brings journey time benefits for both local trips from in and around the Mottram / Tintwistle / Glossop area and for existing Trans-Pennine trips using the A628 or A57. The A57(T) – A57 link is particularly effective at reducing journey time for users of the A57. The package should also improve reliability for all users;
- The package is effective in reducing delays on the A628 and A57 and moves traffic away from the village of Mottram which will bring benefits for local residents in the form of improved air quality, less noise, accident benefits and reduced severance;
- The package will improve connectivity between Manchester and Sheffield to some extent, but does not provide significant additional capacity for these trips and future growth;
- Journey times on both the A628 and A57 will decrease as a result of reduced delays at the western end. Eastbound traffic on the A628 will also benefit from climbing lanes and the re-alignment at Salter's Brook;
- The package is expected to bring slightly adverse impacts to the landscape, noise, historic environment, biodiversity and the water environment;
- The overall outturn of the scheme range from £196m to £283m. At this stage the budget is unknown and the contingent liabilities will be unknown;
- If a start is made in March 2015 then it is anticipated that package 2 could achieve start of works by early 2021 and open to traffic by early 2023.

6 Package 3 – Central Package plus A57 Mottram One Way

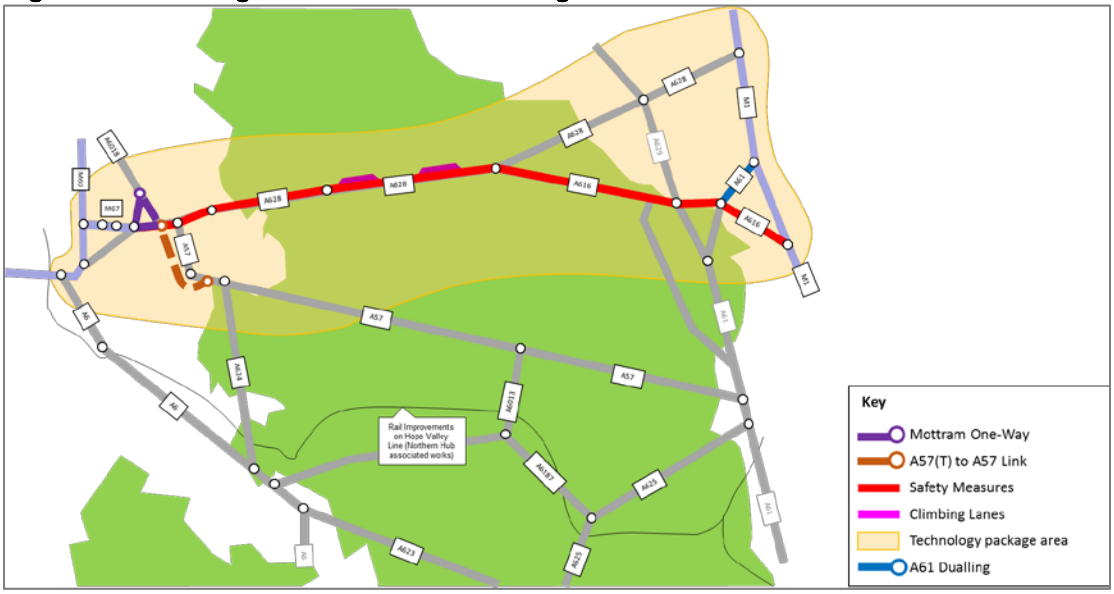
6.1 Package Overview

6.1.1 Trans-Pennine Route Package 3 consists of the following elements:

- **A57 Mottram One Way** – This scheme consists of the construction of a new one way eastbound link road connecting the M67 terminal roundabout with A6018 at Roe Cross, reducing the A6018 to one way operation southbound between the new link road junction and the A57; and making the A57 one way westbound between A6018 and M67;
- **A57(T) to A57 Link** – Construction of a new single carriageway link road from the A57(T), at Mottram Moor to a new junction on the A57 at Brookfield bypassing the existing A628/A57 and A57 Woolley Lane/Hadfield Road junctions (this element of the package would be located on the Local Authorities network);
- **A61 Dualling –** Conversion of the existing single carriageway A61 to dual carriageway between the A616 roundabout and M1 junction 36;
- **Route Safety Improvements** – Introduction of a range of safety improvements focussed on identified accident clusters and junctions with high accident numbers. Measures include a review of the existing signing and road marking provision together with appropriate targeted improvements, enhanced crossing facilities at appropriate points of demand and speed limit reductions;
- **Climbing Lanes (including a proposed realignment at Salter's Brook)** – Provision of three separate eastbound climbing lanes on the A628, focused on sections with significant gradients. The first location commences approximately 200m east of Woodhead Bridge and continues in an easterly direction for 1.3km. The second location commences 1.5km west of Salter's Brook Bridge and continues in an easterly direction for approximately 1.1km. The third climbing lane is part of a wider realignment of the A628 including the replacement of the viaduct / bridge at Salter's Brook. The climbing lane itself commences 500m west of Salter's Brook and continues in an easterly direction for approximately 1.6km; and
- **Technology Package** – Installation of Variable Message Signing (VMS) on strategic routes and the surrounding local road network to inform motorists of incidents, closures and/or severe weather. Use of average speed cameras to enforce speed limits and red light camera compliance technology at traffic signalised junctions. Use of Vehicle Activated Signing (VAS) at appropriate locations to re-enforce safe speeds and highlight potential hazards on routes.

6.1.2 The following schematic drawing highlights the location of the different elements of the Package 3 in relation to the trans-Pennine study area.

Figure 6-1 Package 3 Schematic Drawing



6.2 Strategic Case

6.2.1 The strategic case for package 3 is as presented for package 1 providing a strategic fit, meeting some stakeholders' aspirations and policy aims with a positive impact on the economy. Therefore, as this has already been documented this section of the report will only record key differences from the strategic case presented in chapter 4.

6.2.2 The key difference between package 3 and package 1 is the reduced land take required, particularly with regard to the National Park.

6.2.3 This package impacts on fewer environmental features / locations than package 1.

6.2.4 This results in this package being less complex and potentially easier to build and deliver.

6.2.5 Whilst package 3 fits with a number of strategic aspirations, plans and policies these are not as numerous as packages 1 and 2 and as result this package does not have as much stakeholder support as the other two packages.

6.3 Economic Case

Monetised Benefits

6.3.1 PVB, PVC and BCR are presented in Table 6-1.

Table 6-1 – Monetised Benefit Summary

	Initial BCR
Present Value Benefits (PVB) (£m)	£333.0m
Present Value Costs (PVC) (£m)	£81m - £116m

	Initial BCR
Benefit Cost Ratio (BCR)	2.87 – 4.09

6.3.2 Package 3 is shown to offer a range of BCR values depending on the scheme cost assumptions. Note that BCR excludes technology.

6.3.3 Table 6-2 and Table 6-3 present journey times for 2 routes for 2020 and 2035. These results are indicative and are intended to allow comparative assessment of the scale of the potential benefits for the package.

- **Route 1** between the M1 Junction 36 and M67 Junction 4. This routes follows the A61, A616 and A628 (via the Mottram one-way in the case of the with scheme scenario).
- **Route 2** from Sheffield Inner Ring Road (Brook Hill) to M67 Junction 4. This route follows the A57, and is included as the A57(T) to A57 Link affects travel times along this alternate trans-Pennine route.

6.3.4 The climbing lanes with Salter's Brook were modelled separately in Paramics and are therefore recorded separately in the table. The A61 was appraised using a model developed by the HA and estimates of time savings, which exclude technology measures, are presented separately.

Table 6-2 – Approximate Journey Times by Intervention (minutes) – AM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings A61 dualling	Additional time savings Climbing lanes / Salter's Brook)	Total Change	
		2020			2035						
		DM	DS P3	Change	DM	DSP3	Change			2020	2035
Route 1 EB	42	43	41	-2	44	42	-2	-0.5 to -1	-5	-8	-8
Route 1 WB	47	49	49	0	51	52	+1	-0.5 to -1	-0.5	-1.5	-0.5
Route 2 EB	50	51	47	-4	53	48	-5	n/a	n/a	-4	-5
Route 2 WB	55	57	56	-1	60	58	-2	n/a	n/a	-1	-2

Table 6-3 – Journey Times by Intervention (minutes) – PM

Route	2013 Base Model	Western End Interventions Only						Estimated Additional time savings A61 dualling	Additional time savings Climbing lanes / Salter's Brook)	Total Change	
		2020			2035						
		DM	DS P3	Change	DM	DSP3	Change			2020	2035
Route 1 EB	45	44	43	-1	46	45	-1	-0.5 to -1	-5	-7	-7
Route 1 WB	43	45	44	-1	49	48	-1	-0.5 to -1	-0.5	-2.5	-2.5
Route 2 EB	56	55	50	-5	57	52	-5	n/a	n/a	-5	-5
Route 2 WB	51	52	48	-4	56	51	-5	n/a	n/a	-4	-5

6.3.5 Tables 6-2 and 6-3 indicate that if all interventions in the package are implemented then, indicatively, journey time benefits on the key strategic route (A628 and A616) could be up to 8 minutes in the morning peak and up to 7 minutes in the evening peak.

Non Monetised Benefits

6.3.6 Due to time constraints and the level of uncertainty surrounding the monetised benefit calculations (both cost estimates and accuracy of modelled benefits) it was decided that other benefits would be considered using a qualitative approach. Benefits which have a moderate or large impact are summarised in Table 6-5 below. The table uses the seven-point scale as set out in in line with TAG guidance and summarised in Table 6-4.

Table 6-4 – 7 Point Scale of impact

Seven point scale of impacts						
Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral	Slight Adverse	Moderate Adverse	Large Adverse

Table 6-5 – Non-Monetised Benefits

Impacts	Positive Non-monetised benefits	Scale of impact
Reliability	• Improved reliability – Mottram One Way and A57(T) Link reduce congestion at western end of route. A61 Dualling reduces congestion on eastern section. • Climbing Lanes, Route Safety Improvements and Maintenance Strategy will reduce number	Moderate

Impacts	Positive Non-monetised benefits	Scale of impact
	of incidents, improving reliability across the route. • Better route choice through technology measures (VMS).	
Journey Quality	• Reduce traveller stress – Route Safety Improvements reduce fear of accidents; Climbing Lanes, A57(T) Link, A61 Dualling and Mottram One Way reduce frustration for users who are either be inhibited by slower moving vehicles or are travelling on congested sections of the route.	Moderate

6.3.7 Whilst construction of the package is expected to lead to an overall improvement in air quality, due to reduced traffic flows with the One Way links implemented in Mottram, the remaining environmental impacts are considered to be adverse. For instance, an overall adverse impact on noise levels is anticipated, despite a reduction in the number of receptors affected and the potential for reduced noise levels as a result of speed reductions on other sections of the route. The package is expected to result in the erosion of some of the open countryside, adversely affecting the landscape, one of the defining features associated with the Pennines. In relation to biodiversity, some adverse impact on species in the study area can be expected and the Salter's Brook realignment would result in loss and fragmentation of a triple designation habitat (Peak District Moors Special Protection Area, South Pennine Moors Special Area of Conservation and The Dark Peak Site of Special Scientific Interest), an area of international and national importance. Finally, groundwater quality may also be adversely affected in addition to increased discharge into a number of watercourses and increased flood risk to the River Etherow.

6.3.8 Table 6-6 presents the carbon impact of this package.

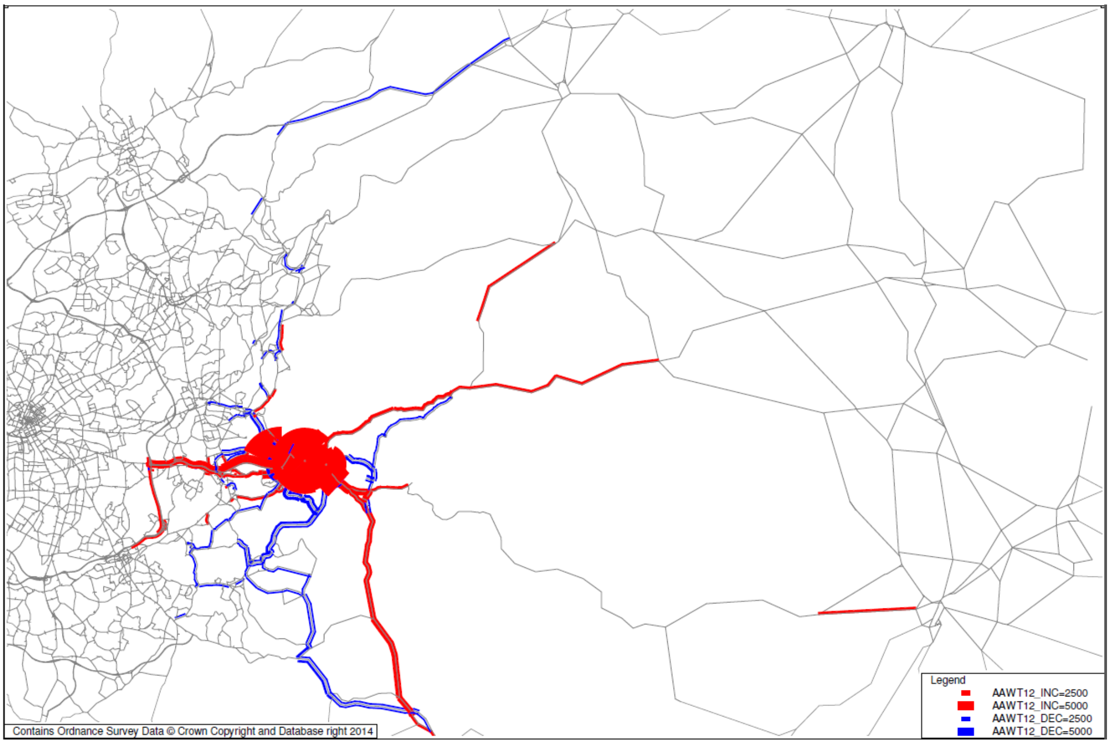
Table 6-6 – Carbon Impact

Carbon impact (tCO_2e) for budget period	2020-2024	2025-2029	2030-2034	2035-2039
Traded sector	8	10	9	5
Non-traded sector	433	-164	-715	-1,040

Key Objectives and Traffic Analysis

6.3.9 Figure 6-2 compares modelled flows in the DM scenario with those in Package 3. Significant daily increases in DSP3 flow are shown in red, with decreases in blue.

Figure 6-2 – Flow Difference Plot Comparing DM and DSP3 flows



6.3.10 Package 3 has a number of impacts on flows and delays in the study area:

- Increases in flow on A628 and A624. This is due to the reduction in congestion at the A57 / A628 junction which traffic using the A57(T) - A57 link will bypass. A smaller increase in flow on the A628;
- Flows on the A628 through Hollingworth and Tintwistle remain relatively stable;
- Flow decrease on the M62;
- Flow decrease on the Monks' Road / A626 (route parallel to the A624);
- Increased flow on M67; and
- Reductions in delays, particularly at the A628 / A57 and A57 / B6174 junctions.

6.4 Financial Case

6.4.1 Present Value Cost (PVC) discounted to 2010 for Package 3 range from £81m – £116m.

6.4.2 The total estimated outturn costs for Package 3 range from £120m to £171m. Table 6-7 summarises the financial costs of the scheme in nominal (outturn) prices.

Table 6-7 – Outturn Project Costs

Option	Outturn Cost Range (£m)
Mottram one Way	16 to 24
A57(t) to A57 Link	18 to 26
Salter's Brook	50 to 71
A61 Dualling	12 to 17
Safety Measures	4 to 6
A628 Climbing lane	15 to 20
Technology Scheme	5 to 7
Total £'m	**120 to 171**

6.5 Management Case

6.5.1 A detailed project plan for the overall scheme would be generated in PCF stage 1. Indicative key milestones are identified in table 6-8.

Table 6-8 – Indicative Project Plan

Stage	Anticipated Completion Date
PCF Stage 1: Options Identification	March 2017
PCF Stage 2: Options Selection	March 2018
PCF Stage 3: Preliminary design	September 2019
PCF Stage 4: Statutory Procedures and Powers	February 2020
PCF Stage 5: Construction Preparation	February 2021
PCF Stage 6: Construction, Commissioning and Handover Open for Traffic	February 2022
PCF Stage 7: Closeout	March 2022

6.6 Summary

6.6.1 A summary of the key findings for package 3 is as follows:

- Package 3 brings some journey time benefits but these are primarily as a result of the A57(T) to A57 link. The inclusion of a one-way system in Mottram will increase journey length for a number of users which will also add to journey times. Forecasting suggests negligible journey time savings for users of the A628. The A628 eastbound is forecast to see small improvements in journey times, in the eastbound direction the bulk of these benefits will come from faster speeds and improved overtaking opportunities resulting from the new climbing lanes. The A57(T) to A57 link will improve journey times for users of the A57 at the western end;
- The package should provide some improvement in connectivity between Manchester and Sheffield but only for trips which route via the A57, the scheme does not provide significant additional capacity for trans-Pennine trips;
- The package does not remove traffic from urban areas, with the exception of the A57 to A57(T) 'Glossop Spur' link;
- If the A57(T) – A57 Link was removed from the package, the overall VfM case would be considerably weaker;
- The package is expected to bring slightly adverse impacts to the landscape, noise, historic environment, biodiversity and the water environment;
- The overall outturn cost of the scheme range from £120m to £171m. At this stage the budget is unknown and the contingent liabilities will be unknown; and
- If a start is made in March 2015 then it is anticipated that package 3 could achieve start of works by early 2021 and open to traffic by early 2022.

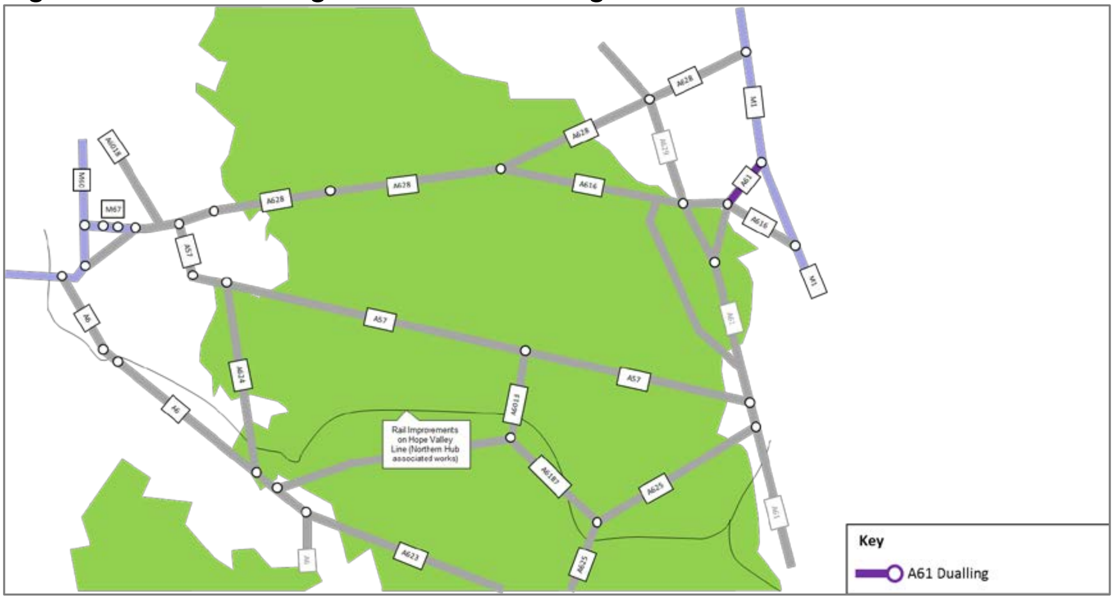
7 A61 Dualling

7.1 Scheme Overview

7.1.1 The A61 Dualling scheme involves the conversion of the existing single carriageway A61 to dual carriageway between the A616 roundabout and M1 Junction 36.

7.1.2 The following schematic drawing highlights the location of the scheme in relation to the trans-Pennine study area.

Figure 7-1 A61 Dualling Schematic Drawing



7.2 Strategic Case

7.2.1 The strategic case for the A61 Dualling is, in broad terms, is similar to the case presented for package 1 providing a good strategic fit, meeting some stakeholders' aspirations and policy aims with a positive impact on the economy. Therefore, as this has already been documented this section of the report will only record key differences from the strategic case presented in chapter 4.

7.2.2 During stage 2 of this study, stakeholders were broadly supportive of the emerging options, noting that any measures that could improve conditions at the eastern end of the corridor would be welcomed. The A61 Dualling option was seen as being important, benefiting areas of forecast employment and population growth.

7.2.3 Consideration will need to be given to impacts on traffic movements on the existing network. In particular, at the eastern end of the route traffic management associated with the A61 Dualling will need to be carefully planned so as not to adversely impact on M1.

7.2.4 The topography of the study area does not present a challenge. However the traffic management associated with the A61 Dualling will need to be carefully planned so as not to impact on M1 will need to be carefully managed.

7.2.5 There are a number of direct environmental constraints which need to be considered, both in terms of the actual design, but also in terms of the anticipated impact of any measures. Initial environmental analysis has indicated that there are a small number of important environmental features in the vicinity of the A61.

7.3 Economic Case

Monetised Benefits

7.3.1 PVB, PVC and BCR are presented in Table 7-1.

Table 7-1 – Monetised Benefit Summary

	Initial BCR
Present Value Benefits (PVB) (£m)	25
Present Value Costs (PVC) (£m)	9 – 12
Benefit Cost Ratio (BCR)	2.08 – 2.93

7.3.2 The A61 Dualling is shown to offer a High BCR, irrespective of the scheme cost assumptions. A significant proportion of benefits come from accident savings, although there will also be some small journey time savings.

7.3.3 Table 7-2 presents user benefits split by business and commuting trips. The benefits from the A61 Dualling are split relatively evenly between business and commuting and other users.

Table 7-2 – Journey Time Benefits by User

Net JT changes	0-2min
Business Users & Transport Providers	£5.1m
Commuting & Other Users	£5.6m

Non-Monetised Benefits

7.3.4 Due to time constraints and the level of uncertainty surrounding the monetised benefit calculations (both cost estimates and accuracy of modelled benefits) it was decided that other benefits would be considered using a qualitative approach. Benefits which have a moderate or large impact are summarised in Table 7-4. The table uses the seven-point scale as set out in in line with TAG guidance and summarised in Table 7-3:

Table 7-3 – Point Scale of Impact

Seven point scale of impacts						
Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral	Slight Adverse	Moderate Adverse	Large Adverse

Table 7-4 – Non-monetised Benefits

Impacts	Positive Non-monetised benefits	Scale of impact
N/A	No moderate or large positive economic, environmental or social impacts for the A61 Dualling scheme have been identified.	N/A

7.3.5 In general, the A61 Dualling is expected to have a slight adverse impact on the environment. Whilst the reduction in congestion would improve air quality, receptors adjacent to the road could experience a worsening of air quality, as they would be closer to the emission source. Similarly, noise levels could increase both as a result of traffic being closer to receptors, but also potentially due to the increased attractiveness of the route and subsequent increase in traffic.

7.3.6 In terms of biodiversity, the value of the habitats in the study area are of national importance, with the Potter Holes Local Nature Reserve adjacent to the A61. Several protected species have been recorded in the study area and it is expected that the scheme would result in the loss of non-designated habitat.

7.3.7 Carbon impacts were not assessed for this option.

7.4 Financial Case

7.4.1 Present Value Cost (PVC) discounted to 2010 for A61 Dualling range from £9m to £12m.

7.4.2 The total estimated outturn costs for the A61 Dualling range from £12m to £17m.

7.5 Management Case

7.5.1 A detailed project plan for the overall scheme would be generated in PCF stage 1. Indicative key milestones are identified in table 7-5.

Table 7-5 – Indicative Project Plan

Stage	Anticipated Completion Date
PCF Stage 1: Options Identification	June 2016
PCF Stage 2: Options Selection	September 2016
PCF Stage 3: Preliminary design	December 2016

PCF Stage 4: Statutory Procedures and Powers	June 2017
PCF Stage 5: Construction Preparation	September 2017
PCF Stage 6: Construction, Commissioning and Handover Open for Traffic	June 2018
PCF Stage 7: Closeout	July 2018

7.6 Summary

7.6.1 A summary of the key findings for A61 Dualling is as follows:

- The A61 Dualling scheme brings journey time benefits for local trips in and around the section of the A61 in question, between M1 Junction 36 and the Westwood Roundabout. This would improve reliability for users travelling in the local area, however for trans-Pennine trips journey time benefits would be limited as the congestion problems in the Mottram / Tintwistle / Glossop area would remain for existing trans-Pennine trips using the A628 or A57;
- The scheme will improve local connectivity but have very little impact on connectivity between Manchester and Sheffield, as the congestion at the western end of the route would remain in place, and so no additional capacity for these trips can be created by this scheme;
- The scheme is expected to bring slightly adverse impacts to the air quality, landscape, noise, biodiversity and the water environment;
- The scheme will only slightly improve connectivity between Manchester and Sheffield due to it being a small-scale scheme;
- The overall outturn cost of the scheme range from £12m to £17m. At this stage the budget is unknown and the contingent liabilities will be unknown; and
- If a start is made in March 2015 then it is anticipated that the A61 Dualling scheme could achieve start of works by late 2017 and open to traffic by early mid-2018.

8 Central Package

8.1 Introduction

8.1.1 Stakeholder engagement during the study highlighted the need to assess the elements that made up the various packages. This section documents the work undertaken to disaggregate the benefits of the three main packages, testing individual schemes in isolation from other package elements.

8.1.2 Principally this work considered the elements that made up the central package, namely:

- A57(T) to A57 Link;
- Climbing lanes (including a proposed realignment at Salter's Brook);
- Safety improvements; and
- Technology improvements – Variable Message Signs (VMS).

The work also assessed the relative costs and benefits of the principal highway improvements identified at the western end of the route, namely:

- Mottram, Hollingworth, Tintwistle Bypass;
- Mottram Moor Link; and
- Mottram One Way

8.1.3 In some cases benefits of an individual scheme might not be maximised in this testing because the scheme also requires another element of the package, for example a capacity improvement at a bottleneck upstream. On the other hand an individual element of a package may appear to deliver very positive benefits in isolation. In these cases a level of caution needs to be adopted as the scheme may deliver benefits locally or in a very specific area such as safety or journey quality but does not deliver the wider benefits that are the objectives of the trans-Pennine study.

8.2 Western End Measures

8.2.1 To understand the relative benefits and costs of the A57(T)-A57 Link scheme in isolation the assessment needed to be undertaken in conjunction with the other highway schemes proposed at the western end of the route. In the initial assessment, using the SATURN traffic model, it was assessed as part of the core package, which is to say in conjunction with either the Mottram – Tintwistle bypass, the Mottram Link or Mottram One-Way.

Methodology

8.2.2 To undertake these assessments modified versions of the Do Something Greater Manchester (GM) model were developed. New versions of the network were created with just one element of the core package coded in each. This was then run and benefits were calculated in TUBA. All modelling assumptions and parameters are the same as those in the testing of the full packages reported in the previous sections of this report. A fuller explanation of the modelling methodology is detailed in section 3.

Cost and Benefit

8.2.3 Table 8-1 summarises the costs and benefits of the western end schemes.

Table 8-1 Western End Scheme Cost and Benefits

Scheme	PV Costs* (£m)	PVB TUBA (£m)	PVB Accidents (£m)	PVB (£m)	BCR Range
A57(T) – A57 Link	12.8 to 18.1	98.4	-2.2	96.2	5.44 to 7.71
Bypass	152.6 to 221.0	207.6	7.1	214.7	0.97 to 1.41
Mottram Moor Link	64.1 to 94.6	169.3	23.8	193.2	2.04 to 3.01
Mottram One-Way	11.1 to 16.7	-11.7	-1.6	-13.3	-0.8 to -1.19

8.2.4 The A57(T) – A57 link delivers large benefits when assessed in the GM model as a single measure.

8.2.5 Further analysis indicates that:

- The A57 / A628 junction at the Gun Inn is currently a major source of delays which would be bypassed by A57 traffic if the A57(T) – A57 link is built;
- A large proportion of total benefits come from time savings as a result of reduced delays, higher speeds and a shorter route between the A57(T) and A57;
- When these benefits are examined in more detail it emerges benefits are particularly large between the model sector covering Tameside & Stockport and Glossop & Hadfield and the surrounding area suggesting large time saving benefits for local journeys; and
- In addition to this the new roundabout proposed at the northern end of the link and the existing A57 / B6174 junction in Mottram, which is unaltered under these plans, would be heavily congested in future years with large delays.

8.2.6 BCRs for the other elements of the package are noticeably lower when not assessed together with the A57(T) to A57 Link, with only the Mottram Moor Link delivering monetised benefits which fall into the high category.

- The high cost of the bypass is reflected in the measure's low to poor value for money, although it should be noted the measure still delivers the highest overall user benefits; and

- The one-way scheme produces time dis-benefits. This is because a large number of trips will have longer journeys if a one-way system is introduced leading to increases in operating costs and journey time.

Summary

8.2.7 The A57(T) – A57 link provides clear benefits to journey times on local trips and may be effective as a local traffic scheme. It also contributes a significant level of benefits when assessed with a core option, adding relatively little additional cost However it has much less impact on some of the other objectives such as moving traffic from Mottram and the wider strategic aim of the study which is to improve trans-Pennine connectivity. As part of a wider package it would be effective in relieving the existing congestion hotspot at the A57 / A628 junction and should help other elements of a package to maximise their benefits.

8.2.8 The Mottram Moor Link offers a strong economic case without some of the environmental challenges associated with the bypass. Although the bypass produces the highest total benefits it is also the most expensive scheme (more than twice the cost of the Mottram Moor Link). However it does provide the biggest capacity increase at the western end of the route which is the major existing pinch point. Further interrogation of the benefits would provide additional insight into the origin / destination and distance of trips which benefit from each option.

8.2.9 The Mottram One Way scheme produces dis-benefits despite having a very strong BCR when assessed with the A57(T) – A57 link. Due to the relatively low scheme costs this finding is hidden when the two elements are modelled together.

Limitations of this Approach

8.2.10 The total benefits of a package is not necessarily the sum of its parts. It is likely that in a heavily congested network, the provision of any additional capacity will bring some time savings by reducing delay and increasing capacity. When adding the benefits together from several elements of a package it is possible the total benefits could be more or less than the benefits when all the elements are modelled as a package. This situation arises because some packages might complement one another and benefits can only be maximised when all elements of the package are included. Equally, separate elements of a package might deliver large benefits on their own but when combined as a package cancel each other out as the measures do not provide complementary benefits.

8.2.11 Further adjustments and refinements to the cordon and sector system which is applied to eliminate spurious benefits could alter the total level of benefits for each element, but would not change the ranking by BCR.

8.2.12 Further to this as the scale of the intervention becomes smaller, the modelling becomes increasingly reliant on the detail of the model such as zone density, location of zone connectors and the accuracy of the matrices in the external model area.

8.3 Climbing Lanes and Salter's Brook

8.3.1 This section explains the methodology and results from the Paramics model which was built to assess the economic benefits of the introduction of two climbing lanes along the A628 road in the eastbound direction and route re-alignment at Salter's Brook (which also includes an eastbound climbing lane).

8.3.2 The assessment was undertaken using the micro simulation software S-Paramics 2014.1 and economic assessment package PEARS 2014.1. S-Paramics allows detailed modelling of overtaking and the effects of gradient on vehicle speeds and acceleration which are not possible in SATURN.

Methodology

8.3.3 The Paramics model consisted of scenarios based on those used in the trans-Pennine packages stage 3 modelling and separate assessments of the scheme in isolation. Although there were only one set of network changes being tested as part of the climbing lanes / Satler's Brook scheme, there were four sets of flows from the tests of each package in the SATURN model which needed to be assigned in both the Do Minimum (DM) and Do Something (DS) network in Paramics.

8.3.4 Do Minimum flows have been used to assess the climbing lanes and Salter's Brook as if there was no intervention at the western end of the route.

8.3.5 'With scheme' flows for Packages 1, 2 and 3 were used to assess the measures as if there is an intervention at the western end of the route. These benefits are included in the package assessments undertaken in the previous sections of this report.

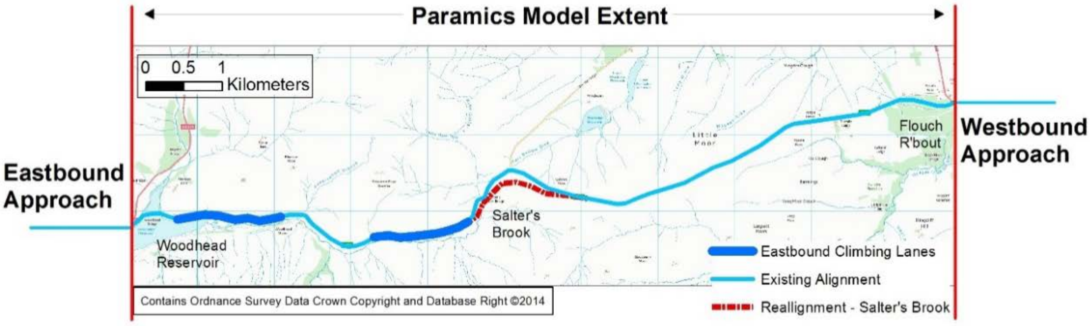
Modelled Network

8.3.6 Four Paramics networks were created in this test:

- Do Minimum (DM): without any modifications to the existing alignment;
- Do Something 1 (DS1): network with climbing lanes and Salter's Brook;
- Do Something 2 (DS2): network with climbing lanes only (this does not include the length of climbing lane which makes up part of the Salter's Brook re-alignment); and
- Do Something 3 (DS3): network with Salter's Brook re-alignment (includes the climbing lane which is part of the re-alignment).

8.3.7 The existing network alignment used in the DM was derived from Ordnance Survey mapping. The location of climbing lanes and the alignment are shown in Figure 8-1.

Figure 8-1 Paramics Model A628 Alignment



- The alignment at the eastern and western approach was added in order to better replicate platoons of traffic which form behind slower HGVs. Additionally, no exact alignment was provided for the proposed viaduct which forms part of the second climbing lane, assumption was therefore made based on provided schematic drawings;
- Gradients along the route were calculated using spot heights and link lengths;
- The route of the viaduct covers approximately 2690m and has an average gradient of 2.2% whereas the existing layout is approximately 2940m with an average gradient of 2%; and
- All roads were assumed to have a speed limit of 50mph, with vehicles over 7.5 tonnes limited to 40mph.

Demand

8.3.8 Demand was extracted from the SATURN model. Three packages were tested in SATURN with variations at the western end of the A628. Flows from the following scenarios were modelled with the climbing lanes and Salter's Brook:

- Without scheme;
- Package 1: Mottram to Tintwistle bypass;
- Package 2: Mottram Moor Link; and
- Package 3: Mottram one-way

8.3.9 Each package produced different sets of flow which were converted to demand matrices for use in the Paramics model. The DM and DS schemes were modelled with each of these flows reflecting how differing flows - as a result of additional capacity at the western end - will influence the benefits generated by other schemes on the remainder of the route.

Results

8.3.10 A summary of Present Value Cost (discounted to 2010) and Present Value Benefits are presented in Table 8-2 when the climbing lane and Salter's Brook were assessed as a single measure.

Table 8-2 Climbing Lane and Salter's Brook Benefits

Network	Demand	PV Costs* (£m)	PVB (£m)	BCR range
DS1	Without scheme	46.3 to 65.2	196.4	3.01 – 4.25
DS1	Package 1 flows	46.3 to 65.2	251.8	3.86 - 5.44
DS1	Package 2 flows	46.3 to 65.2	223.5	3.43 – 4.83
DS1	Package 3 flows	46.3 to 65.2	203.0	3.11 – 4.38

8.3.11 *The key findings from this analysis are:*

- Journey time savings due to non-HGVs overtaking slow moving HGVs;
- Journey time savings for all vehicles (exc HGVs) due to shorter route;
- Vehicle Operating Costs (VOC) for non-HGV's are reduced due to shorter journey times and distance;
- VOC for HGV increase due to increased gradient where the road has been re-aligned at Salter's Brook;
- Benefits to Non business users (Commuters) of approx. £22 - 30m;
- Benefits to Non business users (other) of approx. £100 – 120m; and
- Benefits to Business User & Provider benefits of approx. £78 - 105m

8.3.12 Table 8-3 shows the costs and benefits of the climbing lanes and Salter's Brook when assessed individually.

Table 8-3 Climbing Lane and Salter's Brook Benefits

Network	Demand	PV Costs (£m)	PVB (£m)	BCR range
DS2 (climbing lanes)	Without scheme	10.9 to 14.5	44.2	3.04 – 4.05
DS3 (Salter's Brook)	Without scheme	35.4 to 50.7	112.4	2.22 – 3.18

Summary

8.3.13 The climbing lane and Salter's Brook re-alignment provide significant benefit. Salter's Brook is a costly scheme and involves significant construction in the National Park and would result in loss and fragmentation of a triple designation habitat (Peak District Moors Special Protection Area, South Pennine Moors Special Area of Conservation and The Dark Peak Site of Special Scientific Interest), an area of international and national importance.

8.4 Safety Improvements

8.4.1 A number of safety measures were included in all three packages ranging from improved signage to reduced speed limits and surface treatments. These elements of the package were appraised by factoring the current accident rate and comparing this to national average rates.

Methodology

8.4.2 The initial step of this assessment looked at observed accident rates and identified stretches of the A628 where the accident rate over a 5 year period (2007-2011) exceeded the national average (DfT statistics RAS10002 statistics). Where the observed rate exceeded the national average it was assumed the proposed safety measures would reduce the accident rate to the national level in the future. The benefits of these savings were appraised over a 30 year period. The difference between the observed and national accident rate is assumed to remain flat over the appraisal period.

Assumptions

8.4.3 The assumptions used in these calculations are summarised below.

Table 8-4 Accident Calculation Assumptions

Variable	Assumption
Observed Accident Rate	406 (accidents per billion vehicle miles)
National Accident Rate	324 (accidents per billion vehicle miles)
Assumed Saving	51 (accidents per billion vehicle miles)
Average value of accident prevention (all severities)	£69,718

- Growth Rate are taken from COBA guidance have been applied to the value of benefits;
- Benefits have been estimated over a 30 year period and discounted to 2010 prices assuming a rate of 3.5%; and
- Costs have also been discounted to 2010 prices.

Results

8.4.4 Costs and benefits are summarised in table 8-5.

Table 8-5 Safety benefits

Package	PV Costs (£m)	PVB (£m)	BCR range
Package 1 flows	2.7 to 4.1	4.2	1.04 - 1.54
Package 2 flows	2.7 to 4.1	3.7	0.91 -1.35
Package 3 flows	2.7 to 4.1	3.6	0.88 – 1.33

Summary

8.4.5 The benefits of the safety measures broadly cover the investment costs. It should be noted that this scheme is part of a wider package and the actual level of benefits are dependent on changes in flow on the A628.

8.5 Technology

8.5.1 This section presents the findings of an investigation into the impacts of the proposed interventions which make up the technology element of the Trans-Pennine Feasibility study.

8.5.2 The measures include provision of Variable Message Signs (VMS) at a number of locations on approaches to junctions with the A628. The cost of this measure was calculated as £4,479,970 (2010 prices, discounted to 2010). This cost assumes a relatively basic system which is able to provide journey time information.

8.5.3 The ability to provide information on alternative routes is particularly important in the context of the A628 because the route is single carriageway. This increases the likelihood of the route having to be closed temporarily for reasons such as breakdowns, accidents or poor weather which might not be the case if additional lanes were available.

Effectiveness of VMS on Route Guidance

8.5.4 Research has been conducted into the effectiveness of VMS in a number of different situations and countries, the following excerpts from Erke et al. (2007) summarise these findings:

"Research on VMS has shown that drivers generally welcome information about incidents or congestions and suggestions for alternative routes.
However, the proportion of drivers actually changing route choice varies considerably, and is seldom over 40%."

8.5.5 A study in Oslo conducted by Erke et al found "about each fifth vehicle that would have continued on the motorway changed route choice and followed the recommended route. Almost none of the vehicles that passed the VMS while a message was shown, drove as far as the supposedly closed road section."

8.5.6 Based on these findings it is evident VMS is noticed by at least some road users and the advice displayed is acted upon on. If VMS was used on approaches to the A628 it could potentially help to avoid some of the long delays which currently form or at least give road users notice of these delays so they are informed of the issue and if necessary plan for a longer journey.

8.5.7 In the context of the VMS proposed as part of the trans-Pennine Feasibility Study this proportion of traffic diverting would be equivalent to hundreds of vehicles per hour.

8.5.8 The HA's Interim Advice Note (IAN) 160/12 advises *"Technology potentially has impacts under all of the WebTAG appraisal headings of Economy, Environment and Society… The main source of benefits of the technology covered in this guidance is a reduction in accident rates and / or incident durations. This can lead to significant benefits under Economy in terms of reduced delay due to queuing at accidents and the associated improvement in journey time reliability. It can also lead to significant Accident benefits under the Society heading."*

8.5.9 The remainder of this section looks at potential benefits of VMS under the following headings:

- Journey reliability including reduced queuing at incidents and day-to-day variability;
- Journey quality; and
- Accidents;

8.5.10 It should be noted that IAN 160/12 specifically relates to technology schemes on motorways and therefore the summary of benefits and methodologies contained within may not be directly applicable to the A628.

Journey Reliability

8.5.11 For technology schemes which make up part of managed motorways, journey reliability can be monetised using MyRIAD software which was specifically developed for this purpose. Methodologies have also been developed to measure incident delays according to the average severity and length of each type of incident, the number of lanes blocked and the volume of traffic at the time. TAG Unit A1.3 advises:

"for journeys predominantly on single carriageways outside urban areas, it is not currently possible to estimate monetised reliability benefits. Instead, the assessment of changes in reliability should be based on changes in 'stress', the ratio of the annual average daily traffic (AADT) flow to the Congestion Reference Flow (a definition of capacity). Reliability of road journey times is believed (on the basis of work carried out for DfT's TASM Division) to decline as flows approach capacity. Thus, 'stress', is, with some limitations, considered to be a reasonable proxy for reliability. Detailed advice on stress, including the definition of Congestion Reference Flow, is provided in DMRB Vol 5, Section 1, Part 3, TA46/97."

8.5.12 This method refers to calculating reliability based on capacity and traffic flow, but gives no indication of how this calculation could be affected by technology. As journey reliability has not been calculated as part of this appraisal and there is not sufficient evidence to back up any assumptions, no monetised or qualitative benefits can be attributed to improvements in journey reliability resulting from the installation of VMS.

Journey Quality

8.5.13 Journey quality is a measure of the real and perceived physical and social environment experienced while travelling. TAG Unit M4.1 breaks down journey quality into three sub-groups:

- traveller care: aspects such as cleanliness, level of facilities, information and the general transport environment;
- travellers' views: the view and pleasantness of the external surroundings in the duration of the journeys; and
- Traveller stress: frustration, fear of accidents and route uncertainty.

8.5.14 Of these sub-groups all three could potentially be impacted by VMS. Benefits are likely to be positive for traveller care and particularly traveller stress. Travellers' views could be somewhat negative if the location of signs unduly impacts the views, although these impacts are likely to minor given the relatively short amount of route length from which a VMS will be visible.

8.5.15 Traveller stress is likely to be the sub-group with the most significant positive impact resulting from VMS.

8.5.16 Currently, there is limited evidence of monetary valuations of journey quality specific to road users.

Accidents

8.5.17 Research suggests VMS can provide accident benefits, although at this time the evidence is not sufficient to produce a robust assessment. As part of this study accident benefits have been calculated elsewhere, the cost of Vehicle Activated Signs (VAS) was included in the safety package.

Summary

8.5.18 VMS should provide reliability and journey quality benefits when implemented as part of the trans-Pennine packages. However the limited evidence base and research means that these benefits cannot be quantified at this time.

8.6 Summary

8.6.1 The following tables present an economic summary for each package breaking each one down by the various elements contained with the relevant package.

8.6.2 **Package 1**

Table 8-6 Package 1 Economic Summary

Description	Economic Summary		
	PV Costs	PV benefits	Range of BCR
Full Package 1	£222.9m to £320.6m	£623.3m	1.94 to 2.80
Mottram – Tintwistle Bypass	£152.6m to £221.0m	£214.7m	0.97 to 1.41
A57 (T) – A57 Link	£12.8m to £18.1m	£98.4m	5.44 to 7.71
A61 Dualling	£8.6m to £12.2m	£25.3m	2.08 to 2.93
Route Safety Improvements	£2.7m to £4.1m	£4.2m	1.04 to 1.54
Eastbound Climbing Lanes and Salter's Brook Realignment	£46.2m to £65.2m	£251.8m	3.86 to 5.44
Technology Measures	£3.9m to £5.1m	Not modelled / not assessed / not included in PV costs	

8.6.3 **Package 2**

Table 8-7 Package 2 Economic Summary

Description	Economic Summary		
	PV Costs	PV benefits	Range of BCR
Full Package 2	£134.4m to £194.2m	£532.4m	2.74 to 3.96
Mottram Moor Link	£64.1m to £94.6m	£193.2m	2.04 to 3.01
A57 (T) – A57 Link	£12.8m to £18.1m	£98.4m	5.44 to 7.71

A61 Dualling	£8.6m to £12.2m	£25.3m	2.08 to 2.93
Route Safety Improvements	£2.7m to £4.1m	£4.2m	1.04 to 1.54
Eastbound Climbing Lanes and Salter's Brook Realignment	£46.2m to £65.2m	£251.8m	3.86 to 5.44
Technology Measures	£3.9m to £5.1m	Not modelled / not assessed / not included in PV costs	

8.6.4 Package 3

Table 8-8 Package 3 Economic Summary

Description	Economic Summary		
	PV Costs	PV benefits	Range of BCR
Full Package 3	£81.4 m to £116.3m	£333.0m	2.87 to 4.09
Mottram One Way	£11.1m to £16.7m	-£13.3m	-0.80 to -1.19
A57 (T) – A57 Link	£12.8m to £18.1m	£98.4m	5.44 to 7.71
A61 Dualling	£8.6m to £12.2m	£25.3m	2.08 to 2.93
Route Safety Improvements	£2.7m to £4.1m	£4.2m	1.04 to 1.54
Eastbound Climbing Lanes and Salter's Brook Realignment	£46.2m to £65.2m	£251.8m	3.86 to 5.44
Technology Measures	£3.9m to £5.1m	Not modelled / not assessed / not included in PV costs	

9 Findings

9.1 Summary

9.1.1 The further analysis undertaken in Stage 3 to assess the costs, benefits and business cases identified that all four packages deliver positive results (BCRs).

9.1.2 Key points from this analysis include:

- Package 1 delivers capacity and the greatest journey time saving benefits for local and trans-Pennine journeys;
- Package 2 delivers capacity and journey time benefits but not as large as package 1, however the cost of package 2 is significantly lower;
- Package 3 delivers fewer benefits. The one-way system in isolation produces very limited journey time savings and this package is reliant on the A57(T) – A57 Link to generate benefits;
- The A57 (T) to A57 link delivers significant benefits on its own; and
- Dualling the A61 delivers positive benefits. This scheme could be implemented by 2018.

9.1.3 Additional analysis has been undertaken on the elements that made up the various packages. This key points from this analysis include:

- The climbing lane and Salter's Brook re-alignment provide benefit and a strong BCR. This latter scheme has negative environmental impacts and would involve major road building in the National Park**.** Furthermore the Salter's Brook realignment would result in loss and fragmentation of a triple designation habitat in an area of international and national importance;
- The benefits of the safety measures broadly cover the investment costs. It should be noted that this scheme is part of a wider package and the actual level of benefits are dependent on changes in flow on the A628; and
- VMS should provide reliability and journey quality benefits when implemented as part of the trans-Pennine packages. However the limited evidence base and research means that these benefits cannot be quantified at this time.

9.1.4 As part of stages 2 and 3 of this study detailed qualitative environmental assessments have been undertaken in line with steps 5 to 9 in WebTAG.

9.1.5 This found that all options have environmental challenges. These are most significant in package 1 with potentially an adverse impact on biodiversity, landscape, historic environment and the water environment.

9.1.6 All packages have environmental benefits. These are most prevalent in package 1 and could potentially bring benefits for local residents in the form of improved air quality, less noise, accident benefits and reduced severance. Package 2 will also bring benefits to residents in the communities at the western end of the route.

9.1.7 Timescales and the limitations of the model have precluded the quantitative assessment of noise and air at this stage. It is proposed that these will be assessed at a later stage following the development of a new transport modelling tool.

9.1.8 Given that fact that there are 11 AQMAs in the study area further work will be required to understand these impacts and this will be undertaken in the next stage of the study.

9.2 Further Work

Transport Modelling

9.2.1 A traffic model has been used to make forecasts and assessments to support the environmental and value for money assessments within the business case assessments. Modelling of the economic case was undertaken using the Greater Manchester (GM) SATURN highway model which was previously used for testing of the HA's M60 Smart Motorways proposal at which stage it was re-validated to a 2013 base year.

9.2.2 Although the modelling follows well established methodologies, the assessment is relatively high level. The current assessments are based on the standard assumptions about economic growth and demand for road travel provided by the DfT, but there are a number of limitations with the modelling approach including:

- The model is not detailed to the east of Tintwistle;
- Public transport, walking and cycling are not modelled; and
- There is no demand response in the model – this means that trips cannot shift to or from other modes of travel, change the origin or destination of a trip or the time of day in which they travel.

9.2.3 The level of modelling carried out is proportionate to that required at this stage of a study. Further work would be required to build a model which will provide results which fully satisfy the criteria for further business case development.

9.2.4 The newly constructed model will need to consist of a number of transport and land use models. This combination will provide a strong suite of evidence of the effect that the level and location of proposed growth in the Sheffield and Greater Manchester City Regions will have on future transport infrastructure, and therefore ensure they are adequately supported. This includes identifying transport interventions to mitigate or accommodate expected growth without adverse environmental or social impacts on other parts of the route as a result of interventions proposed as part of this study.

9.2.5 The model will consider:

- Other routes, where traffic flows may be affected by changes to the trans Pennine route, such as the M62 which could see a reduction;
- The impact of potential interventions on mode choice; and

- The potential impact on AQMAs and potential mitigation.

Weather Resilience and Maintenance

9.2.6 Some stakeholders were keen that the study should look to develop weather mitigation measures along the route in order to improve resilience, and consider engineering solutions that have been implemented in other countries.

9.2.7 An enhanced maintenance strategy and the introduction of further 'local' VMS signs on the routes will partially addresses this. However it is recommended that further work is required to research and identify engineering solutions which could be applied particularly to the section of the A628 at its highest point, namely the section between the Flouch roundabout, on the eastern side and the Woodhead Reservoir on the western side. These will need to be included in any enhanced maintenance programme or strategy.

9.2.8 The development of an enhanced maintenance strategy was considered within the options assessment report (stage 2) but was not progressed through the business cases in stage 3 as the benefits, costs and impacts could not be assessed within the timescales of the study.

9.2.9 Further work will need to be taken by the Highways Agency to develop this strategy which will provide a clear and concise way forward setting out how highway maintenance could be delivered to meet the challenges and objectives of the study. It will cover a number of aspects regarding the planning, delivery and management of highway infrastructure assets and how these are delivered over the short, medium and long term.

Longer Term Solutions

9.2.10 The study has highlighted the interest amongst stakeholders of potential longer term solutions, such as tunnels, to further improve connectivity, provide resilience and minimise the impact on the Peak District National Park.

9.2.11 Further work will be required to investigate solutions which could introduce a step change in improved connectivity between Manchester and Sheffield through a reduction in journey times and improved journey-time reliability, thus stimulating economic growth and new development.

9.2.12 There are clear potential benefits to be gained through investment in a major infrastructure project including a tunnel in order to address the longstanding issues of traffic congestion, road safety and environmental impact along the A628/A616 corridor.

9.2.13 However, the challenges to delivery of such a project may be significant. Therefore, a further assessment of the technical feasibility of such proposals and the potential wider benefits would be necessary.

10 Glossary

BCR: Benefit-Cost Ratio. A measure of a schemes value for money. Calculated by dividing the Present Value Benefits (PVB) by the Present Value Costs (PVC).

DfT: Department for Transport.

EAST: Early Assessment and Sifting Tool. A DfT decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format.

Glossop Spur: A proposal for a new link from the A57(T) to the A57 (part of the Mottram to Tintwistle Bypass Scheme).

HA: Highways Agency.

HS2: High-Speed 2 a planned high-speed railway between London Euston, the English Midlands, North West England, Yorkshire, and potentially North East England and the Central Belt of Scotland.

NPV: Net Present Value. Calculated by subtracting the Present Value Costs (PVC) from the Present Value Benefits (PVB).

Outturn Cost: The costs of a scheme including allowance for projected inflation over the construction period.

PVB: Present Value of Benefits. The stream of benefits over the appraisal period that are converted to 2010 prices and discounted to 2010 to give a present value.

PVC: Present Value of Costs. The costs of a scheme over the construction period converted to 2010 prices and discounted to 2010 to give a present value.

South Pennines Route Strategy: A Highways Agency Route-based strategy designed to identify investment needs on the strategic road network.

VAS: Vehicle Activated Signing - an electronic sign activated by the presence and/or speed of a vehicle, used to warn of hazards or enforce speeds.

VMS: Variable Message Sign - an electronic traffic sign used to give drivers information about traffic congestion, accidents, incidents, roadworks, or speed limits on a specific link.

WebTAG or TAG: The Department for Transport's web-based multimodal guidance on appraising transport projects and proposals, commonly referred to as Transport Appraisal Guidance.