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A9 Dualling Case for Investment

Summary report 2016

CONTENTS

1 Introduction

1.1 Overview

The A9 is the major trunk road between the Central Belt and the Highlands and at 273 miles from Dunblane to Thurso, it is the longest trunk road in Scotland. The Scottish Government intends to dual the section of this road between Perth and Inverness. The Programme to dual the remaining 80 miles of single carriageway between Perth and Inverness will be one of the biggest investments in transport infrastructure in Scotland's history. Figure 1.1 presents the A9 Dualling Programme graphically.

This report is a summary of the Scottish Government's Strategic and Socio-Economic Case for Investment in the A9 Dualling Programme. It includes key information covering economic, social and environmental impacts. The Case for Investment also estimates the benefits of the Programme in relation to the costs and sets out:

- Improvements related to the Dualling Programme.
- How well the Programme performs in addressing the problems on the A9.
- How the Programme will deliver value for money when all economic, social and environmental benefits / impacts are taken into account.

The assessment has been undertaken in line with Transport Scotland's 'Guidance on the Development of Business Cases'[1]. As part of this study, Transport Scotland undertook consultations with A9 road-users, tourists, local businesses and road and rail freight operators. Throughout the development of this Case for Investment Transport Scotland has engaged with the relevant authorities and key stakeholders including The Highland Council, Perth and Kinross Council, the Regional Transport Partnerships, Highlands and Islands Enterprise, Scottish Enterprise, Visit Scotland, Scottish Council for Development and Industry, and bus and rail operators.

The dualling of the A9 is one of the largest infrastructure projects ever undertaken in Scotland. The scale and complexity of the dualling mean that it will be 2025 before the work can be completed. To improve the safety of the route, and everyone using it in the intervening period, the Scottish Government set up the A9 Safety Group in 2012. The Group was tasked specifically with improving driver behaviour and so improving safety 'before and during' the Dualling Programme. To achieve this, the Group has developed and is delivering an interim safety plan, details of which are available on the Group's website www.A9road.info.

The plan includes the provision of new lining, signing and surfacing schemes, targeted vegetation clearance, education campaigns and the introduction of average speed cameras on selected sections of single and dual carriageway between

[1] Guidance on the development of business cases, Transport Scotland, December 2015 (http://www.transport.gov.scot/report/guidance-development-business-cases-8733)

Dunblane and Inverness. It will continue to be developed as part of Transport Scotland's wider safety programmes and will focus on the themes of education, engineering and enforcement, which collectively have been shown to be effective in improving safety across the wider trunk road network.

The Case for Investment will continue to be reviewed and updated as further information becomes available as the project advances. Cost estimates will become more refined and research will continue on the monetisation of driver frustration benefits. Following the implementation of the A9 interim safety plan accident statistics will be included in the Case for Investment and the quantification of tourism benefits will also be considered.

Figure 1.1 – The A9 Dualling Programme

2 The A9 Dualling Programme

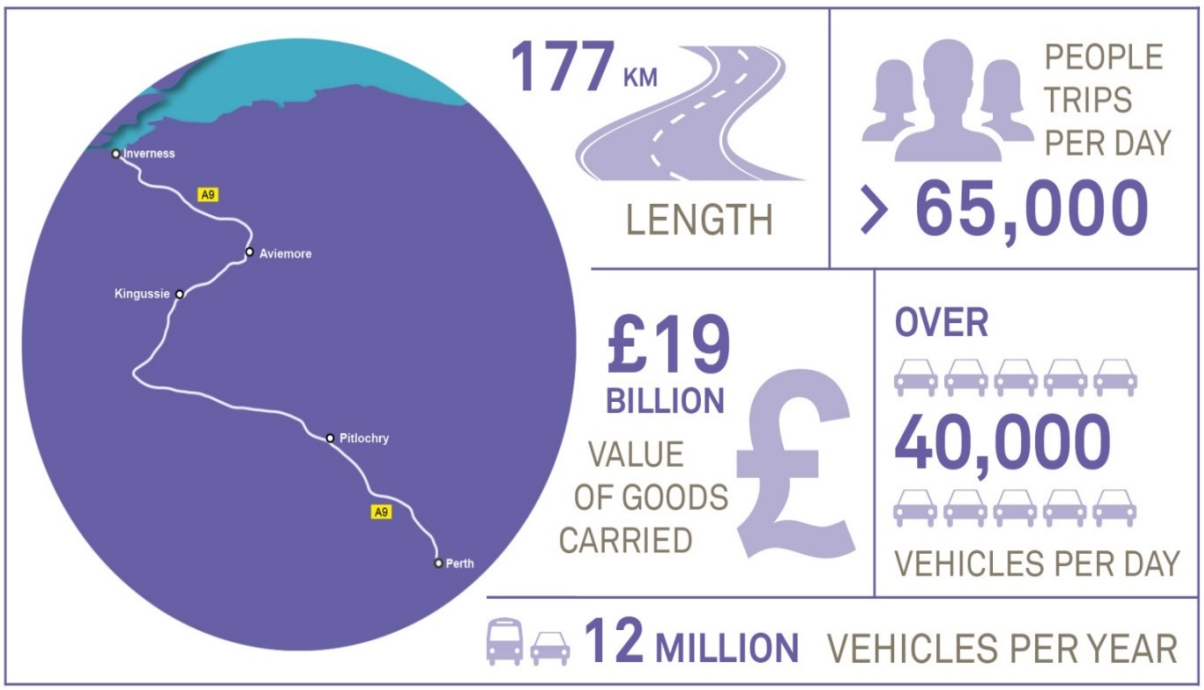

Figure - 2.1 - The A9 Key Facts between Perth and Inverness

2.1 Background and Key Facts

The A9 between Perth and Inverness is 177km long of which 48 km (approximately 25%) is of dual carriageway standard. The road is regarded by many as the spine of the Scottish road network, providing a vital strategic link in Scotland, carrying over 40,000[2] vehicles per day (over 65,000 people) along the Perth to Inverness section. Traffic includes commuters, business travellers, tourists and goods vehicles. The A9 is important to the economy of Scotland with a higher than average rate of business trips, a large number of tourists during summer months and a substantial volume of goods transported. There is an estimated value of £19 billion goods transported on the A9 annually making the A9 a key strategic freight route. Figure 2.1 presents the A9, Perth to Inverness key facts.

The A9 connects Inverness and the Highlands to Perth and onwards to the Central Belt and the rest of the UK. It serves settlements within the corridor providing access to local services, employment and tourism. The A9 is also a commuter route for people who work in Perth and Inverness. Traffic levels vary along the corridor from between around 6,000 Annual Average Daily Traffic (AADT) on the more rural sections to 24,000 AADT on approaches to Perth and Inverness (Figure 2.2). Traffic volumes on the A9 also vary significantly according to the season, with approximately 50% more traffic in summer months due to high volumes of tourist traffic. Depending on the time of year and location, heavy goods vehicles (HGVs)

[2] Based on September 2012 Roadside Interview Data and Annual Average Daily Traffic data

can account for between 10% and 40% of total daily traffic with many HGVs undertaking long journeys along the corridor.

The route is predominantly a rural trunk road which traverses mountainous upland terrain in sections, with approximately 50% passing through the Cairngorms National Park. The road passes through areas of outstanding natural beauty and environmental importance including Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites (internationally important wetland sites) and National Scenic Areas.

The road connects the cities of Perth and Inverness and serves a number of settlements including, Luncarty, Dunkeld, Birnam, Pitlochry, Bankfoot, Ballinluig, Blair Atholl, Dalwhinnie, Kincraig, Newtonmore, Kingussie, Aviemore, Carrbridge and Tomatin. The route provides connections to an extensive Core Path Network as well as other facilities, which are used by walkers, cyclists and equestrians.

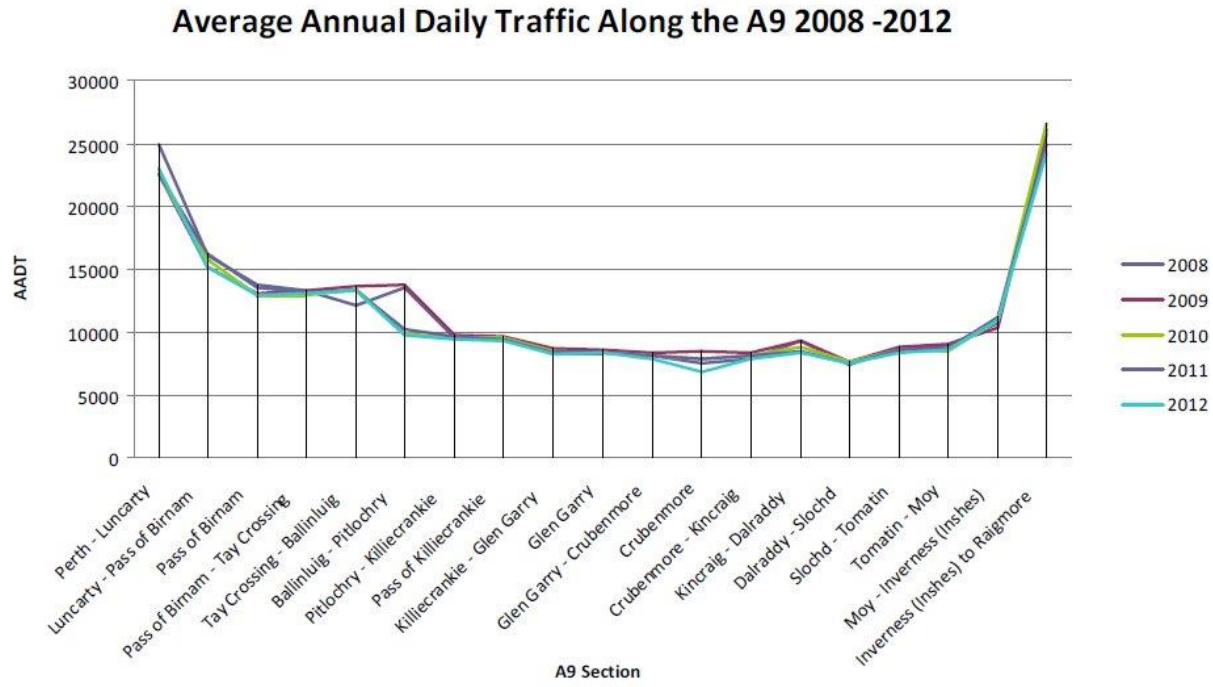

Figure 2.2 Annual Average Daily Traffic along the A9 (Perth to Inverness) between 2008 and 2012

2.2 Key Features

The A9 Dualling Programme will deliver a high quality dual carriageway road with the following key features:

- No gaps in the central reserve to prevent right turns across carriageways.
- 'Grade separation' - separation of the levels at which roads cross each other in order to prevent conflicting streams of traffic and reduce the risk of accidents.
- Junctions will be provided with all A and B class roads unless junction locations can be combined.
- The number of junctions with C class roads, unclassified roads and accesses will decrease and, unless there are specific considerations which demonstrate the need for direct access, an alternative connection will be provided .
- Crossings for pedestrians, cyclists and equestrians will be via overpasses or underpasses.

In general the road will be dualled adjacent to the alignment of the existing road however consideration will be given to off-line options where appropriate. As such, the evidence and appraisal within this Case for Investment considers a mainly online option. Construction work has commenced at the first section to be dualled between Kincraig and Dalraddy and the remainder of the Programme is scheduled to be completed by 2025.

2.3 Economic Conditions

The A9 corridor is dominated economically by the cities of Perth and Inverness. The Local Authorities of Perth & Kinross and Highland are home to around 350,000 people, of which around one quarter live in Inverness or Perth. Almost half of all jobs within the Highlands and Perth and Kinross are in Perth and Inverness.

The A9 is the main route to the north and north-west of Scotland as well as serving areas in Moray. The A9 corridor serves diverse areas with different economic specialisms. Moray has a strong food and drink sector (the Spey valley, in particular, is synonymous with whisky production). Inverness boasts a thriving life sciences sector, and the renewable energy sector is expected to grow strongly across the Highlands. The five key sectors most likely to be impacted by the dualling of the A9 are considered to be:

Figure 2.3 - HGVs transporting goods on the A9

- Food and Drink
- Tourism
- Energy
- Life Sciences
- Forestry

3 Strategic Policy Context

3.1 Policy Background

3.1.1 Introduction

The A9 Dualling Programme forms an important element of a number of key Government policy directives. Figure 3.1 presents the linkages between the various government policies.

Figure 3.1 - A9 Dualling Programme policy context

3.1.2 The Strategic Transport Projects Review (STPR)

The intention to dual the section of the A9 between Perth and Inverness was first announced in 2008 as part of the Scottish Government's blueprint for transport investment priorities over two decades, the Strategic Transport Projects Review (STPR). The STPR was a comprehensive, multi-modal assessment of the transport network across Scotland, taking into account current and future problems and opportunities.

The STPR Corridor objectives for the Inverness to Perth Corridor are:

1. To reduce journey time and increase opportunities to travel between Inverness and the Central Belt.
2. To improve the operational effectiveness of the A9 as it approaches Perth and Inverness.
3. To address issues of driver frustration relating to inconsistent road standard, with attention to reducing accident severity.
4. To promote journey time reduction, particularly by public transport between the Central Belt and Inverness primarily to allow business to achieve an effective working day when travelling between the centres.

The STPR made recommendations for the following two major projects in the Inverness to Perth corridor:

Project 16: A9 upgrading from Dunblane to Inverness. 'This intervention considers the full dualling and wider improvement of the A9 between Dunblane and Inverness. The intervention supports the objectives to promote journey time reduction between Inverness and the Central Belt, improve the operational effectiveness of the A9, reduce the severity of accidents and address driver frustration'.

Project 17: Rail enhancements on the Highland Main Line between Perth and Inverness. "This intervention supports objectives to reduce journey time and increase travel opportunities between Inverness and Perth, more effectively linking Inverness to the Central Belt." The rail enhancements on the Highland Main Line are expected to provide journey time improvements between Inverness and Perth and onwards to the Central Belt, contributing to national objectives. Increasing the frequency of services would provide further benefits through providing additional opportunities to travel.

By dualling the A9 as far north as Inverness and making major improvements to the Highland Main Line it will be possible to address the problems and issues on this key route. Improving the connection between the north and south of Scotland will have a positive impact on both areas. The STPR identified that the A9 upgrading from Dunblane to Inverness is expected to have the specific benefits of:

- Tackling the high proportion of severe accidents on the A9 occurring around at-grade junctions, and reducing accident rates overall, (a national objective).
- Relieving congestion at northern and southern sections, including the heavily trafficked section between Perth and Blair Atholl.
- Improving journey times between the Central Belt of Scotland and Inverness, (a national objective).
- Improving the operational effectiveness of the corridor and addressing issues of driver frustration.
- Making a significant contribution to the Scottish Government's Purpose of increasing sustainable economic growth.

The Programme objectives of the A9 Dualling Programme are:

1. To improve the operational performance of the A9 by:
   (i) Reducing journey times.
   (ii) Improving journey time reliability.
2. To improve safety for motorised and non-motorised users by:
   (i) Reducing accident severity.
   (ii) Reducing driver stress.
3. Facilitate active travel in the corridor.
4. To improve integration with Public Transport Facilities.

3.1.3 Scotland's Cities

In December 2011 further emphasis of support for improvements to the A9 corridor was provided in the Scottish Government publication of The Agenda for Cities, 'Scotland's Cities: Delivering for Scotland'. The purpose of this document was to set out the vital contribution that Scotland's major population centres can make in delivering the Government Economic Strategy. The Agenda identifies connecting cities with strong, reliable and resilient transport infrastructure as a key requirement to support growth.

3.1.4 Infrastructure Investment Plan

The A9 Dualling Programme is currently included as an identified measure within the Scottish Government's Infrastructure Investment Plan (IIP). The IIP highlights transport infrastructure improvements as enablers to enhance productivity and deliver sustainable economic growth. The IIP and subsequent updates set out the Scottish Government's commitment to dualling the A9 between Perth and Inverness by 2025, with a phased programme of schemes delivered from 2015/16 onwards[3]. The IIP also reiterates the Scottish Government's commitment to rail infrastructure investment on the Highland Mainline within a similar timeframe. To complement the

[3] Source: Infrastructure Investment Plan 2011 - Updated Programme Pipeline, January 2015

Agenda for Cities, the IIP contains a commitment to complete the dual carriageway network between all Scotland's cities by 2030.

3.1.5 Scotland's Economic Strategy

Scotland's Economic Strategy (2015) sets out an overarching framework for a more competitive and fairer Scotland. It identifies four broad priority areas. One of the priority areas is infrastructure. Scotland's Economic Strategy recognises that investment in infrastructure stimulates economic activity and deepens access to the labour market. The A9 Dualling Programme is included within the Strategy as a measure which will improve connectivity and help Scottish towns and regions to drive growth and compete internationally.

4 Problems, Opportunities and Impacts

4.1 Introduction

Historically, A9 road-users experienced slow and inconsistent journey speeds, frustrating driving conditions, a higher than average incidence of serious and fatal accidents, long diversions and delays in the event of incidents. The driving conditions and traffic volumes vary depending on the month of the year, the day of the week and the section of the A9. The route has been characterised by:

Figures 4.1 and 4.2 - Variable standard of road provision

- A mixture of vehicle and journey types, with a relatively high proportion of slower moving vehicles leading to platooning of vehicles.
- Variable levels of road space and standards, with both single and dual carriageway provision (Figures 4.1 and 4.2) and 'at-grade junctions'.
- Long diversions and delays to road-users and businesses when incidents occur.
- Regular road closures due to bad weather and landslips and, in the event of closure, long delays and diversions via alternative routes.
- Historically, a higher proportion of fatal and serious accidents than the national average for single carriageway roads.
- Lack of opportunities to overtake safely and frustrating driving conditions.
- Driver fatigue issues on sections of the route.

In October 2014 an average speed camera system was implemented on the A9 as part of the wider suite of education, enforcement and engineering measures set out in the A9 Interim Safety Plan. Details on this and the quartely update of route performance are published on the A9 Safety Group website www.A9road.info.
One element of the A9 Interim Safety Plan is an average speed camera system. The system is intended to enforce speeds limits of 60mph for cars and a trial 50mph speed limit for HGVs on single carriageways. As a result of the implementation of

the system journey times have increased and have become more reliable. As more safety data is collected following the introduction of the average speed camera system it will be incorporated into the safety and economic case.

The A9 provides critical access to markets and suppliers, particularly for businesses in the identified key sectors of Food and Drink, Tourism, Energy, Life Sciences, and Forestry. The road is also a key route for the transportation of goods and materials between the Central Belt of Scotland and the Highlands and Moray. Figure 4.3 presents the proportions of types of goods transported on the A9 between Perth and Inverness.

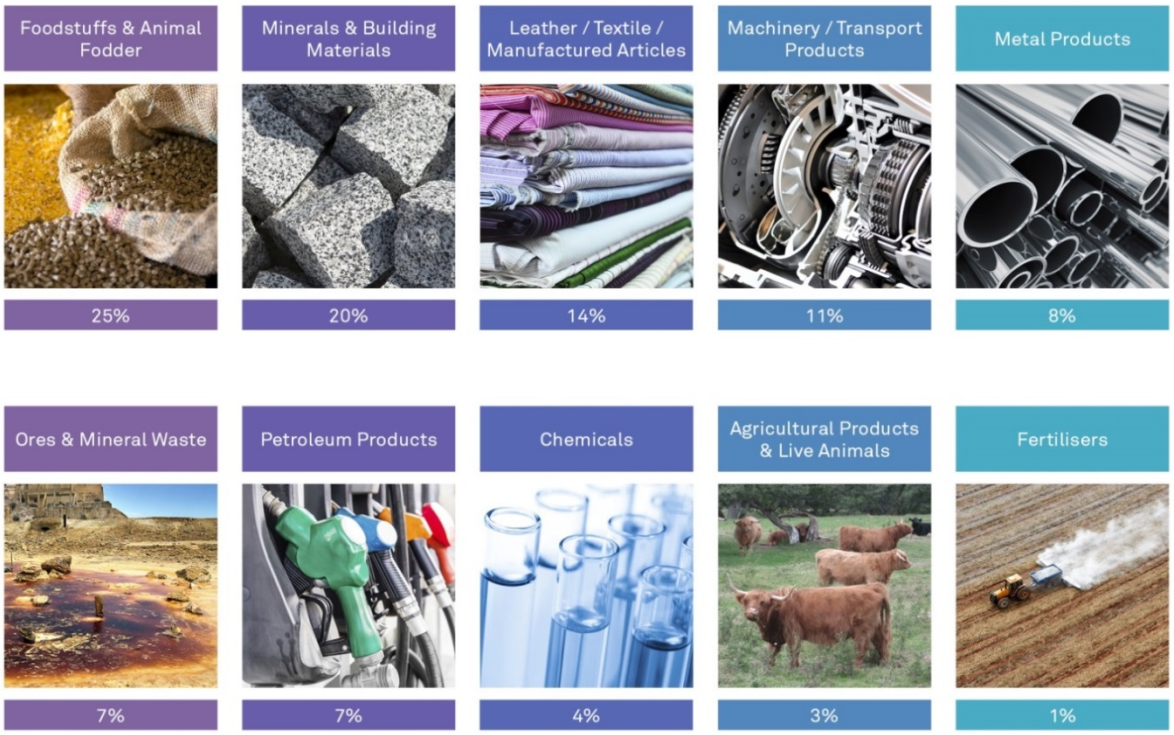

Figure 4.3 - Goods transported on the A9

4.2 Journey Times

Vehicles travelling on the sections of the A9 approaching Perth and Inverness are susceptible to delays due to the higher traffic volumes on these sections. Delays in winter months occur due to poor driving conditions related to weather. Delays in summer months can be caused by the combination of buses, tractors, HGVs and slow moving tourist vehicles such as caravans and camper vans, which means there is a wide range of vehicle speeds.

It has been estimated that around 10 million tonnes of goods are transported along the A9 in any given year, with a value of £19 billion[4]. Extra time allocated for trips on the A9 to cover anticipated delays manifests as costs to businesses. Consultations with businesses have illustrated that for many products delivered via the A9, such as

[4]AECOM Technical Note 12 – Freight Corridor Assessment, September 2015

fishery products and whisky, journey time reliability is time critical and can be severely impacted by slow journey times and road closures.

Removal of at-grade junctions will reduce delays. The Dualling Programme will deliver journey time reductions of between 18 and 20 minutes for the full route between Perth and Inverness representing a 14 to 16% reduction. The journey time reduction between Inverness and the Central Belt is estimated to be about 10 to 12%. Average vehicle speeds are forecast to increase. The travel time reductions resulting from this increased speed are summarised in Table 4.1.

Journey Description	Time Saving (Mins)	Time Reduction % Change
Perth – Inverness	18	14%
Inverness – Perth	20	16%
Glasgow – Inverness	18	10%
Inverness – Glasgow	20	11%
Edinburgh – Inverness	18	10%
Inverness – Edinburgh	20	12%

Table 4.1 - Forecast 2027 Journey Times for selected Origins and Destinations (hh:mm) excluding Average Speed Cameras

Reduced journey times on the A9 with the Dualling Programme in place, will encourage rerouting of traffic from both the A82 in the west and the A93 in the east giving increased traffic flows of 2500 to 4600 vehicles per day (Figure 4.4). On the A82 South of Fort William it is predicted that there will be on average 400 fewer weekday trips northbound and 300 fewer weekday trips southbound as a result of the A9 Dualling Programme. On the A93 south of Braemar on a weekday it is estimated that there will be on average 800 fewer trips both northbound and southbound as a result of the A9 Dualling Programme.

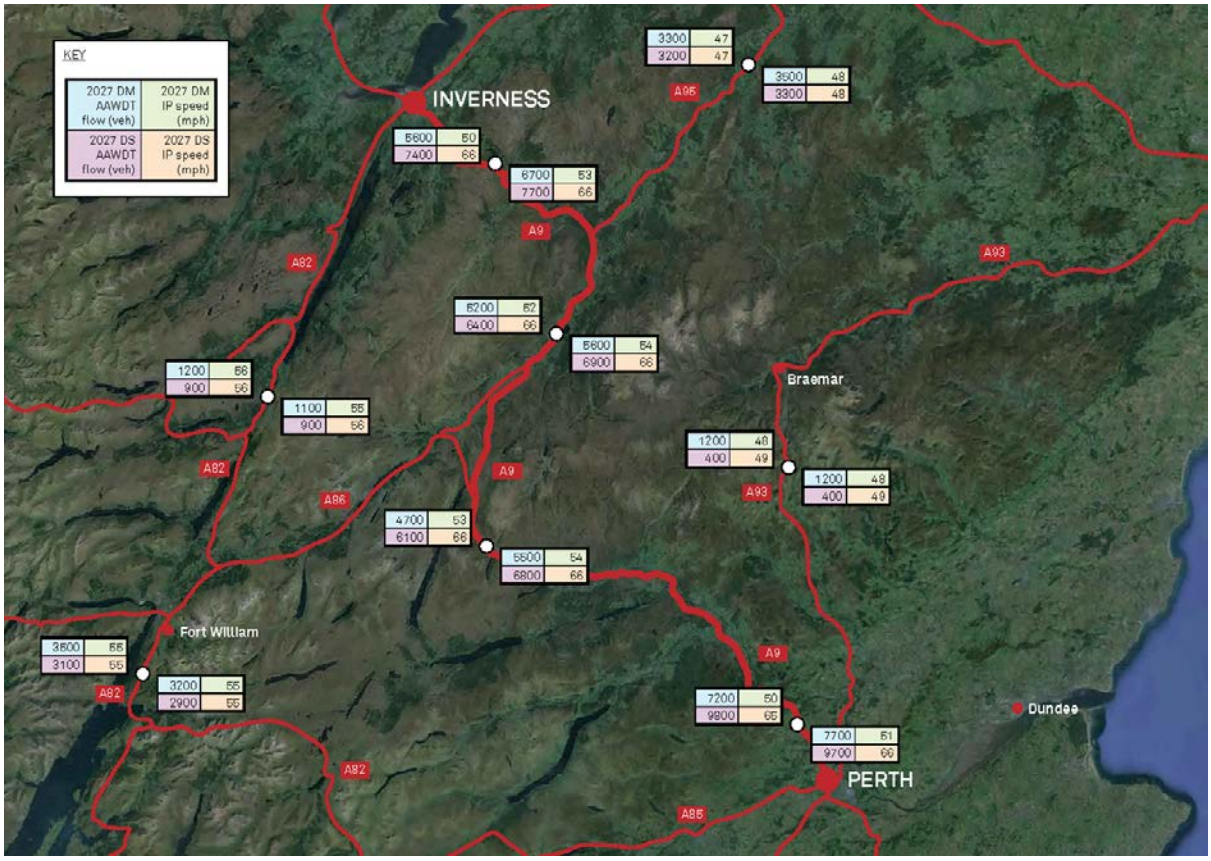

Figure 4.4 - Summary of main traffic impacts (excluding Average Speed Cameras)

Journey Time Impacts

Journey time reductions on the route will mean that Inverness and the North of Scotland will be brought further within reach of the working day of the Central Belt, bringing efficiencies for businesses and associated positive economic impacts. Feedback from business consultations has indicated that key attractions on the route including the Cairngorms National Park will become easier to access for day trips, depending on the road-user's journey origin, which will have a positive economic effect for businesses in the region. Regular users of the route will benefit from reduced journey times by being able to reach their destination faster, spending less time travelling below desired speed which will have the effect of reducing levels of frustration.

4.3 Journey Time Reliability

Historicall, journey times on the A9 have been variable and delays occur due to a range of factors. Due to the rural nature of the route, tractors cross the carriageway and travel along the road, often at low speeds. This mix of vehicles and range of vehicle speeds and lack of overtaking opportunities can cause journey times to be unreliable and contributes to drivers becoming frustrated.

Incident related journey time variability is concerned with events such as severe weather, roadworks, or accidents. Any incident occurring on a carriageway will give rise to delays for motorists. Breakdowns cause brief blockages of at least one traffic lane, while serious incidents involving personal injuries or fatalities can result in extended road closures on one or more lanes.

Staff on business journeys have noted the need to factor in additional unproductive travel time to account for current journey time variability. Hauliers have advised of difficulties in completing return trips to Glasgow in one day within daytime hours. Tourism can suffer from road closures and visitors are less likely to return following bad driving experiences on the A9. For forestry, haulage time can be critical and delays on the A9 can significantly increase costs. The A9 Dualling Programme will provide a high quality connection from Perth to Inverness and will deliver reduced journey times, improved safety and reliability, reduced driver frustration and increased resilience to incidents.

Journey Time Reliability Impacts

Business consultations undertaken highlight that journey time variability (the inability to rely on the A9 for a consistent journey time) has significant impacts on business costs and operations. Extra time is allocated for trips on the A9 to cover anticipated delays, which manifests itself in extra costs such as overtime for drivers. Variability in journey times also mean that haulage drivers have maximum limits for hours on the road, and deliveries can sometimes not be made within a single shift, resulting in extra costs. By dualling the A9 Perth to Inverness businesses will benefit from reduced costs in relation to delays.

The implementation of a high quality dual carriageway road will have the effect of both reducing the occurrence of incidents (through safer driving and improved resilience to weather conditions) and reducing the delay impact of each incident, thus delivering road user time savings. Since its introduction, indications are that the A9 Interim Safety Plan has improved journey time reliability.

4.4 Road Safety

Before the introduction of the interim safety plan, the single carriageway (Killed and Seriously Injured) KSI ratio (0.32) was above the trunk road national average (0.24). Loss of control, failing to look properly, failing to judge other people's speed, carelessness/recklessness, being 'in a hurry' and travelling too fast for conditions were commonly recorded contributory factors. Speeding has also been a problem on the route. To address the issue of speeding, in advance of the A9 Dualling Programme, in October 2014 an average speed camera system was implemented on the A9 as a road safety initiative. From the 1st of November 2014 to the 31st of January 2016 the KSI ratio is 0.26 which is the same as the trunk road national average.

Road Safety Impacts

The proposed high quality road design and the associated high levels of vehicle segregation will deliver significant safety benefits through reductions in the severity of road accident casualties. Analysis shows that the A9 Dualling will result in approximately 61 fewer fatalities over the first ten years and 37 fewer serious casualties based on a baseline of data before the introduction of the A9 interim safety plan. Further analysis on safety benefits will be undertaken as more data becomes available.

4.5 Incidents

Road incidents typically occur due to breakdowns, accidents and weather. The result is often partial or complete closure of the A9. Analysis of incident data for the period 2011 to 2014 reveals that there are on average 23 recorded incidents per year on the A9 between Perth and Inverness. The data also shows that 30% of incidents resulted in road closures with the remaining 70% likely to incur lane closures or restrictions. Incidents occurring on dual carriageway links tend to be shorter in duration than those on single carriageway sections and there were almost double the number of incidents per km of single carriageway compared with dual carriageway over the three and a half year assessment period.

The mainly single carriageway nature of the A9 between Perth and Inverness means that there are a relatively high number of incidents and associated delays. The occurrence of incidents on the route increases the variability of journey times and reduces the resilience of the route. This is further exacerbated by the lack of alternative routes adjacent to the A9.

Incident Impacts

Road traffic incidents, such as breakdowns and weather-related events, will continue to occur following the completion of the A9 Dualling improvements however the dualling will significantly improve the effectiveness of incident management, typically allowing at least one lane to remain open in each direction. Furthermore, access to incident sites for emergency and breakdown vehicles will be significantly quicker, reducing costs and increasing the availability of emergency services for other priorities.

Figure 4.5 - Platooning on the A9 is a cause of driver frustration

Drivers on the A9 experience frustrating driving conditions. The road is mainly single carriageway with few overtaking sections, which means that it can be difficult to overtake slower vehicles. Platooning occurs regularly due to the presence of slower moving vehicles and the lack of overtaking opportunities. When platoons occur travel speeds are slower than most drivers wish to travel, leading to driver frustration. Recent research has established the value drivers place on avoiding travelling in platoons below their desired speeds. This research has shown that driver frustration levels on the A9 are linked to three main factors: the number of heavy goods vehicles in a platoon, the presence of oncoming traffic and the extent to which travel speed is restricted below the speed at which drivers would like to travel.

Driver Frustration Impacts

The availability of a continuous dual carriageway between Perth and Inverness will allow easier and safer overtaking manoeuvres, thus reducing platooning and driver frustration. Continuous dual carriageway sections will mean that drivers can travel at higher general speeds more safely, improving their overall journey experience. This research is innovative and this is the first major business case that has included the monetisation of driver frustration and this will be refined as research continues.

5 Socio-Economic Case

5.1 Overview

This chapter provides an assessment of the impact of the A9 Dualling Programme on the economy and considers the role the investment would make in supporting sustainable economic growth and delivering value for money. Scottish Transport Appraisal Guidance (STAG) recommends assessing programmes and projects using cost-benefit analysis. Cost benefit analysis involves presenting as many of the impacts of a scheme or option as possible in monetary terms, so that they can be compared in a common unit of measurement. The valuation of some other impacts, is derived from research. It is not possible to derive monetary values for some impacts but they should still be considered as part of the socio-economic case that forms part of this Case for Investment.

HM Treasury has laid out a four stage process that should be followed in the development of business cases[5]. The stages are:

- Stage 0 – Business planning: Strategic Outline Plan (SOP).
- Stage 1 – Scoping: Strategic Business Case (SBC).
- Stage 2 – Planning: Outline Business Case (OBC).
- Stage 3 – Procurement: Full Business Case (FBC).

This Case for Investment forms strategic case and socio-economic case elements of the OBC (Stage 2). The economic appraisal assesses the benefits of the proposed dualling scheme ('with scheme option') by comparing it against a 'base case' without the intervention, but which includes committed transport infrastructure projects which are forecast to be in place by 2017. The A9 'without scheme' option also includes the average speed camera system that went live along the A9 from Dunblane to Inverness in October 2014. This chapter presents the findings of the key monetised impacts of the A9 Dualling Programme which has taken account of averge speed cameras as far as the available data allows. Further analysis on this area will be undertaken as more data becomes available.

5.2 Environment

The A9 passes through areas which are of outstanding wildlife and scenic significance, some of which are nationally and even internationally renowned. The landscape is subject to a number of environmental designations, and runs through the Cairngorms National Park, which is Britain's largest National Park (Figure 5.1). A Strategic Environmental Assessment (SEA) has been undertaken as part of the A9 Dualling Programme. The SEA assessed a predominately online project alongside four nearby offline options. As part of the design process of the A9 Dualling, further, more detailed assessments will be undertaken to identify impacts and any mitigation required. The SEA report (June 2013) is available at:

[5] Public Sector Business Cases using the Five Case Model: a Toolkit, available at: http://www.hm-treasury.gov.uk/data_greenbook_business.htm

Figure 5.1 – The A9 passes through environmentally sensitive areas.

http://www.transport.gov.scot/report/a9-dualling-strategic-environmental-assessment-2541 and the SEA Addendum report (March 2014) is available at:http://www.transport.gov.scot/report/a9-dualling-sea-addendum-environmental-report-3115

5.2.1 Global Air Quality

The predicted increase in travel speeds following the dualling of the A9 will result in additional fuel use and corresponding increases in greenhouse gas emissions (CO2). Using current, central, valuations of carbon emission costs it has been estimated that, over the 60 year appraisal period, the value of CO2 emission disbenefit will amount to around £50m.

5.3 Safety

Road traffic accidents cause a wide range of economic impacts on people and organisations, including medical and healthcare costs, losses in economic output, material damage, emergency services costs, insurance and legal costs as well as the emotional costs associated with the pain, grief and suffering incurred. The A9 Dualling will provide a high standard, segregated dual carriageway delivering significant improvement in road safety. The application of standard monetary valuations to road accident related casualties provides a basis for valuing these safety benefits.

The A9 has a lower than average rate of accidents for a Scottish trunk road, but historicallythese accidents tend to be more serious in nature (and hence more costly in economic terms) when they do occur. Analysis of A9 accident data was used to calculate local accident rates and severity rates. The A9 Dualling is estimated to deliver road safety benefits in the order of £343.8m.

5.3.1 Driver Frustration

As part of the development of the Case for Investment, primary research was undertaken to estimate the amount of time that drivers would experience driving conditions that cause driver frustration. Further details on the Stated Preference surveys including uplift factors are provided in the A9 Driver Frustration Stated

Preference Report[6], TRL's report on Factors associated with driver frustration and overtaking intentions[7] and Technical Note 07[8]. Work is on-going to improve our understanding on the monetisation of driver frustration benefits.

Benefits due to the relief of driver frustration by implementing the A9 Dualling Programme have been calculated. The value of benefits derived by the A9 Dualling Programme in relation to Driver Frustration is itemised separately from the Transport Economic Efficiency (TEE) analysis, which is explained in the next section. The analysis indicates that the A9 Dualling Programme will provide a significant benefit (£430 million) to road users by reducing conditions related to frustrating driving environments.

5.4 Economy

5.4.1 Transport Economic Efficiency

Economic (TEE) Analysis	
Travel Time	1160.94
Travel Time: Construction & Maintenance	161.99
Travel Time: Junction Rationalisation	-85.50
User charges	13.82
Vehicle operating costs	-190.55
Investment costs	0
Operating and maintenance costs	0
Revenues	-16.02
Grant/subsidy	0
Monetised summary	1044.68

Table 5.1 – TEE Benefits (£m, 2010 values and prices)

The central principle of Transport Economic Efficiency (TEE) analysis is to estimate the welfare gain which results from transport investment, as measured by the individual's willingness to pay for such an improvement and the financial impact on private sector transport operators. TEE analysis (Table 5.1) presents the key effects disaggregated by particular groups, mode of transport and by impact (journey time, vehicle operating costs, and user costs).

The project is forecast to deliver significant user benefits through journey time savings, as the increase in road class allows higher speeds on the corridor. These higher speeds, however, result in increased vehicle operating costs, such as greater fuel consumption, resulting in user dis-benefits that offset some of the time benefits. The standard monetary value of key user benefits minus user costs is in the order of

[6] *A9 Driver Frustration Stated Preference Research Final Report, AECOM, September 2014*
[7] *Factors associated with driver frustration and overtaking intentions, TRL, January 2014*
[8] *Driver Frustration, AECOM Technical Note 07, September 2015*

£960 million. The monetised summary of all TEE impacts is approximately £1,045 million in 2010 values and prices.

5.4.2 Wider Economic Benefits

Wider Economic Benefits (WEBs) are monetised economic impacts of transport changes that occur in the wider economy rather than to transport users. These are additional to the other monetised impacts (such as time savings) summarised above. WEBs arise because of imperfect markets in the business sectors that use the transport system. For example, improved connectivity between businesses provides spin-off benefits through effectively clustering businesses closer together, fostering more specialised supply chains, wider labour markets and improved diffusion of knowledge and best practice. The Wider Economic Benefits adjustment indicates additional benefits attributed directly to transport users in the order of 210m.

5.5 Transport Integration

Dualling the A9 between Perth and Inverness provides the opportunity to enhance linkages to walking, cycling and equestrian routes and core paths. Designs will seek to minimise the likelihood of severance along the route and open up opportunities to increase levels of active travel and improve access to recreational opportunities.

Improved journey times, reliability and resilience will improve bus and coach movements along the corridor. A public transport strategy has been developed in consultation with bus operators. On board bus and rail surveys were undertaken in 2013 to understand road and rail users' travel patterns and priorities. One of the main aspirations of the public transport strategy is to support the aim of providing a quality experience for bus,coach and rail users and in doing so support modal shift from car to public transport. The strategy aims to ensure the integration of the route design with bus services. On-going consultation with the bus industry will be required to maximise these opportunities and minimise disruption whilst construction works are underway.

The Highland Main Line railway between Perth and Inverness runs close to the A9 for much of its route, stopping at ten stations along the corridor. The end to end journey time between Perth and Inverness by rail is between 2 hours 5 minutes and 2 hours 10 minutes. The journey time between Perth and Inverness by bus is between 2 hours 20 minutes and 3 hours. The transport corridor is underpinned by the A9 trunk road and the Highland Main Line. Both serve the communities along the route. The A9 Dualling Programme together with the Upgrade to the Highland Main Line would provide a step change in connectivity to the A9 corridor.

For freight, improved journey times, reliability and resilience will aid movements along the corridor allowing more efficient and effective transportation of goods worth an estimated £19 billion per annum. Rest area and lay-by facilities will be enhanced, better serving the requirements of commercial vehicles. The dualling of the A9 is not anticipated to have a material impact on rail freight along the corridor.

5.6 Accessibility and Social Inclusion

Figure 5.2 - National cycle route 7 at Glengarry

Figure 5.3 – Core paths network

Accessibility for pedestrians, cyclists and equestrians is being examined as part of the the A9 Dualling Programme. The A9 connects many communities and the A9 dualling may create opportunities to open up wider access from the road and into communities. There are a number of recreational activities that take place along the A9 corridor which in turn will support tourism in the area. Opportunities to promote walking, cycling and equestrain facilities will be developed. Work to date has collated relevant information relating to outdoor access, and considered previous studies, current legislation and policy to ensure they will be recognised and integrated in the design. The safety of access will be improved overall.

For safety reasons, some local accesses along the improved A9 route will be closed off and alternative access provided where necessary. Although this will cause some reduction in local accessibility this consolidation of accesses will deliver significant road safety benefits. Visitors and leisure users are likely to benefit from the A9 Dualling through improved access by road. The provision of high quality laybys as part of the scheme design will further enhance links to core paths, outdoor activities and viewpoints along the route. Transport Scotland oversees a Non-Motorised Users' Forum which is supporting consultation with relevant stakeholders.

5.7 Cost to Government

Construction costs have been estimated for the complete A9 Dualling Programme. The assessment includes costs due to design and preparation, land acquisition, construction and other costs (such as supervision, statutory undertakers and authorities etc.). Costs were independently calculated by Benchmark Estimating and provided in Quarter 2 2013 prices. The costs were then transformed into 2010 values and prices in line with HM Treasury guidance and STAG. The costing has taken the following factors into account:

- Quantified risk assessment (where the level of design has made this possible).
- An indicative construction programme has been adopted for the purposes of the costing exercise. Further work will be undertaken to consider the construction programme and procurement route.
- Optimism bias assessment (where the level of design is not yet mature enough for a bottom up assessment of risk and opportunities).
- Inflation in excess of general inflation using an assumed profile through to 2025.

The present value of (capital) costs (PVC) adjusted for risk and inflation is £1,892 million, expressed in 2010 values and prices in line with HM Treasury and STAG guidance. Outline maintenance costs between the with scheme and without scheme option are broadly comparable at approximately £71.4 million although the investment profile will differ between options. There will be a £134.3 million benefit to the public sector from taxation impacts.

5.8 Economic Case

In Table 5.2 the elements of costs and benefits outlined in the Case for Investment have been drawn together to provide a summary of the monetary value delivered by the A9 Dualling Programme. The monetised impacts produce benefits of £1.9 billion (including driver frustration benefits of £430 million and a Net Present Value of £11 million (expressed in 2010 values and prices). This represents a positive return on investment. The benefit cost ratio is 1.01 for the monetised benefits. In line with appraisal guidance, this value excludes ajustment to the monetised benefits due to Wider Economic Benefits which is included as an additional sensitivity test.

Indicator	Index	Value
Present Value of Transport Benefits (PVB)	Global Air Quality + Safety + Economy + Taxation Impact	1472.9
Present Value of Cost to Government (PVC)	PVC = Public Sector Investment Costs	-1891.6
Net Present Value (NPV)	NPV = PVB + PVC	-418.7
Benefit-Cost to Government Ratio (BCR)	Ratio = PVB / (PVC x -1)	0.78
Benefit-Cost to Government Ratio (BCR) (including Driver Frustration)	Ratio = (PVB + Driver Frustration) / (PVC x -1)	1.01
Benefit-Cost to Government Ratio (BCR) (including WEBs)	Ratio = (PVB + WEBs / (PVC x -1)	0.89
Benefit-Cost to Government Ratio (BCR) (including WEBs and Driver Frustration)	Ratio = (PVB + WEBs + Driver Frustration) / (PVC x -1)	1.12

Table 5.2 – Monetised Benefits Summary (£m, 2010 values and prices)

5.9 Reference Case from when Ministers made commitment to dual the A9 from Perth to Inverness

A reference case scenario has been assessed as part of the Case for Investment that considers the situation when Scottish Ministers originally made the commitment in 2011 to dual the A9 from Perth to Inverness. Specifically the reference case does not include the A9 Interim Safety Plan measures including average speed cameras. Table 5.3 below summarises the cost benefit appraisal for the A9 Dualling Programme Reference Case scenario.

Indicator	Index	Value
Present Value of Transport Benefits	PVB = Global Air Quality + Safety + Economy + Taxation Impact	1400.2
Present Value of Cost to Government	PVC = Public Sector Investment Costs	-1891.6
Net Present Value	NPV = PVB + PVC	-491.4
Benefit-Cost to Government Ratio	Ratio = PVB / (PVC x -1)	0.74
Benefit-Cost to Government Ratio (including Driver Frustration)	Ratio = (PVB + Driver Frustration) / (PVC x -1)	0.94
Benefit-Cost to Government Ratio (including WEBs)	Ratio = (PVB + PV15) / (PVC x -1)	0.85
Benefit-Cost to Government Ratio (including WEBs and Driver Frustration)	Ratio = (PVB + PV15 + Driver Frustration) / (PVC x -1)	1.04

Table 5.3 – A9 Dualling Programme Reference Case Cost Benefit Summary (£m, 2010 values and prices

The A9 Dualling Programme reference case has a net present value of -£491m and a BCR of 0.74. For clarity driver frustration has been itemised separately and increases the BCR to 0.94. Including WEBs as a sensitivity in accordance with STAG guidance increases the BCR to 1.04.

6 Conclusions

6.1 Impacts from the A9 Dualling Programme

This Case for Investment clearly demonstrates the proposal to dual the A9 will provide benefits to meet the needs of those people who live, work, commute and transport goods along the A9 corridor. Taken together, the A9 Dualling Programme and the Upgrade to the Highland Main Line will provide a **step-change in connectivity to and between the cities of Inverness and Perth**. As a result of the Dualling Programme, **journey times between Inverness and Perth will reduce by approximately twenty minutes**, which will benefit businesses and road users and deliver significant wider economic benefits.

The A9 Dualling Programme is expected to contribute to local economic performance **through improved access to markets, reduced need for stockpiling and better productivity**. Significant time savings for business and freight are also expected as the benefits **of less disruptive future maintenance** more than outweigh disruption caused by the construction period.

Completing of the dualling between Inverness and Perth will not only provide drivers with **safe, consistent and reliable driving conditions** but will also lead to **improved route resilience and reduced delays during incidents and adverse weather.** Journey times and journey time reliability will be improved enabling road users and businesses to plan **predictable trips**. Road safety will also improve significantly due to the safety features of the proposed road design. **There will be fewer road accident related deaths and fewer serious injuries.** The conditions that currently lead to high levels of driver stress and frustration will be largely eliminated**. Drivers will be able to travel at their optimum speed**, and those wishing to stop for comfort breaks or leisure/tourism activities will be able to take advantage of enhanced lay-by facilities and new rest areas.

Potentially adverse impacts on the environment, landowners, people who live near or have direct access to the road will be considered during design and development and mitigations measures will be developed to minimise the impacts.

6.2 Economic Summary

Where possible the appraisal has attached standard monetary values to costs and benefits associated with the impacts. Other significant impacts, for which no standard monetary valuations are available have been assessed in qualitative terms. Together, the monetary and qualitative appraisal results provide a fully rounded assessment of the value that the A9 Dualling would provide when measured against a no improvement option.

When viewed in monetary terms the A9 Dualling is predicted to deliver present value benefits in the order of £1,903m, expressed in 2010 values and prices The main areas of benefit include:

- Travel time savings
- Road safety benefits
- Reduced driver frustration

In 2010 values and prices, the A9 Dualling Programme would cost **£1,892m** to construct and hence the net present value (total benefits minus total costs) would amount to **£11.3m.** The A9 Dualling Programme would also produce Wider Economic Benefits beyond those attributed directly to transport users. The Wider Economic Benefits adjustment indicates additional benefits attributed directly to transport users in the order of **£210m,** mainly arising from improved patterns of accessibility which, effectively, bring businesses closer together and support specialisation of labour within supply chains and the diffusion of best practice.

As part of the economic assessment the benefit to cost ratio (BCR) of the A9 Dualling Programme was calculated and sensitivity testing undertaken. The BCR calculated in line with appraisal guidance is **1.01**, which includes the benefits of relieving driver frustration. The Programme BCR excluding driver frustration is 0.78 and including Wider Economic Benefits is 1.12.

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