A9 DUALLING
PERTH TO INVERNESS

DMRB STAGE 1 ASSESSMENT

A9 Dualling: Preliminary Engineering Support Services

March 2014

TRANSPORT SCOTLAND
The Scottish Government

JACOBS®

Document Control Sheet

Project: A9 Dualling: Preliminary Engineering Services
Client: Transport Scotland Project No: B1557620
Document title: DMRB Stage 1 Assessment Report
Ref. No: 1

	Originated by	Checked by	Reviewed by
ORIGINAL	NAME Mark Preston	NAME Kirsty Kelly	NAME Kirsty Kelly
Approved by	NAME Andrew Mackay	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS
DATE 23/10/13	**Document status** FINAL DRAFT		
REVISION 1	NAME Mark Preston	NAME Kirsty Kelly	NAME Kirsty Kelly
Approved by	NAME Andrew Mackay	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS
DATE 25/11/13	**Document status** FINAL		
REVISION 2	NAME Mark Preston	NAME Kirsty Kelly	NAME Kirsty Kelly
Approved by	NAME Andrew Mackay	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS AMM
DATE 07/03/14	**Document status** FINAL		
REVISION	NAME	NAME	NAME
Approved by	NAME	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS
DATE	**Document status**		

Contents

LIST OF APPENDICES

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF PHOTOS

LIST OF PHOTOS (continued)

LIST OF PHOTOS (continued)

1 INTRODUCTION

1.1 Background to Dualling the A9

On 6th December 2011, the Cabinet Secretary for Infrastructure and Capital Investment launched the Infrastructure Investment Plan (IIP), which provides an overview of the Scottish Government's plans for infrastructure investment over the coming decades. Contained within the document is a commitment to complete the dualling of the A9 between Perth and Inverness by 2025. The IIP commitment builds on work undertaken in the Strategic Transport Projects Review (STPR) in 2008, which identified dualling of the A9 as a priority Trunk Road intervention.

The A9 corridor forms a strategic link between Central Scotland and the Scottish Highlands and is shown in **Figure 1.1.1** below**.** The 177 kilometre route between Perth and Inverness is vital to the growth and development of northern Scotland's economy which is noted in STPR Report 1: Review of Current and Future Network Performance as being primarily based upon agriculture and tourism.

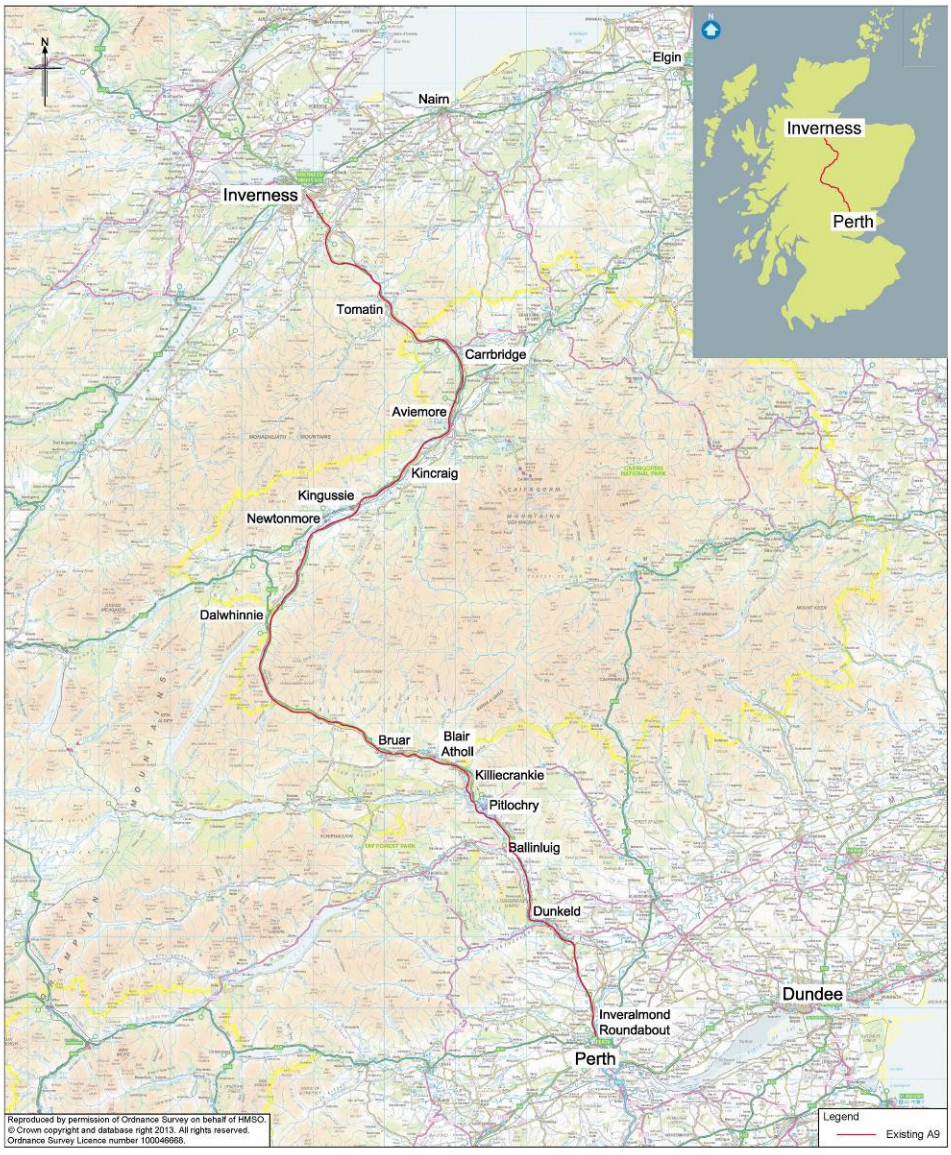


Figure 1.1.1 Location Plan: A9 Corridor between Perth and Inverness

The A9 is utilised by a combination of vehicle types including passenger vehicles, coaches and HGVs, serving strategic, local, agricultural, commercial, and tourist traffic. In addition, the tourism industry contributes to a significant traffic volume along the length of the route during summer months and holidays. Agricultural, freight and tourist traffic is frequently slow moving and this has led to a rise in congestion and driver frustration, particularly along the single carriageway sections. Journey time reliability can be unpredictable; for example the journey time between Perth and Inverness can vary by up to half an hour as a result of slow moving vehicles. Driver frustration due to the lack of safe overtaking opportunities has led to a higher than average rate of serious and fatal accidents.

In the event of an accident, severe traffic delays are common, particularly within single carriageway sections where one or both lanes become fully blocked and lengthy diversion routes must be utilised. Journey times are significantly impacted for diverted traffic, as the presence of accessible diversion routes is minimal within the surrounding topography of the Grampian and Cairngorm Mountains.

Photo 1.1.1 Platooning behind HGVs near the Pass of Killiecrankie snow gates

The STPR identified the following objectives for the corridor between Perth and Inverness:

- *To reduce journey time and increase opportunities to travel between Inverness and Perth (and hence onwards to the Central Belt);*
- *To improve the operational effectiveness of the A9 as it approaches Perth and Inverness;*
- *To address issues of driver frustration relating to inconsistent road standard, with attention to reducing accident severity; and*
- *To promote journey time reductions, particularly by public transport, between the Central Belt and Inverness primarily to allow business to achieve an effective working day when travelling between these centres.*

The STPR recommended upgrading of the A9 from Dunblane to Inverness. STPR confirmed that dualling the A9 would be expected to provide a significant contribution to the Scottish Government's purpose of increasing sustainable economic growth; contribute to the national objectives of promoting journey time reductions between the Central Belt and Inverness and the reduction in accident rates; and address the A9 corridor specific objectives of improving the operational effectiveness of the A9 on approaches to Perth and Inverness and addressing issues of driver frustration.

In particular, STPR noted the following:

- *Grade separation of Keir, Broxburn and Inveralmond Roundabouts would remove congestion at these locations contributing to reduced journey times and improved journey time reliability and road safety;*
- *Dualling the A9 between Perth and Blair Atholl would have the most significant impact on reducing journey times and improving journey time reliability and would contribute to a consistent carriageway standard along this section of the route; and*
- *Dualling the A9 between Blair Atholl and Inverness would further reduce journey times and improve journey time reliability between Perth and Inverness, as well as provide a consistent carriageway standard along the whole of the A9 between Perth and Inverness.*

1.2 Background to the Design Manual for Roads and Bridges (DMRB) Stage 1 Assessment

In September 2012, Transport Scotland commissioned a Preliminary Engineering Services (PES) study for the dualling of the A9 between Perth and Inverness. The commission includes undertaking a preliminary engineering assessment equivalent to a DMRB Stage 1 Assessment for the initial development and assessment of proposed corridor options and strategies for the improvement of the A9 to dual carriageway standards.

The route is predominantly comprised of a single carriageway interspersed with sections of dual carriageway and wide single WS2+1 carriageway. Currently, approximately 48 kilometres or approximately 25% of the A9 between Perth and Inverness is dualled. Typical carriageway sections along the route are shown below.

Photo 1.2.1 Existing single carriageway section on the A9 (Dalraddy)

Photo 1.2.2 Existing WS2+1 carriageway section on the A9 (Raliabeag)

Photo 1.2.3 Existing dual carriageway section on the A9 (Ballinluig)

The scheme objectives established for the A9 dualling programme are as follows:

- *To improve the operational performance of the A9 by:*
- *Reducing journey times; and*
- *Improving journey time reliability*
- *To improve safety for motorised and non-motorised users by:*
- *Reducing accident severity; and*
- *Reducing driver stress*
- *To facilitate active travel within the corridor; and*
- *To improve integration with Public Transport Facilities.*

This DMRB Stage 1 Assessment for dualling the A9 between Perth and Inverness has been developed according to assessment reporting guidance in the Design Manual for Roads and Bridges (DMRB). Typically, this type of report is the first element of a three-stage assessment process. A DMRB Stage 1 Assessment is a preliminary assessment and typically involves a broad, strategic approach to developing and assessing indicative corridor options to allow the identification and consideration of the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with the developed improvement strategies.

Following completion of this Stage 1 Assessment, DMRB Stage 2 and 3 Assessments will be undertaken for the route. It is anticipated that the Stage 2 and 3 work will be undertaken considering the route in different sections with individual assessments and reports prepared for each section.

Stage 2 will involve a more detailed study of the corridor options which progressed from the high level assessment of Stage 1 and the outcome of the Stage 2 assessment will be confirmation of the preferred option for upgrading each section of the A9. Stage 3 will develop the preferred option in more detail and also includes the preparation of an Environmental Statement. The completion of Stage 3 will typically be publication of the Environmental Statement and draft road orders which start the statutory process to gain authorisation for the construction of the project.

1.3 Preliminary Engineering Services (PES); Strategic Environmental Assessment (SEA); and Land Use and Transport Integration in Scotland (LATIS) Context

The work being undertaken to inform the development and assessment of potential corridor options for the A9 dualling involves three separate commissions procured by Transport Scotland, as follows:

- *Preliminary Engineering Services (PES) commission – this commission covers the design and overall assessment of corridor options. The Stage 1 Assessment Report produced considers problems and opportunities associated with the A9 corridor improvements; develops various route strategies; outlines the corridor selection process; discusses potential corridor options; reports in detail the engineering assessment of the potential corridor options; and refers to the outcome of the SEA and ongoing LATIS work covering the environmental and traffic assessment of proposed corridor options. The DMRB Stage 1 Assessment Report makes recommendations*

for the corridor options deemed feasible for progression to the next assessment stage. The conclusion of the DMRB Stage 1 Assessment also includes suggestions for prioritising future improvements, together with steps for advancing to Stage 2.

- *Strategic Environmental Assessment (SEA) commission – a separate study has been undertaken to identify the potential environmental constraints, advantages and disadvantages associated with the corridor options. A separate SEA report has been prepared and the main findings of the SEA relevant to the consideration of corridor options and the recommendations made within the SEA Report are summarised in this Stage 1 Assessment Report.*
- *Land Use and Transport Integration in Scotland (LATIS) commission – separate studies have been undertaken to build an A9 corridor transport model and to assess the economic benefits associated with the A9 corridor. Outputs from earlier work under the LATIS commission are included in this DMRB Stage 1 Assessment Report including baseline flows, forecasts, traffic review (including holiday and am/pm peaks) and accidents review. This includes results from modelling the impact of dualling the A9 in traffic terms and is sufficient to meet the requirements of a DMRB Stage 1 Assessment. A separate Advance Wider Economic Appraisal has also been undertaken and is summarised in this Stage 1 Assessment Report.*

1.4 A9 Corridor Components

To facilitate the Stage 1 assessment, this report considers the A9 corridor in 18 subsections which generally correspond to alternating sections of single and dual carriageway. Some sections of single carriageway have been further split into shorter sections where work to develop the improvements for those sections has been accelerated. This is described further in Section 1.6. The sections, which are shown in **Figure 1.4.1**, are described as follows:

- ***Perth to Luncarty:*** *Dual carriageway section which originates at the Inveralmond Roundabout in Perth and travels 3.4km north to Luncarty; shadows the west bank of the River Tay;*
- ***Luncarty to Pass of Birnam:*** *Single carriageway section, 9.4km in length, which veers northwest from Luncarty, travelling away from the River Tay and passing east of Bankfoot;*
- ***Pass of Birnam:*** *Dual carriageway section, 1.8km in length within the Pass which crosses over a railway line;*
- ***Pass of Birnam to Tay Crossing:*** *Single carriageway section which extends 8.4km west along the western boundary of Birnam and Little Dunkeld, separated from Dunkeld by the River Tay to the east;*
- ***Tay Crossing to Ballinluig:*** *Single carriageway section, 7.6km in length which crosses the River Tay northwest of Dunkeld; the A9 lies east of Tay Forest Park, and passes through Dowally toward the southern extents of Ballinluig;*

- ***Ballinluig to Pitlochry:*** *Dual carriageway section surrounded by woodlands along its 5.8km route, which passes west of Ballinluig; the A9 shadows the east bank of the River Tummel, a tributary to the River Tay; south of Pitlochry the A9 crosses this tributary, bypassing Pitlochry to the west;*
- ***Pitlochry to Killiecrankie:*** *Single carriageway section that continues 6.2km north of Pitlochry through the Tay Forest Park, crossing a tributary of the River Tay before travelling along its east bank on approach to Killiecrankie. The B8019 and B8079 shadow the A9 to the west and form an alternative route between Pitlochry and Killiecrankie;*
- ***Pass of Killiecrankie:*** *Dual carriageway section of 1.7km which lies east of the River Garry and railway;*
- ***Killiecrankie to Glen Garry:*** *Single carriageway section which travels west from Killiecrankie along the southern boundary of the Cairngorms National Park for 21.8km, also passes west of Blair Atholl, Bruar, and Calvine;*
- ***Glen Garry:*** *Dual carriageway section which travels 9km westward through forestlands and lies east of the River Garry;*
- ***Glen Garry to Crubenmore:*** *Single carriageway section that travels 20.5km north into the Cairngorms National Park and passes east of Dalwhinnie and the River Truim on approach to Crubenmore;*
- ***Crubenmore:*** *Dual carriageway section 3.7km in length which lies east of Crubenmore and the River Truim;*
- ***Crubenmore to Kincraig:*** *Single carriageway section which travels northeast for 15.9km from Crubenmore through the Cairngorms National Park passing east of Newtonmore and Kingussie; the A86 merges with the A9 near Kingussie;*
- ***Kincraig to Dalraddy:*** *Single carriageway section traveling northeast from Kincraig for 7.5km within the Cairngorms National Park;*
- ***Dalraddy to Slochd:*** *Single carriageway section, 24.7km in length from Dalraddy lying west of the River Spey and the railway, also passing west of Aviemore, Kinveachy, and Carrbridge;*
- ***Slochd to Tomatin:*** *Dual carriageway section traveling northwest from Slochd for 5km and exiting the Cairngorms National Park boundary;*
- ***Tomatin to Moy:*** *Single carriageway section continuing northwest for 9.3km, lying east of Tomatin and the railway and west of the River Findhorn and Loch Moy; and*
- ***Moy to Inverness:*** *Dual carriageway section which extends 11.5km from Moy passing by Daviot to the southern limit of Inverness where the proposed corridor limits terminate at Inshes Junction.*

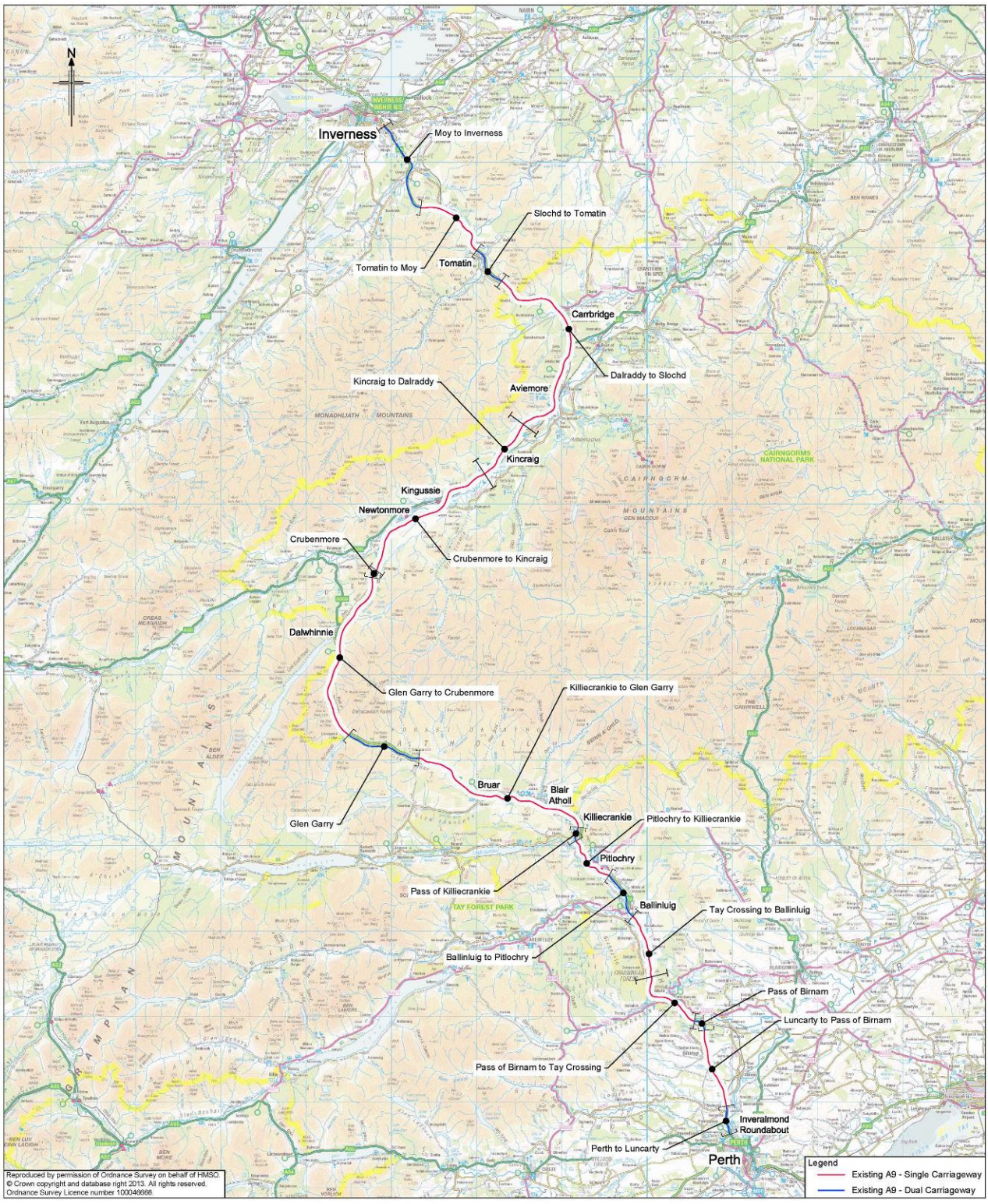


Figure 1.4.1 Existing A9 Carriageway Subsections

1.5 Stakeholders

There are numerous stakeholders with interests in the proposed A9 dualling between Perth and Inverness. The A9 dualling programme is of particular importance to the following key stakeholders who have been consulted as part of this study:

- *Transport Scotland;*
- *Scottish Water;*
- *Scottish Environment Protection Agency (SEPA);*
- *Scottish Natural Heritage (SNH);*
- *Historic Scotland;*
- *Perth and Kinross Council;*
- *The Highland Council;*
- *Cairngorms National Park Authority;*
- *Tayside and Central Scotland Transport Partnership (TACTRANS);*
- *Highlands and Islands Transport Partnership (HITRANS);*
- *Forestry Commission Scotland;*
- *Health and Safety Executive; and*
- *Community Councils.*

In addition to the above, numerous local and community organisations and other special interest groups have been consulted regarding the proposals. Further details are provided in Section 2.10, Stakeholder Consultation.

1.6 Overview of Previous Work

In recent years, Transport Scotland has commissioned a number of studies relating to the A9 corridor. As summarised below, these historical reports have informed the decision to progress the A9 dualling work and current accelerated schemes involving upgrades of three sections of the route.

A9 (T) Perth to Inverness, Development of a Route Strategy: Phase 2 Interim Report and Phase 3 Final Report (1997). These reports present initial safety and operational strategies considered to improve the level of service to road users, provide further safe overtaking opportunities and reduce the number of road traffic accidents. Forward visibility, the requirements for rest and service facilities on the road, and the opportunities for the safe provision of cycle routes were also considered. The Phase 3 Final Report recommended that five improvement schemes be progressed. Outline designs were presented alongside operational, economic and environmental assessments for each improvement scheme, which included:

- ***Luncarty to Birnam Dual Carriageway:*** *upgrading of the existing 9.4km single carriageway to dual 2 lane carriageway; scheme included as part of A9 dualling;*
- ***Dowally to Ballinluig Wide Single 2 Lane Carriageway:*** *widening of 4.7km of the existing 7.3m wide single carriageway to 10m wide single carriageway; scheme has not been progressed;*

- ***Calvine (North) Northbound Climbing Lane:*** *provision of a 1.9km climbing lane; scheme has not been progressed;*
- ***Kincraig to Dalraddy Wide Single 2+1 Lane Carriageway:*** *widening of 4km of the existing 7.3m wide single carriageway to 10m wide single 2+1 lane carriageway; scheme included as part of A9 dualling; and*
- ***Carrbridge (South and North) Northbound Climbing Lane:*** *provision of a 4.2km climbing lane; scheme has been completed.*

A9 Perth to Blair Atholl Route Improvement Strategy Study (RISS) (2005). This study was commissioned to outline a medium to long term strategy for introducing both dual (D2AP) and wide single (WS2+1) carriageway improvements on the A9 corridor between Perth and Blair Atholl. The study indicated that traffic volumes reduced significantly to the north of Pitlochry. Subsequently, the route strategy published in an executive summary in 2006 recommended a programme of improvements to upgrade the A9 to dual carriageway standard between Perth and Pitlochry. It also recommended upgrading the A9 to WS2+1 standard between Pitlochry and Bruar, a settlement which is directly north of Blair Atholl.

A9 Strategic Transport Projects Review (STPR) from Perth to Inverness (2008). In 2006 the Scottish Executive published its National Transport Strategy (NTS). This strategy outlined the vision for the country's transport network and the context for transport policy in the next 20 years. One of the mechanisms for delivering the National Transport Strategy was the Strategic Transport Projects Review (STPR), which identified a programme of transport interventions for the period 2012 to 2022 and beyond.

The STPR examined the transport corridor between Perth and Inverness and the outcomes of the study which are important in terms of the decision to progress the A9 dualling programme are described in Section 1.1 of this report.

In line with the recommendations from the previous studies, in particular the recommendations of STPR, the development of several schemes has already been taken forward. The schemes lie within the sections of the A9 identified in Section 1.4 and include:

- ***Luncarty to Pass of Birnam:*** *9.4km corridor from Luncarty extending north to a short dual carriageway section at Pass of Birnam; Stage 3 Assessment underway at the time of this Report;*
- ***Pass of Birnam to Tay Crossing:*** *8.4km corridor beginning at the Pass of Birnam and continuing to the proposed bridge crossing over the River Tay, northwest of Dunkeld; Stage 2 Assessment underway at the time of this Report; and*
- ***Kincraig to Dalraddy:*** *7.5km corridor between Kincraig and Dalraddy; Stage 3 Assessment underway at the time of this Report.*

The Luncarty to Pass of Birnam and the Pass of Birnam to Tay Crossing schemes are between Perth and Blair Atholl and improvement to this section of the A9 was identified in STPR as being part of the initial phase of the improvements recommended to upgrade the A9 corridor.

The section between Kincraig and Dalraddy was identified in STPR as being an improvement to wide single carriageway standard to be taken forward in the initial phase of the improvements to the A9 corridor. However, with the commitment to upgrade the A9 to dual carriageway standard as part of the overall strategy for the A9 corridor recommended in STPR, development of this scheme is continuing as a dual carriageway improvement.

1.7 Structure of this DMRB Stage 1 Assessment Report

This DMRB Stage 1 Scheme Assessment Report has been prepared in accordance with the DMRB, Volume 5, Section 1 Part 2, TD37/93 Scheme Assessment Reporting.

This report is structured as follows:

- ***Section 1 Introduction:*** *Background to the A9 Dualling Programme and the Stage 1 Assessment;*
- ***Section 2 Existing Conditions:*** *General description of the existing conditions along the existing A9 corridor and the offline corridor options that have been developed;*
- ***Section 3 Description of Alternative Schemes:*** *Description of the corridor development process and the alternative corridor options together with outline cost estimates;*
- ***Section 4 Engineering Assessment:*** *Engineering assessment, including constraints, advantages and disadvantages associated with road alignment, geotechnical, pavement, structures, junctions, parking/bus lay-bys/rest areas, provision for non-motorised users, roadside features and public utilities;*
- ***Section 5 Environmental Assessment:*** *Summary of findings from the separate SEA for the corridor options in relation to environmental issues, potential impacts and sustainability measures;*
- ***Section 6 Traffic and Economic Assessment:*** *Summary of traffic and economic conditions and the effects of corridor options, based on the findings from the Advance Wider Economic Appraisal; and*
- ***Section 7 Key Findings and Recommendations:*** *Recommendations for Stage 2 corridor options, early implementation schemes and the related delivery of the scheme.*

2 EXISTING CONDITIONS

2.1 Introduction

A review of the existing A9 corridor has been undertaken to determine the present engineering, environmental, traffic, and economic features. These key features are considered as part of the DMRB Stage 1 Assessment to provide a background of the current conditions and an understanding of how the dualling scheme may impact or improve these features in various ways. The information presented in this section is intended to provide a high level overview of present conditions along the route. Existing features discussed in this section are also illustrated in the Key Constraints Plans in **Appendix A**.

2.2 Topography and Land Use Overview

2.2.1 Route Characteristics

(a) Topographical Features

The existing A9 route lies within steep terrain bound by alternating hills and valleys of the Grampian and Cairngorm Mountains. The corridor encompasses a varied topography of rock formations, forest lands, open flatlands, and river valleys. Generally, the A9 lies in proximity to numerous rivers and water bodies, which the carriageway sometimes crosses as it extends north from Perth to Inverness. Elevation differences vary along the route as the topography alternates between highlands and lowlands.

Travelling north between Perth and Dunkeld, the A9 gradually rises until reaching the Pass of Birnam. Along this section, the surrounding land consists of the River Tay valley and adjoining flatlands in the south, varying to dense forests on the northern approach to the Pass of Birnam.

Continuing north between Dunkeld and Crubenmore, the A9 elevation increases nearly 350m towards the Pass of Drumochter, which lies between Glen Garry and Crubenmore. The adjacent topography is characterised by lowlands and floodplains in the south, followed by forest land surrounding the Pass of Killiecrankie. There are wooded slopes to the north within Glen Garry, increasing to steep terrain with roadside rock cuttings as the A9 reaches its highest point at the Pass of Drumochter (460mAOD). The A9 crosses or lies adjacent to the Rivers Tay, Tummel, Garry, and Truim within this section.

In the section between Crubenmore and Slochd, the route gradually rises from lower lying areas towards the Slochd Summit. The southern extents consist of a wide river valley prone to flooding, surrounded by steep, forested hills. This area includes the Rivers Spey and Dulnain, along with major water bodies at Loch Insh and Loch Alvie. The northern extents lie within steep terrain and narrow roadside rock cuttings on approach to the Slochd Summit (405mAOD).

The section between Slochd and Inverness gradually decreases in elevation as the A9 travels through open river valleys separated by a high point at Daviot. The route crosses or lies adjacent to Loch Moy and the Rivers Findhorn and Nairn.

Highland sections centrally located between Perth and Inverness are particularly affected by winter weather. For traveller safety, road closures are implemented through the use of snow gates at or near the following four locations, which correspond to previously noted high points along the route:

- ***Blair Atholl*** *– north of the Pass of Killiecrankie;*
- ***Trinafour/Dalnacardoch Estate*** *– south of the Pass of Drumochter;*
- ***Dalwhinnie*** *– north of the Pass of Drumochter; and*
- ***Newtonmore*** *– within Cairngorm Mountains, north of the Pass of Drumochter.*

(b) Existing Land Use

The land use along the existing corridor varies widely, often in accordance with the surrounding topography. The A9 connects these diverse areas for use by local and long-distance commuters, tourists, agricultural transport and other commercial services. The road network is supplemented by the Highland Main Line railway, which generally follows the A9 route between Perth and Inverness. The main land uses surrounding the A9 corridor are listed in the following broad categories:

- *Settlements with varied residential and commercial components;*
- *Sparsely populated agricultural sites; and*
- *Uninhabited or sparsely populated natural areas.*

The existing route currently bypasses major settlements, which include Luncarty, Dunkeld, Birnam, Pitlochry, Blair Atholl, Dalwhinnie, Newtonmore, Kingussie, Aviemore and Carrbridge. These major settlements are separated by sparsely populated features such as mountains, rivers, forests and agricultural areas. Regular travel between settlements is common for local residents to access work locations, commercial areas and schools.

Agricultural land use is common in lowlands, midlands and adjacent floodplains. Farmland is interspersed along the entire corridor in these areas where population is generally sparse. While the A9 is used as a transport connection to outside destinations, the carriageway itself forms a physical barrier between some agricultural properties. Farm vehicles often use the A9 to access various fields along the route, which can attribute to traffic congestion, delays and safety hazards.

Natural areas which are uninhabited or sparsely populated comprise a majority of the surrounding land use served by the A9. These areas include mountains, dense forests and river valleys which are often scenic locations popular with tourists. A significant amount of the A9 passes through the Cairngorms National Park, which is a major recreational destination along with various cycleways, equestrian routes, and hill walking accesses along the corridor.

Key tourist attractions include touring scenic areas and participating in winter sports, hunting and seasonal festivals. Tourism is a key element of the local economy, as it supports numerous businesses, transportation services and lodging facilities along the corridor. Between Killiecrankie and Glen Garry, the A9 passes tourist facilities at Bruar, Calvine, and Struan, along with several lodges. The topography between Crubenmore and Kincraig and proximity to the Cairngorms makes the area popular with tourists. The A9 also provides access to the popular ski centres of Cairngorm, Glen Shee and The Lecht.

2.2.2 Cairngorms National Park

The Cairngorms National Park is a vast natural sanctuary with a diverse topography of mountains, forests, moorlands, rivers and lochs. As the UK's largest national park, it attracts over 1.5 million visitors annually. It is also home to over 17,000 people and hundreds of businesses, many of which are accessed by the existing A9 route. The Park's significance encompasses a wide range of activities and features from sustainable tourism and the local economy to the preservation of endangered species and protected environmental and archaeological sites. Approximately 100km of the existing A9 passes through the Park, which covers 4528 square kilometres of land mass.

The Cairngorms National Park Authority (CNPA) was set up in 2003 and has statutory responsibility under the National Parks (Scotland) Act 2000. The CNPA works in partnership with relevant stakeholders to help ensure that projects such as the A9 Dualling meet four key aims of this Act, namely:

- *To conserve and enhance the natural and cultural heritage of the area;*
- *To promote sustainable use of the natural resources of the area;*
- *To promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public; and*
- *To promote sustainable economic and social development of the area's communities*

Park boundaries, which enclose the A9 between Killiecrankie and Slochd, are shown on the Key Constraints Plans (**Appendix A**).

2.2.3 Non-Motorised User (NMU) Provisions

(a) NMU

Drawings B1557620/1100/001 – 027 in **Appendix B** illustrate the existing NMU provisions throughout the length of the A9 between Perth and Inverness. NMUs include pedestrians, cyclists and equestrians.

The availability of NMU routes varies throughout the scheme. There is, generally, a noticeable increase in the provision of NMU facilities on the approach to and within populated areas i.e. in and around Perth, Luncarty, Birnam, Dunkeld, Pitlochry, Newtonmore, Kingussie, Aviemore, Carrbridge and Inverness. Between these centres of population, there are considerably less NMU facilities. The location of the NMU routes in relation to the A9 varies considerably within the unpopulated areas; from running roughly parallel to the A9 to being positioned a considerable distance from it (sometimes offset as far as 700m from the existing road).

Throughout the length of the scheme, there are various existing NMU provisions comprising the following:

- *Core paths, which include rights of way by foot, horseback, cycle or any combination of those;*
- *Rights of way and National Cycle Network (NCN) routes that are not designated as core paths; and*
- *Informal NMU routes.*

Some of the key core paths and NCN routes are those used for daily commutes to the highly populated areas of Perth, Pitlochry, Aviemore and Inverness and the NCN which extends the length of the A9 (Routes 1, 7 and 77). The NCN comprises both on-road (unsegregated from traffic) sections and off-road sections.

(b) Core Paths

Under the Land Reform Act of 2003, every local authority in Scotland was required to draw up a plan for a system of core paths. The gathered research also indicates where new routes and improvements might be needed, while the plan assists landowners and land managers with managing public access on their property. The existing A9 corridor passes through three core path networks, overseen by Perth and Kinross Council; the Cairngorms National Park Authority; and the Highland Council.

The development of a Core Path Network is based on information gathered through various methods about where people enjoy walking, cycling, horse-riding and other outdoor activities. A Core Path Network is comprised of multiple core paths, which individually are of no particular standard type and may not be suitable for all potential user activities. Rather, a single path is sufficient for the purpose of giving the public reasonable access throughout the countryside across varied terrain and user functions. A core path is commonly identified according to the following general criteria:

- *The path is fit for multi-use;*
- *The path creates a route in and around settlements and centres of population;*
- *The path helps people travel to and enjoy visitor attractions and historic or natural heritage sites;*
- *The path contributes to the overall network of routes around settlements and attractions; and*
- *The path creates links between settlements, facilities (e.g. shops, banks, schools), transport links and attractions.*

The core paths within the extents of the scheme also include hill tracks, which are predominantly located within the Cairngorms National Park boundary.

2.3 Environmental Conditions

2.3.1 Introduction

At the time of the DMRB Stage 1 Assessment phase, a Strategic Environmental Assessment (SEA) has been developed as a parallel commission to the PES. This section summarises the objectives of the SEA Report (June 2013), along with the environmental conditions identified within the corridor.

The SEA aims to deliver a route-wide approach which:

- *is similar in scope to a DMRB Stage 1 Environmental Assessment;*
- *provides a link between previous STPR work and later DMRB route alignment and design work;*

- *identifies and collates the range of environmental constraints around the A9 between Perth and Inverness;*
- *presents and assesses significant issues and risks;*
- *considers whether a particular issue would affect where the route goes, in determining significance;*
- *develops effective mitigation and enhancement proposals in terms of:*
    - *recommendations for specific detailed studies;*
    - *opportunities for development and application of consistent strategic environmental principles; and*
    - *guidance for later route alignment studies, detailed design and environmental assessment stages.*
- *consults the public and statutory authorities with environmental responsibilities; and*
- *works alongside the A9 PES commission to clearly identify the most constrained sections of the route and to inform the overarching dualling programme.*

SEA Scoping considered a list of all potential issues relating to the A9 Dualling with a number of these removed from consideration following consultation and an SEA Scoping Workshop. The A9 SEA topics include:

- *Material Assets;*
- *Population and Human Health;*
- *Landscape;*
- *Historic Environment;*
- *Biodiversity, Flora and Fauna;*
- *Soil; and*
- *Water.*

The SEA adopted a Geographical Information System (GIS) mapping approach in order to effectively assess key issues and constraints. The environmental assessment focussed on identifying features within a 200m boundary for each corridor option. The findings of the assessment were presented in six geographical sections; Inveralmond to Tay Crossing, Tay Crossing to Bruar, Bruar to Dalwhinnie, Dalwhinnie to Newtonmore, Newtonmore to Kinveachy and Kinveachy to Inverness.

2.3.2 Environmental Conditions

The existing environmental conditions are shown on the Key Constraints Plans in **Appendix A** and, for the main, encompass the following:

- *Significant biological designations; such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), Ramsars, National Nature Reserves and Ancient / Semi-Natural Ancient Woodland Sites;*

- *Historic Environment and Landscape Designations; such as National Scenic Areas, Historic Gardens and Designed Landscapes (HGDL), Conservation Areas, Battlefields, Scheduled Monuments and Listed Buildings;*
- *Geological Conservation Review (GCR) sites;*
- *Geological Sites of Scientific Interest (SSSI); and*
- *Water bodies.*

2.4 Carriageway Features

2.4.1 Introduction

This section of the report provides a brief overview of carriageway features, including alignment and cross section variations, pavement condition and structural characteristics. Junctions, accesses, lay-bys and rest areas are also described. Beyond the general aspects highlighted below, further information on these topics is presented in Section 4.

2.4.2 Alignment and Cross Section

Phased construction of the existing A9 between Perth and Inverness was undertaken from the 1970s to mid-1980s. It was designed to the engineering standards that were relevant at the time of construction i.e. the "Layout of Roads in Rural Areas" design guide. Since its original construction as a single two-lane all-purpose (S2AP) carriageway, discrete sections of the A9 between Perth and Inverness have been upgraded to either all-purpose dual two lane (D2AP) carriageway or wide single 2+1 (WS2+1) carriageway. Consequently, there are numerous changes in the cross-section between Perth and Inverness. There are currently seven single carriageway sections interspersed within eight dual carriageway sections, and approximately one quarter of the 177km length of road is dual carriageway.

The existing alignment and how it compares with current DMRB standards is discussed in detail within Section 4.6 of this report and applicable information on horizontal and vertical geometry, stopping sight distance (SSD) and Departures from Standards are included for each subsection of the online route. At present, approximately 27% of the dual carriageway sections and approximately 7% of the single carriageway sections are not in accordance with current standards.

The cross section varies along the length of the A9 but is predominantly as follows:

- *For the dual carriageway sections: two carriageways of 7.3m width travelling in opposing directions (each containing two 3.65m wide lanes); a 2.5m wide central reservation separating the two carriageways; a 1.0m wide hardstrip adjacent to both sides of each carriageway (sections have reduced 0.7m wide hardstrip); and a 2.5m wide verge adjacent to each offside hardstrip;*
- *For the single carriageway sections: one 7.3m wide carriageway, with two 3.65m wide lanes travelling in opposing directions; a 1.0m wide hardstrip adjacent to both sides of the carriageway; and a 2.5m wide verge adjacent to each hardstrip; and*

- *For the WS2+1 carriageway sections: an 11.5m wide carriageway with three 3.5m wide lanes and a 1m wide separator zone; a 1.0m wide hardstrip adjacent to both sides of the carriageway; and a 2.5m wide verge adjacent to each hardstrip.*

Photo 2.4.1 WS2+1 Section of Carriageway near Ralia

There is one dual carriageway section within the scheme which contains split level carriageways (Glen Garry); the two carriageways within this section are also offset a considerable distance from each other.

Further details of the existing cross sections and compliance with standards are provided in Section 4.7.

2.4.3 Pavement

The original A9 pavement was constructed as a flexible composite. However as improvement and maintenance works have been undertaken over recent years, there has been a shift in favoured pavement construction techniques resulting in sections of the A9 now being fully flexible. The A9 has an average pavement thickness varying from 135mm bituminous and 175mm cementitious material for the flexible composite construction and 255mm bituminous and 150mm of granular material for the fully flexible construction.

As discussed in Section 4.8, the pavement composition of the existing carriageway was determined by analysing Transport Scotland's Scottish Executive Roads Information System (SERIS) database which includes details of material, thickness, and structural properties. Preliminary residual life analysis, derived from deflectograph surveys undertaken by a high speed road monitor, indicates that over 50% of the route has at least 20 years of life remaining but that 25% of the route has less than 10 years remaining. A small percentage of the route has less than 5 years

residual life remaining and includes sections of the pavement between Perth and Luncarty, Tay Crossing and Ballinluig and Tomatin and Moy.

2.4.4 Structures

There are numerous existing structures along the length of the route between Perth and Inverness. These consist of overbridges (where the road, railway or pedestrian structure passes over the existing A9), underbridges (where the road, railway or pedestrian structure passes under the existing A9) and watercourse crossings. In total, there are 230 of these structures along the length of the A9 between Perth and Inverness.

A detailed assessment of existing structures based on a review of recent inspection reports is contained within Section 4.9 of this report. In general, the majority of existing structures are in fair to good condition; approximately half of the existing structures currently require some form of repair. The cross sections of the structures vary along the length of the route and are typically not in compliance with current standards; however, cross section information is limited and therefore a full assessment of compliance has not been undertaken for all structures. Several existing structure locations are constrained by watercourses, railways and steep topography.

Key structures along the route include eight underbridges and one viaduct. The underbridges are all located within single carriageway sections. The viaduct, which lies within a dual carriageway, has a reduced cross section width of 24.6m that is not compliant with current standards. These structures are listed below along with a description of existing repair needs, constraints, and structure lengths.

- ***A9 450 River Tay Underbridge:*** *Repairs involving drainage, paint, spalling and verge surface; significant river crossing and railway in proximity (226m in length);*
- ***A9 530 Tummel Underbridge:*** *Repairs involving drainage, concrete, pavement surface and bearing replacement; significant river crossing (157m in length);*
- ***A9 550 Clunie Underbridge:*** *Repairs involving drainage and pavement surface; significant watercourse crossing (147.5m in length);*
- ***A9 590 Killiecrankie Viaduct:*** *Cross section not compliant with current standards; spans Pass of Killiecrankie (615m in length Northbound);*
- ***A9 640 Allt Girnaig Underbridge:*** *Repairs to joints and pavement surface; significant river crossing (83m in length);*
- ***A9 670 Essangal Underbridge:*** *No major defects identified; significant river and railway crossing (166.5m in length);*
- ***A9 690 Pitaldonich Underbridge:*** *Repairs to pavement surface, kerb, and paint; significant river crossing (79.6m in length);*
- ***A9 1190 Dulnain Underbridge:*** *Repairs involving drainage, concrete, and pavement surface; significant river crossing (82.3m in length); and*
- ***A9 1210 Slochd Beag Underbridge:*** *Repairs involving drainage, concrete, and pavement surface, parapets, and waterproofing; steep valley crossing and proximity to railway and local road (145m in length).*

2.4.5 Junctions and Accesses

Along the length of the existing A9 between Perth and Inverness, there are a total of 259 junctions and accesses which provide connections to other trunk roads, local roads, villages, towns and community facilities. A detailed assessment of existing junctions and accesses is contained within Section 4.10 of this report. Eight of these junctions connect to A class roads, of which 3 are trunk roads located south of Dalwhinnie (A889), Kingussie (A86) and north of Aviemore (A95). In addition, there are 14 B class roads connecting to the A9. Other junctions connect a C class road and/or unclassified roads and private or agricultural accesses.

Existing junction types include 6 grade separated junctions (GSJs), 3 left-in/left-out junctions and 34 at-grade junctions and 216 accesses. GSJs involve two or more roads crossing at different levels, which facilitate the free-flow of traffic on both roads. The existing GSJs have been reviewed against the DMRB TD 22/06 Layout of Grade Separated Junctions which determined that all the existing junctions are below the current design standard requirements. At-grade junctions involve two or more roads converging at the same level; typically, the major road has priority over minor road(s). Two of the at-grade junctions allow right turn manoeuvres across the existing A9 dual carriageway sections. In addition to GSJs and at-grade junctions, there are three left-in/left-out access arrangements (where right turn manoeuvres across the existing A9 are prohibited), generally providing private or agricultural accesses. Full details of all the junction and access assessments can be found in Section 4.10.

The current design standards reference historical research which highlights statistical evidence of a correlation between an increase in the frequency of junctions and accesses and higher accident numbers on rural all-purpose routes. The A9 shows a similar trend and the accident statistics from Perth to Inverness between 2001 and 2010 shows that 31% of the 566 recorded injury accidents were adjacent to junction and accesses. A further review of the historical information for roads similar in nature to the A9 also shows that accidents increase in frequency at junctions and accesses.

2.4.6 Lay-bys and Rest Areas

The lay-by provision for the existing A9 between Perth and Inverness is more fully described in Section 4.11 and comprises both parking lay-bys and bus lay-bys. There are a total of 198 lay-bys which can be summarised as follows using the layouts specified in TD 69/07 of DMRB:

- *Layout A – 26;*
- *Layout A with taper – 3;*
- *Layout B – 148;*
- *Bus – 20; and*
- *Combined Bus / Layout B – 1.*

It is apparent that Layout B is by far the most common; this layout is acceptable for single carriageway roads but not for dualled roads. With respect to bus stops, the 20 lay-bys represent 10 stopping locations, each with a lay-by on either side of the road, an additional bus stop exists on the southbound section of a dual carriageway with the corresponding northbound stop located off the carriageway.

There are also a number of additional locations along the A9 corridor where vehicles park along the side of the road to allow access to NMU routes including those leading to Munros and Corbetts.

Ralia is the only recognised existing rest area along the A9 route, located in Newtonmore at the Highland Gateway Centre. Additional services are provided within adjacent communities, accessed upon exiting the A9, and the House of Bruar is known to be used as a rest area. Details of the existing rest area locations and facilities provided are included in Section 4.12.

2.5 Traffic and Safety Characteristics

2.5.1 Traffic Conditions

The current traffic flows, observed on the A9 between Perth and Inverness in 2012, are between 6,800 and 24,300 vehicles per day. Traffic levels vary along the route, with greater commuter traffic demand adjacent to Perth and Inverness and lower levels of demand within the central more rural section between Pitlochry and Moy. The volume of Heavy Goods Vehicles (HGV) is relatively consistent along the corridor at circa 1,000 vehicles per day, which equates to between 11% and 18% of the traffic volumes dependant on the particular section of the route. Further details are included within Section 6 of this report.

Table 2.5.1 details the Annual Average Daily Traffic (AADT) recorded at Automatic Traffic Counters (ATC) locations along the A9 in 2012. The table shows that the highest flows are found at the most southern and northern extents of the A9.

A9 Section	Year
	2012
Perth – Luncarty	23,000
Luncarty – Pass of Birnam	15,200
Pass of Birnam	12,900
Pass of Birnam – Tay Crossing	13,100
Tay Crossing - Ballinluig	13,200
Ballinluig - Pitlochry	13,000
Pitlochry - Killiecrankie	9,400
Pass of Killiecrankie	9,300
Killiecrankie – Glen Garry	8,300
Glen Garry	8,300
Glen Garry - Crubenmore	7,900
Crubenmore	6,800
Crubenmore - Kincraig	7,900
Kincraig - Dalraddy	8,300*
Dalraddy - Slochd	7,600
Slochd - Tomatin	8,400*
Tomatin - Moy	8,600
Moy – Inverness (Inshes)	11,000
Inverness (Inshes) - Raigmore	24,300

**Estimated flows based on one or more counters or on a counter not in the exact location of the carriageway.*

Table 2.5.1 AADT Flows for 2012 along the A9

Traffic information shows a significant seasonal variation in traffic flows. In the summer months between May and September, traffic on the A9 can be double of that between the months of November and February on the lighter trafficked sections of the route.

In general, given the rural nature of the route, traffic queuing is restricted to the at-grade roundabout at Inveralmond Roundabout at the southern extent of the Perth to Luncarty section of the A9.

2.5.2 Safety Issues / Accident History

Analysis of accident trends during recent years demonstrates that the accident rate on both single and dual carriageway sections of the A9 are lower than the comparable national rates. When assessing the national accident data, 68% of all accidents occur on a single carriageway road, 27% of accidents occur on dual carriageway sections.

However, the proportion of severe accidents (classed as fatal or serious accidents) on the A9 has remained higher than the national average in the most recent five year period. In 2011, 71.4% of accidents on the A9 resulted in a minor injury, 11.9% resulted in a serious injury and 16.7% resulted in a fatality, whilst the 2011 national average for serious accidents is higher at 20.0%, the fatal accidents are significantly lower at 3.7%. Accident severity has therefore been identified as an area of concern on the route.

A map of accident clusters is shown in **Appendix O**. The majority of accidents on the A9 between 2007 and 2011 were as a result of slippery roads due to the weather conditions. Other causes of accidents were failure to look properly, poor turn or manoeuvre, loss of control and following too closely.

2.5.3 Diversion Routes

Transport Scotland has developed diversion routes in partnership with Local Authorities, Traffic Scotland and the Police. They provide an alternative route should the A9 be closed due to a major vehicle accident or incident such as a landslide. Diversion routes are provided for the majority of the route; however the distance a road user may be diverted can differ greatly, from 2 to 69 miles in length depending on where an incident has occurred.

In total, 24 diversions have been identified at 13 locations along the route. These are summarised below in **Table 2.5.2**; maps detailing each diversion route can be found in **Appendix C**.

Existing Diversion Routes			
Closed Carriageway Section	**Direction of Traffic**	**Diversion Route (refer to Appendix C for details)**	**Length of Diversion (miles)**
Perth to Dunkeld	Northbound	1	54
	Southbound	2	29
Dunkeld to Pitlochry	Southbound	3	39
Pitlochry to Dalwhinnie	Northbound/ Southbound	-	-
Dalwhinnie to Kingussie	Northbound	4	19
	Southbound	5	19
Kingussie to Granish	Northbound	6	13
	Southbound	7	13
Granish to Carrbridge	Northbound	8	8
	Southbound	9	8
Carrbridge to South Tomatin Junction	Northbound	10	67
	Southbound	11	50
South Tomatin Junction to North Tomatin Junction	Northbound	12	3
	Southbound	-	-
Inverbrough to Dalmagarry	Northbound	13	69
	Southbound	14	69
Moy to Daviot South	Northbound	15	7
	Southbound	16	7
Daviot South to Daviot North	Northbound	17	14
	Southbound	18	11
Daviot North to Drumossie	Northbound	19	12
	Southbound	20	9
Bogbain Junction to Inshes Junction	Northbound	21	3
	Southbound	22	2
Inshes Junction to Raigmore Interchange	Northbound	23	6
	Southbound	24	5

Table 2.5.2 Summary of Diversion Routes

The diversion routes are dispersed along the length of the corridor. At some locations no diversion is available and in others, a diversion is identified in only one direction of travel. The decision to close the A9 and divert traffic is made by the Police.

2.6 Journey Time Reliability and Driver Frustration

2.6.1 Driver Frustration

The route is predominantly single carriageway, interspersed along its length with short sections of dual carriageway to provide guaranteed overtaking opportunities. However, the limited number of overtaking opportunities appears to contribute to driver frustration. The increased traffic in the summer months further reduces the

opportunity to overtake on single carriageway; when the visibility exists there is often an oncoming vehicle travelling in the opposing direction.

Photo 2.6.1 Slow moving vehicles at Dalraddy

The journey time between Perth and Inverness is approximately 2 hours. However in summer months, traffic levels increase and introduce a change in traffic patterns, with greater levels of tourists who may not be familiar with the route. In addition, the HGV speed limit on the single carriageway is 40mph; slower HGV's combined with agricultural vehicles travelling along the route can result in actual speed being significantly lower than desired speed.

These elements can cause journey time reliability issues, which can increase levels of driver frustration. Any incidents which occur along the route can severely impact journey times, due to the isolated location of the route and the long diversion routes. These incidents can therefore further exacerbate the journey time reliability issues.

2.7 Social and Economic Context

Social and economic aspects associated with the A9 Dualling is assessed within a separate Advance Wider Economic Appraisal (AWEA) which was published in September 2013. The intent of this qualitative evaluation is to develop an understanding of national and regional benefits that could arise from dualling the A9 between Perth and Inverness. This will feed into the separate Wider Economic Appraisal referred to in Section 1.3. The objectives and output from the AWEA are detailed as follows:

- *Scope the geographic extent of the area that would be impacted by the schemes (study area)*
- *Review the existing economic data; prepare a baseline data report for the study area;*
- *Identify how dualling the A9 could affect the economy of the study area, considering the effects on existing businesses and the potential for new businesses;*
- *Perform a benchmarking exercise to determine how similar road improvements have affected local and regional economies; and*
- *Produce an Economic Impact Report incorporating the findings from consultations with key stakeholders*

The AWEA report determined that the dualling of the A9 will enhance access to one of the fastest growing areas of Scotland and provide a more reliable route for businesses moving goods and people to and from the central belt and further field. In particular, three main areas will benefit which are Inverness and Nairn, Badenoch and Strathspey and Easter Ross. The improved access should further add to the attractiveness of the area as a place to live, work and invest. The outcomes of the report should be considered in more detail within the DMRB Stage 2 Assessment.

2.8 Public Transport Facilities

2.8.1 Introduction

Improving integration with public transportation facilities is an objective of the A9 dualling improvements. Locations of train and bus facilities have been evaluated to determine their existing distribution across the A9 corridor.

2.8.2 Bus Facilities between Perth and Inverness

Within the corridor limits, there are 10 online bus stop locations, each with a northbound and southbound bus stop facility, an additional bus stop exists on the southbound section of a dual carriageway with the corresponding northbound stop located off the carriageway. The majority of bus facilities are concentrated in either the southern or northern end of the corridor primarily to serve commuters travelling from communities on the A9 to Perth and Inverness respectively. Five southern facilities are located between Luncarty and Pitlochry; one facility is located centrally within the corridor at Dalwhinnie; and the remaining four northern facilities are located between Tomatin and Inverness.

Details of the existing bus facilities are summarised below in **Table 2.8.1**.

Facility Number	Chainage	Location along Existing A9 Corridor
1	2250	South of Luncarty
2	2550	
3	19600	Southwest of Dunkeld
4	19650	
5	28100	Kindallachan, South of Ballinluig
6	28250	
7	31550	Ballinluig
8	31950	
9	34150	4 km South of Pitlochry
10	34050	
11	66900	Dalnacardoch Lodge
12	85800	South of Dalwhinnie
13	85900	
14	153300	North of Tomatin
15	153250	
16	155450	Dalmagarry, 4 km North of Tomatin
17	155450	
18	166800	Daviot
19	166950	
20	172100	Inshes, South of Inverness
21	172150	

Table 2.8.1 Existing A9 Bus Facilities between Perth and Inverness

Scottish CityLink provides a bus service between Perth and Inverness, using three service operators: Megabus, Park's and Stagecoach. In general, the route between Perth and Inverness consists of an hourly bus service seven days a week, along both northbound and southbound directions of travel. In general, the type of service alternates each hour between non-stop and multi-stop service. At certain times of day, the non-stop service is provided more frequently.

Photo 2.8.1 Existing Bus Stop Provision at Dalwhinnie

Stagecoach is the major operator of local bus routes along the A9 corridor. Services are generally concentrated around three locations: Perth, Aviemore (Cairngorms National Park) and Inverness. A summary table of local bus services operating along the A9 is provided in **Appendix D**.

2.8.3 Train Facilities between Perth and Inverness

There are eight existing train stations within the corridor limits. The majority of stations (six total) lie beyond the extents of the immediate existing A9 corridor, separated by watercourses and/or other roads. The southernmost train station at Dunkeld/Birnam is located immediately west of the A9, with a direct access from the northbound and southbound carriageways.

Photo 2.8.2 Dunkeld and Birnam Train Station

The northernmost train station at Carrbridge is located within 100 metres of the A9, east of the road; however, there is no direct access provided in the existing conditions. Existing train station information is summarised below in **Table 2.8.2**.

Station Name	Chainage	Proximity to Existing A9 Corridor	Direct Access
Dunkeld/Birnam	18000	West of A9; Direct Access from A9	*YES*
Pitlochry	38500	Northeast of A9, opposite side of river	*NO*
Blair Atholl	50400	North of A9, opposite side of river	*NO*
Dalwhinnie	87800	West of A9, opposite side of river	*NO*
Newtonmore	104000	West of A9, opposite side of river	*NO*
Kingussie	108500	West of A9, opposite side of river	*NO*
Aviemore	127800	East of A9, opposite side of B9152	*NO*
Carrbridge	138600	East of A9, within 100m; no Direct Access	*NO*

Table 2.8.2 Existing A9 Train Station Facilities between Perth and Inverness

Photo 2.8.3 Existing Train Service between Perth and Inverness

ScotRail train frequency within the corridor was also evaluated using published schedules. A northbound train travels from Perth to Inverness every 1.5 hours on average. There are a varied amount of stops between the two cities. Hourly trains stop at Pitlochry, Kingussie, and Aviemore; other stations are served less frequently at approximately every two to four hours depending on the time of day. In comparison, southbound train frequency is slightly higher, with an average of one hour between stops from Inverness to Perth. Similar to the northbound schedule, hourly trains stop at Pitlochry, Kingussie, and Aviemore. Other stations have less frequent stops at approximately every three to four hours.

2.9 Public Utilities

2.9.1 Overview

Public utility information is currently being collected in accordance with the C2 Preliminary Inquiries stage of the New Roads and Street Works Act 1991, Measures Necessary where Apparatus is Affected by Major Works (Diversionary Works), A Code of Practice.

In addition, utility information for the three advanced schemes introduced in Section 1.4 is currently being obtained and analysed at the time of this report. Key information from the initial findings are summarised for the schemes as follows:

- ***Luncarty to Pass of Birnam:*** *National Grid gas main of nationwide significance has been identified near the Bankfoot Junction; other key facilities include water and telecoms in close proximity and parallel to the road, with occasional crossings; power facilities are also present;*

- ***Pass of Birnam to Tay Crossing:*** *Known utilities include telecom cables and a mobile phone mast adjacent to the corridor, with three cable crossing locations; three high pressure and one low pressure gas main crossings; above and below ground SSE power lines with eight corridor crossings; two Scottish Water crossings and one combined water/sewer crossing; and*

- ***Kincraig to Dalraddy:*** *Potential conflicts with BT telecom, SSE power, and Scottish Water facilities; no gas facilities are present.*

2.9.2 Scottish and Southern Energy (SSE)

In January 2010, the Scottish Ministers granted consent to install a 400kV overhead electricity transmission line to replace the existing 132kV overhead transmission line between Beauly and Denny. Construction on the replacement pylons commenced in 2012; the consent states that electricity transmission should begin within six years of commencing construction. Once the new line is operational, the existing Beauly to Denny power line will be dismantled and removed, which is proposed to take one year following commencement in summer 2014. Discussions between SSE and Transport Scotland are currently ongoing with respect to the A9 Dualling project.

Further details of the project, including the impacts and benefits to this scheme, are reported in Section 4.16.

2.10 Stakeholder Consultation

2.10.1 Key Stakeholders

As part of the A9 Dualling proposals, Transport Scotland is undertaking an ongoing communication and consultation exercise with a wide spectrum of stakeholders. Transport Scotland has an A9 Dualling Stakeholder Engagement Strategy to ensure that engagement with interested parties is properly undertaken. In addition, the A9 will comply with the National Standards for Community Engagement.

To date, consultation with Stakeholders has assisted with the development of the constraints plans by identifying key constraints such as locations of environmental sites, listed buildings and battlefields. Consultation with Stakeholders has also assisted with the development of the NMU facilities to be promoted as part of the A9 Dualling.

Affected Stakeholders have been grouped into Statutory and Non-Statutory Stakeholders. Statutory Stakeholders include Local Authorities, Perth and Kinross Council and The Highland Council, and environmental organisations including Scottish Natural Heritage (SNH), CNPA, Historic Scotland (HS) and Scottish Environment Protection Agency (SEPA). Scottish Water are also a Statutory Stakeholder.

Non-Statutory Stakeholders include, but are not limited to, regional transport partnerships groups (ScotRail, Firstgroup, Citylink, etc.), public utilities providers and emergency services. Consultation with others including the general public, community councils and landowners will be ongoing as the scheme develops.

2.10.2 Summary of Stakeholder Contact

Since January 2012, Transport Scotland has been engaging with many interested parties to identify the risks and opportunities which need to be considered as part of the project delivery.

Transport Scotland has also been engaging with the communities affected by the current A9 projects at Luncarty to Pass of Birnam, Birnam to Tay Crossing and

Kincraig to Dalraddy. More detailed consultation on these schemes will take place in 2013.

In December 2012, community consultation was extended through a series of exhibitions on the route between Perth and Inverness. Further Public Exhibitions were held in June 2013 to provide an update on the A9 PES and SEA Commissions and the progress of the A9 projects outlined above. Feedback is being reviewed and responses provided, as required. A summary report will be produced detailing the consultation outcomes and community input of both the December and June exhibitions.

In recent months, meetings have been held with the Local Authorities and Regional Transport Groups, SEPA, CNPA and SNH to understand their own aspirations as part of the A9 Dualling and to outline the PES and SEA progress to date.

2.11 A9 Safety Group

The A9 Safety Group was set up by Transport Scotland in July 2012 to work closely with partners to reduce road casualties on the route. The main aims of the A9 Safety Group before and during the A9 dualling programme is to work together to positively influence driver behaviours in a way that helps reduce road casualty figures.

The A9 Safety Group is chaired by Transport Scotland, and includes representatives from Police Scotland and their respective Safety Camera Partnerships (SCPs); The Highland Council; Perth & Kinross Council; Scotland TranServ; BEAR; the Road Haulage Association (RHA); the Freight Transport Association (FTA); and the Confederation of Passenger Transport and Stagecoach, both representing professional road users (bus services).

As of July 2013, the A9 Safety Group has formally met on four occasions. It has been recognised that in the first instance the group should review all facts and figures relating to the existing safety performance of the route, including a review of recent accident statistics and vehicle speeds. The A9 Safety Group has agreed to the implementation of Average Speed cameras which are to be introduced between Perth and Inverness by the summer of 2014.

Further details on the work being undertaken by the A9 Safety Group can be found on their website at: www.a9road.info.

2.12 Challenges of the Corridor Environment

2.12.1 Winter Resilience

(a) Introduction

The A9 road reaches its highest level of 460mAOD (1508 feet) as it crosses the mountains at the Pass of Drumochter. This location is also the highest point on the Scottish trunk road network. The second highest point on the route is south of Inverness at Slochd Summit where it is 405mAOD (1328 feet). Both locations and the surrounding areas can experience severe adverse winter weather between November and March and the potential for snow accumulation at these locations is significant.

Winter resilience considerations include the planning and safety features, management approach and strategic issues of the existing corridor. Existing

roadside features related to winter resilience are also presented in detail in Section 4.14.

(b) Winter Service Planning and Safety Features

During prolonged periods of severe weather, road closures have been necessary at the Pass of Drumochter, Slochd Summit, Findhorn Crossing, Dalwhinnie to Blair Atholl, Calvine, Aviemore to Inverness and Dalnaspidal. The power to close the road is afforded to the roads authority in Section 33 of the Roads (Scotland) Act 1984. Snow gates and hidden fold-down signs are located at areas known to be particularly vulnerable to adverse weather conditions: Blair Atholl, Trinafour/Dalnacardoch, Dalwhinnie and Newtonmore. Consideration must be given to stacking lorries and turning vehicles in these locations.

Snow poles are positioned on the verge of the road to demarcate the edge of the carriageway during snow and wintery conditions. Along the A9 they are located from Calvine to Crubenmore and Dulnain to Slochd. There is currently no snow fencing located on the existing A9 route. One shelter belt, to specifically reduce the impact of drifting snow, is located at Dalwhinnie; there is a tree shelter belt to the east of the route between Pass of Drumochter and Dalwhinnie.

(c) Decision and Information Management

The forecasting of weather conditions across climatic zones and decision making responsibilities lies with the Trunk Road Operating Companies, albeit with defined obligations and specifications set out in terms of a maintenance contract.

There are a total of seven weather stations which generate domain specific forecasts between Perth and Inverness on the A9. They are located at Inveralmond, Dunkeld, Calvine, Drumochter, Avielochan, Slochd and Daviot. Furthermore, the stations at Daviot, Avielochan and Calvine utilise ice sensors to model the temperature characteristics of the road pavement. There are also cameras located at both the Slochd and Drumochter weather stations.

The Scottish Government and Transport Scotland annually engage the public with winter travel advice and education. Furthermore, Traffic Scotland provides daily journey time reliability and road condition updates to the public.

Several Areas Requiring Special Attention (ARSAs) have been identified along the route. An ARSA is an area identified as problematic through past experience or local knowledge. The ARSAs between Perth and Inverness include the following:

- ***Dalwhinnie to Trinafour*** *(within Killiecrankie to Glen Garry, Glen Garry and Glen Garry to Crubenmore subsections) – Snow accumulations, drifting and reduced visibility from windblown snow affect serviceability;*
- ***Drumossie Brae Southbound (within Moy to Inverness subsection)*** *– Snow accumulations, drifting, and lorries jack-knifing on steep incline affect serviceability.*

(d) Resources and Operational Issues

Historically, winter service activities involving salting and ploughing on the A9 have been delivered from depots interspersed along the route at Perth, Blair Atholl, Kingussie and Inverness. Resources are currently constrained due to the proximity

between service depots and the fact that there is not a depot with covered salt storage servicing the route. It should be noted that Transport Scotland require operating companies to be within a 1 hour drive of any location on the A9 in order to react in sufficient time to wintery weather conditions. A need exists for winter service provision around the Pass of Drumochter and the Slochd Summit; in particular, by provision of a depot with covered salt storage.

2.12.2 Flooding

Recent experiences and consequences of flooding have increased the importance of flood prevention measures and the need for road authorities to plan for and respond to extreme weather conditions.

The SEPA Flood Map has been utilised to identify areas on the A9 between Perth and Inverness which are at risk of flooding. Floodplains which intersect or encroach upon the route have been identified and outlined (**Table 2.12.1**).

It should be noted that the SEPA Flood Map does not include any flood prevention schemes. Therefore, it is important that any such schemes are identified before further action is taken. A more detailed assessment is required to assess the full extent of the risk and is currently being undertaken as part of the Strategic Flood Risk Assessment (SFRA).

Photo 2.12.1 River Truim Flood Plain south of Dalwhinnie

Flood Risk Location	Floodplain Details
Inveralmond Roundabout (Perth)	A large urban floodplain covers the roundabout and the areas adjacent to the A9 at the start of the corridor limits
North of Luncarty	A small area of the floodplain intersects the A9 carriageway on two separate instances north of Luncarty
Dunkeld to Dowally	A large area of the floodplain flanks the west side of the A9 carriageway
Dowally to Ballinluig	The large floodplain flanking the A9 between Dunkeld and Dowally also covers the majority of the route between Dowally and Ballinluig
Pitlochry	A small section of the A9 intersects a floodplain north of Pitlochry
Blair Atholl	A narrow floodplain intersects the A9 carriageway on three occasions in the vicinity of Blair Atholl.
Kingussie	A large section of floodplain intersects the A9 carriageway on the outskirts of Kingussie
Kingussie to Kincraig	A large floodplain flanks the eastern side of the A9 carriageway between Kingussie and Kincraig, but does not appear to intersect the carriageway at any point

Table 2.12.1 Areas of the A9 Identified as a Flood Risk

2.12.3 Landslides

Given the steep topography at some locations along the existing corridor, there is an inherent risk of landslides due to slope instability and exposed rock faces. The A9 has a history of landslides, typically categorised as debris flow events. Following several major events in 2004, which included three debris flows on the A9, Transport Scotland commissioned studies to assess and plan for future landslide risk, in conjunction with the Scottish Road Network Landslide Action Plan.

Summaries of these Scottish Road Network studies were published in the Landslides Study Report (2005) and Landslides Study – Implementation Report (2008). The reports presented general landslide data, climate change impacts, landslide hazard areas and future risks, along with a related management plan framework. Debris flow landslides result from a potent combination of undeveloped natural slopes, geological deposits and formations, and intense rainfall events. These typically occur in summer and winter months; peak summer tourist season is especially sensitive to closures and delays due to the significant increase in demand.

The most notable recent A9 landslide events were identified as three concurrent debris flows occurring in August of 2004, which closed the A9 corridor north of Dunkeld. Following a two day closure, a single lane was opened until all debris was removed and the slope stabilised. This caused substantial disruption to local

residents and commercial and tourist traffic. A similar event also occurred in July of 2002 along the A9 near Slochd.

Photo 2.12.2 Landslide on A9 North of Dunkeld (Courtesy of Alan Mackenzie, BEAR, for the Scottish Road Network Landslides Study - Implementation Report)

One outcome of the 2008 Implementation Report involved the identification of areas of high perceived hazard. The report identified the A9 between Dunkeld and Drumochter as having a high risk of landslide occurrence. Within this Stage 1 Report, Section 4.4 (Geotechnical Summary) also refers to recent technical studies provided in **Appendix E**, which describe in further detail the causes and risk levels associated with landslides along the A9 corridor.

2.13 Summary of Key Issues

The conditions and challenges present along the A9 route have been incorporated into the Stage 1 assessment to develop an accurate assessment of the existing corridor. Key issues identified during this process are summarised as follows:

- *Critical topography and land use constraints are common in areas where the A9 is in close proximity to settlements, railway lines, structures and significant earth/rock formations;*
- *Construction efforts near or within the Cairngorms National Park involve both environmental, economic/tourism and accessibility considerations; similar concerns exist in areas involving impacts to the Core Path Network and other NMU destinations;*
- *Environmental constraints include battlefield sites, landscape and Flood Risk Zones;*
- *Existing carriageway features to be addressed are numerous and include alignment, cross section, pavement, structures, junctions, accesses, lay-bys, rest areas and NMU facilities;*

- *Traffic demand, safety concerns and accident history attest to the foundational corridor issues and need for improvement;*
- *The restrictive single carriageway cross section contributes to safety and operational issues, including lengthy diversions, unreliable journey times and driver frustration;*
- *Social and economic insights will result from the ongoing AWEA process which identifies corridor impacts to the local economy and existing businesses;*
- *Considerations of existing train and bus facilities serving the A9 route are key to achieving public transport objectives;*
- *Existing utility locations may impact construction management aspects and final corridor alignments;*
- *Stakeholder involvement is an ongoing element critical to success of the programme;*
- *Safety Group research and recommendations are valuable for short-term improvements and long-term strategies; and*
- *Significant environment challenges involve winter weather impacts, floods, and landslides.*

3 DESCRIPTION OF ALTERNATIVE SCHEMES

3.1 Introduction

As an initial step in the assessment process for dualling the A9, multiple indicative corridor options were identified and investigated. These were subject to a sifting exercise to determine those which merited further DMRB Stage 1 Assessment. This sifting process is now described, along with the four corridor options which are subject to Stage 1 Assessment. A preliminary cost comparison has also been developed for the options.

3.2 Sifting Process

A sifting exercise was performed as the initial approach to assessment of indicative corridor options. This process involved a two-part, desk-based constraints study of all potential indicative corridor options to determine which merited further DMRB Stage 1 Assessment.

In Sifting Part 1, all indicative corridor options were assessed against the four key scheme objectives discussed in Section 1.2. Those indicative corridor options which satisfied the criteria of Sifting Part 1 progressed to a more detailed assessment in Sifting Part 2. The corridor options were assessed at a high level against both DMRB Stage 1 type criteria (engineering, environmental and economics) and a general assessment of deliverability. Sifting Part 2 comprised a negative assessment of the indicative corridor options to identify which were significantly less advantageous than others and therefore were sifted out and removed from further consideration.

The results of the sifting exercise were discussed at a workshop held on 28th January 2013 attended by representatives from Transport Scotland, the A9 PES team, the A9 SEA team, the Valuation Office Agency and the consultants responsible for progressing the early implementation schemes. At the workshop, final decisions were made regarding the feasible indicative corridor options to be included as part of this DMRB Stage 1 Assessment. The four options are discussed in detail within this section of the report, and include an online corridor option (3.4) and three offline corridor options (3.5). Reference should be made to the Final Report for Sifting of Indicative Corridor Options (May 2013), which provides further details regarding the sifting exercise and the results of this preliminary indicative corridor assessment.

For the purpose of this assessment, the corridor limits discussed and shown in the Key Constraints Plans (**Appendix A**) refer only to the mainline road carriageway which will be accommodated in the given corridor. The indicative corridor extents do not necessarily include earthworks, drainage and other features incidental to the proposed carriageway. In addition, construction impacts may extend beyond the corridor limits shown at junctions and at major features such as structures, lay-by locations and NMU crossings. Realignment at numerous side roads may involve works to join the intersecting roads and potentially allow for new side road links beyond the corridor limits.

3.3 Do Minimum Scenario

While the approach to this DMRB Stage 1 Assessment is focused upon major dualling improvements along the A9 from Perth to Inverness, the consideration of a "Do-Minimum" scenario is included to highlight various alternatives to corridor-wide dualling. These base improvement options, which include A9 Safety Group solutions, pavement maintenance and single carriageway upgrades are safety and operational provisions which may be implemented in advance of the A9 dualling programme as part of the ongoing operation of the existing route.

As discussed in Section 2.11, the A9 Safety Group was set up by Transport Scotland to work closely with various partners to reduce road casualties on the route, in advance of and during the A9 dualling programme.

To date, a number of signing and lining improvements and the installation of additional Variable Message Sign (VMS) on the route have been delivered as a result of the A9 Safety Group's research. The A9 Safety Group has agreed to the implementation of Average Speed cameras which are to be introduced between Perth and Inverness by summer of 2014.

Ongoing maintenance of the route and in particular pavement works will also form part of the Do-Minimum scenario. It is noted that a programme of pavement reconstruction along the A9 is being undertaken as a result of excessive wear of certain sections. The following sections of the route are likely to be subject to improvement works, with additional areas potentially identified in the near future;

- *Luncarty North;*
- *Kincraig to Dalraddy;*
- *Ballinluig to Pitlochry;*
- *Pitlochry North;*
- *Lynwilg Junction; and*
- *Moy wind farm.*

3.4 Online Corridor Option

3.4.1 Subsection Structure

The two-stage sifting assessment concluded that the online corridor option from Perth to Inverness was to be carried forward for further consideration as part of the DMRB Stage 1 Assessment. When undertaking the sifting exercise, the existing 177km long route was originally divided into six geographical subsections.

Subsequently, the online corridor has been divided into 18 subsections, as introduced in Section 1. **Table 3.4.1** illustrates how the six subsections used in the sifting exercise correlate with the 18 subsections now used to separate the online corridor, along with corresponding offline corridor locations.

Sifting Exercise Section	Location	Stage 1 Assessment Section (Online)	Stage 1 Assessment Section (Offline)
A	Perth to Tay Crossing	Perth to Luncarty	-
		Luncarty to Pass of Birnam	-
		Pass of Birnam	-
		Pass of Birnam to Tay Crossing	Black Option (B2)
B	Tay Crossing to Bruar	Tay Crossing to Ballinluig	Black Option (B2)
		Ballinluig to Pitlochry	-
		Pitlochry to Killiecrankie	Pink Option (B4)
		Pass of Killiecrankie	Pink Option (B4)
		Killiecrankie to Glen Garry	Pink Option (B4)/ Green Option (B5)
C	Bruar to Dalwhinnie	Glen Garry	-
		Glen Garry to Crubenmore	-
D	Dalwhinnie to Newtonmore	Crubenmore	-
E	Newtonmore to Kinveachy	Crubenmore to Kincraig	-
		Kincraig to Dalraddy	-
		Dalraddy to Slochd	-
F	Kinveachy to Inverness	Slochd to Tomatin	-
		Tomatin to Moy	-
		Moy to Inverness	-

Table 3.4.1 Summary of Corridor Subsections

The 18 online corridor subsections have been identified based upon two criteria: firstly, whether the section is a dual carriageway or single carriageway section; and secondly, if there is a scheme currently being progressed through DMRB Stage 2 or 3. Within this report and related figures, the online corridor is also referred to as the Red Option.

3.4.2 Corridor Description

In general, the online corridor follows the route of the existing A9 between Perth and Inverness. Within existing single carriageway sections, proposed corridor dualling will require various work efforts involving widening, reconstruction and new construction. The preferred method(s) of online widening for each of the 18 subsections is discussed in detail in Section 4.6 of this report. Minor works within existing dual carriageway sections will typically be limited to improvements of pavement, safety features and signing, as needed to properly connect with adjacent single carriageway sections and comply with current design standards.

Key constraints common within the general corridor topography include steep, often rocky terrain, numerous watercourses, the Highland Main Line railway, major structures, settlements and sensitive environmental areas. Between the settlements of Killiecrankie and Slochd, nearly 60% of the A9 lies within the boundary of the Cairngorms National Park, an area of high environmental and economic importance.

NMU facilities, including core path access and crossing points, are travelled by local users and tourists throughout the entire corridor. Core path networks extend from Perth to Inverness, with concentrations near populated settlements and scenic areas. National Cycle Network routes run alongside the A9 and travel through the main settlements along the A9. Coordination with stakeholders will continue throughout each assessment stage to achieve NMU safety and accessibility.

Along the existing carriageway, road pavement status varies from poor to good condition with diverse material composition and residual life values. Different approaches and timeframes for pavement treatment will be considered following further detailed analysis.

There are numerous existing bridges connecting the online corridor between Perth and Inverness, spanning road, railway, watercourse and steep valley crossings. Detailed information including description, condition and a comparison to standards is listed for both major and minor structures. Additional existing structures include culverts, retaining walls and sign gantries, which will be extended, relocated or replaced depending upon the impacts of dualling.

Along the corridor, there are 259 junctions and accesses connecting the A9 to various classes of roads and private accesses. These will be impacted by online dualling, especially in locations of at-grade junctions and minor accesses which are not permitted on a standard Category 7A all-purpose dual carriageway. Strategies have been developed to determine the approach for proposed grade separated junction locations at Class A and B road intersections, and for redirecting Class C roads and minor roads/accesses.

Similar to proposed junction development, strategies have been created to assist with proposed lay-by and rest area locations as the corridor design progresses; specific decisions are currently being coordinated with Transport Scotland and local authorities. Lay-bys are important to traveller safety and accessibility along the route. Type B lay-bys, which make up 75% of existing A9 facilities, will be modified or replaced, as they are not compliant with Category 7A standards for dual carriageways. Proposed rest areas are also under consideration for traveller safety and convenience; there is only one existing formal facility at Ralia.

Existing utility information is limited at Stage 1. However, known facilities include recent Scottish Water facilities at Aviemore and the proposed SSE Beauly to Denny HV line, which lies along the A9 between Drumochter and Etteridge. Preliminary information has also been obtained within the three accelerated schemes related to key locations of gas, water, sewer, power, and telecommunications facilities. Coordination and management of utility conflicts are critical factors in online widening due to the length and breadth of the corridor. Public utility information is currently being collected at the C2 Preliminary Inquiries stage with further utilities information to be gathered as the scheme design advances. Utility impacts are critical factors in corridor option selection and future alignment development, due to both community and economic risk factors. These impacts will be avoided whenever feasible. However, if unavoidable utility impacts arise, strong consideration will be given to construction methods for either protection or relocation, depending upon which option is most effective in terms of cost and programme.

The proposed dualling approach will consider how the environment surrounding the A9 corridor is affected by severe weather. Winter resilience features exist for traveller safety as vehicles encounter snow along the route. Four existing snow gate locations are employed during road closures; operations also include salt depots

and maintenance works. Flood risk varies along the route within several floodplains, including high risk watercourse locations along the Rivers Tay, Tummel, Braan, Garry, Truim, Spey and Dulnain. The proposed design of drainage and flood protection elements will be informed by results of further flood risk analysis. Landslides are another potential issue along the corridor, especially between the areas of Dunkeld and Drumochter. Geotechnical analysis is key within these sensitive locations, along with a proactive approach to carriageway protection measures such as runoff management and rock fencing.

The following paragraphs, divided by A9 corridor subsection, highlight the general approach to online construction. Notable details of existing conditions along the route are also provided, as introduced in Section 2.

(a) Perth to Luncarty

As an existing dual carriageway, major construction modifications within this subsection are not anticipated. This southernmost subsection originates at the Inveralmond Roundabout in Perth and travels 3.4km north to Luncarty, encountering two bridges. The Highland Main Line railway lies to the east of the corridor, separating the A9 from the River Tay. The topography is generally flat within the river valley, which consists of agricultural and forest land between the populated areas of Perth and Luncarty. There are several minor accesses within the subsection between the Inveralmond Roundabout and grade separated Luncarty/Battleby Junction.

(b) Luncarty to Pass of Birnam

Dualling improvements for this single carriageway subsection are currently addressed within an early implementation Stage 3 scheme, which will determine the recommended widening approach. The corridor, which encounters three bridges, extends northwest from Luncarty, bypassing Bankfoot to the east on approach to the Pass of Birnam. Near Luncarty, the Highland Main Line railway and River Tay turn in a northeast direction continuing away from the A9. Forest land generally lies along the corridor within lowlands and gradually sloping hillsides. There are numerous accesses between the Luncarty settlement and the at-grade Bankfoot Junction; other at-grade junctions include Luncarty, Tulleybelton and Stanley. Critical utility crossings include a National Grid gas main of countrywide significance.

(c) Pass of Birnam

Major construction modifications are not anticipated within this existing dual carriageway subsection, which travels within the Pass of Birnam for 1.8km. After crossing the Highland Main Line railway upon the single bridge contained within the subsection, the A9 encounters the steep-sided slopes of the Pass, separated from the River Tay by an embankment to the east. The steep terrain is heavily forested with small agricultural areas located in the south. No junctions or accesses exist within this subsection.

(d) Pass of Birnam to Tay Crossing

Dualling improvements for this single carriageway subsection are undergoing assessment within an early implementation Stage 2 scheme. The corridor extends 8.4km west along the western boundary of Birnam and Little Dunkeld, separated from Dunkeld by the River Tay to the east. There are six existing bridges along the route; the 226m A9 450 River Tay Underbridge is a significant structure at the Tay

Crossing. The Highland Main Line railway generally lies parallel to the western boundary of the A9; one exception is a 2km segment where the railway tunnels beneath the A9 and runs east of the road until the Tay Crossing. The land is a mixture of settlements surrounded by forested hillsides and river valley lowlands with six at-grade junctions and numerous accesses. Known utilities include the following: telecom cables and a mobile phone mast adjacent to the corridor, with three cable crossing locations; three high pressure and one low pressure gas main crossings; above and below ground SSE power lines with eight corridor crossings; two Scottish Water crossings and one combined water/sewer crossing.

(e) Tay Crossing to Ballinluig

This single carriageway subsection will require dualling improvements along its 7.6km length. The corridor lies within a floodplain, bounded by steep hills within the River Tay valley. The carriageway runs through forest and agricultural land along the eastern edge of a steep-sided valley, with the river and the Highland Main Line railway lying to the west. The route encounters one bridge and contains a large number of culverts. Settlements and numerous accesses are sporadic along the route, with Dowally centrally located between the Tay Crossing and southern approach to Ballinluig. There are three at-grade junctions in the general vicinity of Dowally.

(f) Ballinluig to Pitlochry

This dual carriageway subsection is not anticipated to require major upgrades related to dualling. The corridor passes west of Ballinluig and encounters six bridges as it runs northwest for 5.8km to the southern approach of Pitlochry. The Highland Main Line railway lies parallel and within close proximity to the west edge of the A9, separating the road from the River Tummel. There are several accesses along the A9 between the recently improved grade separated junction at Ballinluig and the southern outskirts of Pitlochry.

(g) Pitlochry to Killiecrankie

This single carriageway subsection will require major dualling efforts within the corridor running for 6.2km between Pitlochry and the southern approach to the Pass of Killiecrankie. The A9 lies within forested lowlands between steep hills. Immediately north of the Pitlochry South Junction, the road crosses the River Tummel and follows along the west edge of the river until crossing Loch Faskally. The River Tummel separates the A9 from Pitlochry and the Highland Main Line railway which lie to the east. North of Pitlochry, the road lies east of the River Garry with the Highland Main Line railway crossing from east to west of the A9. There are five existing bridges along the route; the 157m A9 530 Tummel Underbridge and 147.5m A9 550 Clunie Underbridge are significant structures to be widened over the river crossings. Several accesses exist along the route; one left-in, left out junction and three at-grade junctions lie in proximity to the main population centre of Pitlochry.

(h) Pass of Killiecrankie

As an existing dual carriageway, major construction modifications within this subsection are not anticipated. The corridor extends for 1.7km through steep terrain in the Pass of Killiecrankie along the Killiecrankie Viaduct. Of the three bridges within this section, the Killiecrankie Viaduct (615m northbound; 285m southbound) is a major structure which is not fully compliant with current standards for cross section

width. The River Garry and the Highland Main Line railway also run through the particularly constrained Pass to the west of the A9. One at-grade junction is located at the north extent of the subsection.

(i) Killiecrankie to Glen Garry

This single carriageway section will require extensive dualling improvements along its 21.8km length. The A9 corridor lies along gradual slopes passing forests and the settlements of Killiecrankie, Blair Atholl, Bruar and Calvine. It is the southernmost A9 subsection located within the boundary of the Cairngorms National Park. The River Garry and the Highland Main Line railway alternate between the north and south of the A9, with the river generally lying between the road and railway. Of the 13 existing bridges in this subsection to be widened, three stand apart as major structures. The A9 640 Allt Girnaig Underbridge (83m) and A9 690 Pitaldonich Underbridge (79.6m) span significant river crossings; the A9 670 Essangal Underbridge (166.46m) spans a railway crossing. 35 culverts are also located within the corridor limits. An existing snow gate is located between Killiecrankie and Blair Atholl. The horizontal alignment of the road consists of several tight curves on southern approach to Bruar. Tourist facilities and lodges are present along the corridor, and numerous accesses lie within the subsection limits. There are three at-grade junctions along the route.

(j) Glen Garry

This dual carriageway subsection is not anticipated to require major upgrades related to dualling. Beginning with a split carriageway section in the south, the corridor runs through steep, forested terrain for the majority of its 9km length. The Highland Main Line railway and River Garry lie within close proximity along the west edge of the corridor. There are 6 bridges and 57 culverts within the subsection. Existing snow gates are located near the beginning of the Glen Garry subsection, south of Edendon Bridge. A few sporadic accesses lie along the sparsely populated corridor.

(k) Glen Garry to Crubenmore

Major dualling efforts are required on this single carriageway subsection. The corridor travels for 20.5km within the Cairngorms National Park, through steep terrain in the south and river valleys in the north. The road extends through the Pass of Drumochter, the highest elevation of the A9. The Highland Main Line railway, the River Truim and minor watercourses generally lie in the vicinity of the west corridor boundary. There are an abundance of existing structures along this subsection, including 11 bridges, 55 culverts and 28 footbridges. Dalwhinnie is the main settlement lying approximately 1km west of the A9. Several accesses lie between the Pass of Drumochter and Crubenmore Cottage in this sparsely populated corridor, with one at-grade junction to the south of Dalwhinnie. Snow gates are located south of Dalwhinnie. The SSE Beauly to Denny HV line lies in the vicinity of the A9 within this subsection joining the corridor near Drumochter.

(l) Crubenmore

As an existing dual carriageway, major construction modifications within this subsection are not anticipated. The corridor extends for 3.7km along the eastern edge of valley floor. The River Truim lies to the west of the A9. The Highland Main Line railway is in close proximity to the corridor along its western edge. Utility pylons are located at several points adjacent to the carriageway along this short

subsection. There is one access at the northern terminus of the corridor. There are two culverts and no bridges within this short dual section.

(m) Crubenmore to Kincraig

This single carriageway section will require major works related to dualling. The corridor bypasses major settlements of Newtonmore and Kingussie along its 15.9km route within the Cairngorms National Park. The A9 lies within a river valley bound by hills with a range of gradual to steep sides. The Highland Main Line railway and the River Spey lie north of the A9 between Crubenmore and Kingussie, after which they continue along the south towards Kincraig. This section contains 7 bridges, 2 underpasses and 24 culverts. There are numerous accesses between the major settlements and the villages of Etteridge, Raliabeag and Lynchat. There are two at-grade junctions, as well as the grade separated Kingussie Junctions. Utility pylons are located at several points adjacent to the carriageway within this section.

(n) Kincraig to Dalraddy

Dualling improvements for this single carriageway subsection are currently addressed within an early implementation Stage 3 scheme. The corridor travels for 8km within the Cairngorms National Park through flatlands, bypassing Kincraig and Dalraddy to the north. There are three bridges along the route. Loch Insh and the River Spey lie to the east of the A9, separated by the Highland Main Line railway. Numerous accesses lie along the corridor between Kincraig and Dalraddy, with no junctions present. Known utilities include BT telecom, SSE power, and Scottish Water facilities.

(o) Dalraddy to Slochd

Major dualling efforts are required on this single carriageway subsection. The 24.7km corridor begins in low-lying areas near Loch Alvie and the River Spey to the south, bypassing Aviemore, Kinveachy, and Carrbridge as the terrain transforms into rolling hills toward the high point of Slochd Summit. The A9 passes to the west of several small lochs and crosses the River Dulnain and floodplain near Carrbridge. The Highland Main Line railway lies to the east of the road for the majority of the route, alternating from a 1km offset near Aviemore to close proximity between Kinveachy and Carrbridge. There is a railway crossing south of Slochd, after which the railway follows closely to the western edge of the A9. There are 6 bridges, 7 underpasses and 28 culverts along the route. The 82.3m A9 1190 Dulnain Underbridge is a significant river crossing; the 145m A9 1210 Slochd Beag Underbridge spans a steep valley within proximity to the railway and a local road. Scottish Water has facilities in the vicinity of Aviemore. Four at-grade junctions and numerous accesses are located near the settlements. The corridor exits the Cairngorms National Park near its terminus north of Slochd.

(p) Slochd to Tomatin

As an existing dual carriageway, major works within this subsection are not anticipated. The corridor runs through grassed hillsides and the River Findhorn Valley, encountering three bridges. The A9 crosses the river approximately 0.5km east of Tomatin, where the Highland Main Line railway turns west after following closely to the road for 3km. One at-grade junction and very few accesses exist along the sparsely populated route.

(q) Tomatin to Moy

This single carriageway section will require major works related to dualling. Beginning north of Tomatin, this corridor passes the village of Moy as it extends north for 9.3km past sparsely populated agricultural areas. Terrain consists of gradual slopes to the west and lowlying areas to the east where Loch Moy feeds into small tributaries. The Highland Main Line railway lies adjacent to the A9 between Tomatin and Moy, crossing from west to east of the road 2km south of Moy. One bridges and 2 underpasses lie within the subsection. Numerous accesses are located between the two villages, with three at-grade junctions present.

(r) Moy to Inverness

This dual carriageway subsection is not anticipated to require major upgrades related to dualling. The 11.5km corridor passes small settlements at Auchbain, Daviot, and Bogbain as it travels past gradually sloping hillsides in the south. The road extends through river valleys and forests on approach to the southern limits of Inverness where it terminates at Inshes Junction Overbridge. The route encounters three bridges. There are numerous accesses along the route, with one grade separated junctions at Drumossie and four at-grade junctions.

3.5 Offline Options within Existing A9 Corridor

In addition to the Red Online Corridor Option, the sifting assessment identified three offline corridor options to be progressed to Stage 1. Therefore, this DMRB Stage 1 Assessment includes three offline corridor options distinguished by colour as follows:

- ***Black Option*** *– an offline corridor which leaves the existing A9 in the vicinity of the Tay Crossing to the west of the existing corridor, crossing the River Tay alongside the Highland Main Line railway and rejoining the A9 in the vicinity of the dual carriageway section at Ballinluig;*
- ***Pink Option*** *– an offline corridor which leaves the existing A9 in the vicinity of Pitlochry at the end of the existing dual carriageway section, sweeps westward around the opposite side of the River Tummel from the A9 and rejoins it in the vicinity of Blair Atholl; and*
- ***Green Option*** *– an offline corridor which realigns the existing A9 over a short section south of Bruar.*

The offline options are located within separate segments along the route, without overlapping. Offline corridors will be implemented in conjunction with adjacent online widening sections throughout the remainder of the route. Proposed offline corridor development will require new carriageway construction and reconstruction at the various departure locations from the existing A9 to be widened. The offline alignments are discussed in detail in Sections 4.17 to 4.20, as summarised in the following paragraphs along with potential constraints within the offline limits.

3.5.1 Offline Corridor 1: Black Option

The Black Option is an alternative to the fully online corridor between Tay Crossing and Ballinluig although the Black Option starts on the northern extents of the Birnam to Tay Crossing section. The corridor is entirely offline, running west of and parallel to the River Tay and existing A9 in the River Tay valley. Along the majority of the

corridor length, the Highland Main Line railway runs in close proximity to the east side of the proposed corridor. There are minor settlements located sporadically within the extents of the offline corridor; however, developments near Dowally and Ballinluig are avoided.

A railway crossing will be required at the northern terminus, with consideration for extended lengths of railway along the route. The corridor crosses and encroaches upon the River Tay, and lies within a SEPA Flood Risk Zone. Potential environmental impacts involve listed buildings, an SAC, and protected woodlands.

3.5.2 Offline Corridor 2: Pink Option

The Pink Option is an alternative to the fully online corridor comprising three subsections between Pitlochry and Glen Garry. The corridor lies offline between Pitlochry and Blair Atholl, west of the existing A9 and the Highland Main Line railway and adjacent to and crossing the Rivers Tummel and Garry. The topography varies between gradual and steep slopes within forest and moorlands, with particularly steep terrain within the Pass of Killiecrankie. The offline corridor generally runs through uninhabited areas, with buildings present in sporadic, isolated locations.

Proposed construction will involve major earthworks due to steep terrain along most of the route, including the narrow Pass of Killiecrankie. A new structure will be necessary at the River Garry crossing, with bridge widening required at the existing Tummel Underbridge. The corridor encroaches upon the River Garry and Loch Faskally within a SEPA Flood Risk Zone. Potential environmental impacts involve listed buildings, HGDL and protected woodlands.

3.5.3 Offline Corridor 3: Green Option

The Green Option is an alternative to the fully online corridor between Killiecrankie and Glen Garry. The offline corridor departs the existing A9 to the south of Bruar for approximately 4km; which would realign a series of sweeping horizontal curves associated with the existing A9. In general, the Highland Main Line railway is separated from the offline corridor by the existing A9 and River Garry. The offline terrain consists of gradual slopes that border the River Garry valley, crossing the river at a point southeast of Bruar. The offline corridor lies within a relatively uninhabited area.

There is the requirement for a new watercourse crossing at the Glen Garry crossing. A number of other minor structures would also be required to cross watercourses and traverse the flood plain and any NMU crossing points will be considered during the DMRB Stage 2 Assessment. The corridor also encroaches on the River Garry and a SEPA Flood Risk Zone. Potential environmental impacts include HGDLs and protected woodlands.

3.6 Comparative Preliminary Cost Estimates

The comparative cost has been determined by reviewing previous online and offline schemes that are similar in nature to the proposed A9 dualling. This information has allowed a comparative cost, in terms of percentage difference in relation to the online section, to be determined and takes cognisance of construction elements such as land purchase, public utilities, roadworks and structures. **Table 3.6.1** below outlines the comparative cost for each of the Offline Corridors in comparison to the associated Online Corridor at that section.

Corridor	Baseline Section (Online Section Length)	% Cost Difference
Black 12850m Online 9200m Offline	Pass of Birnam to Ballinluig (19800m)	+21%
Pink 16700m Online 12500m Offline	Pitlochry to Glen Garry (29400m)	+20%
Green 17200m Online 3970m Offline	Killiecrankie to Glen Garry (21500m)	+7%

Table 3.6.1 Summary of Corridor Options Cost Difference

The table shows that the offline options' comparative costs are between 7% and 21% higher than the online option. In addition, the figures provide a good indication of expected increases based on previous schemes; however, the actual increase will be affected by specific risks as detailed in Section 7.

4 ENGINEERING ASSESSMENT

4.1 Introduction

A broad assessment of the engineering issues associated with dualling the A9 has been undertaken in relation to the following topics:

- *Topography and Land Use;*
- *Geotechnical Considerations;*
- *Water Environment, Hydrology and Drainage;*
- *Alignment;*
- *Cross Section;*
- *Pavement;*
- *Structures;*
- *Junctions and Accesses;*
- *Parking and Bus Lay-bys;*
- *Rest Areas;*
- *Non-Motorised User (NMU) Provision;*
- *Roadside Features;*
- *Intelligent Transport Systems; and*
- *Public Utilities.*

The engineering assessment of the Online Corridor Option is summarised in Sections 4.2 to 4.16, followed by the various Offline Corridor Options' assessment in sections 4.17 to 4.20. Corridor summary tables have been produced for both the online and offline corridors; these are contained in **Appendix G**.

Constraints mapping has been undertaken in relation to the various corridor options, identifying existing constraints such as the Highland Main Line railway, watercourses, structures, buildings, lay-bys and environmental features (SSSIs, SACs, Ramsar sites and the like). Key Constraints Plans are included in **Appendix A**; chainages (abbreviated as Ch.) noted in this report correspond to location references in these plans. Approximate elevations provided in metres above ordnance datum (mAOD) are shown for information only.

As noted in Section 3, the corridor limits discussed and illustrated in the related plans are indicative only and may be subject to change during further development of proposed options; these limits do not include various incidental features such as earthworks and drainage requirements. Some construction impacts may also fall beyond the indicative corridor limits at junction, lay-by, and side road locations.

4.2 Online Corridor: Red Option

The online corridor follows the route of the existing A9 between Perth and Inverness. The corridor has been split into 18 subsections based, largely, upon the existing single and dualled carriageway extents as described in Section 1.4. The exception to this is between Birnam to Ballinluig and Crubenmore to Slochd, which have been divided further to take cognisance of the Birnam to Tay Crossing and Kincraig to Dalraddy schemes which are more advanced than this Stage 1 DMRB Assessment having been taken forward previously in separate commissions by

Transport Scotland. The corridor subsections are listed below, as highlighted in Section 1.4; the Key Constraints Plans in **Appendix A** also illustrate the individual subsection limits and surrounding features.

- ***Perth to Luncarty:*** *Dual carriageway section which originates at the Inveralmond Roundabout in Perth and travels 3.4km north to Luncarty; shadows the west bank of the River Tay;*
- ***Luncarty to Pass of Birnam:*** *Single carriageway section, 9.4km in length, which veers northwest from Luncarty, travelling away from the River Tay and passing east of Bankfoot;*
- ***Pass of Birnam:*** *Dual carriageway section, 1.8km in length within the Pass which crosses over a railway line;*
- ***Pass of Birnam to Tay Crossing:*** *Single carriageway section which extends 8.4km west along the western boundary of Birnam and Little Dunkeld, separated from Dunkeld by the River Tay to the east;*
- ***Tay Crossing to Ballinluig:*** *Single carriageway section, 7.6km in length which crosses the River Tay northwest of Dunkeld; the A9 lies east of Tay Forest Park, and passes through Dowally toward the southern extents of Ballinluig;*
- ***Ballinluig to Pitlochry:*** *Dual carriageway section surrounded by woodlands along its 5.8km route, which passes west of Ballinluig; the A9 shadows the east bank of the River Tummel, a tributary to the River Tay; south of Pitlochry the A9 crosses this tributary, bypassing Pitlochry to the west;*
- ***Pitlochry to Killiecrankie:*** *Single carriageway section that continues 6.2km north of Pitlochry through the Tay Forest Park, crossing a tributary of the River Tay before travelling along its east bank on approach to Killiecrankie. The B8019 and B8079 shadow the A9 to the west and form an alternative route between Pitlochry and Killiecrankie;*
- ***Pass of Killiecrankie:*** *Dual carriageway section of 1.7km which lies east of the River Garry and railway;*
- ***Killiecrankie to Glen Garry:*** *Single carriageway section which travels west from Killiecrankie along the southern boundary of the Cairngorms National Park for 21.8km, also passes west of Blair Atholl, Bruar, and Calvine;*
- ***Glen Garry:*** *Dual carriageway section which travels 9km westward through forestlands and lies east of the River Garry;*
- ***Glen Garry to Crubenmore:*** *Single carriageway section that travels 20.5km north into the Cairngorms National Park and passes east of Dalwhinnie and the River Truim on approach to Crubenmore;*
- ***Crubenmore:*** *Dual carriageway section 3.7km in length which lies east of Crubenmore and the River Truim;*
- ***Crubenmore to Kincraig:*** *Single carriageway section which travels northeast for 15.9km from Crubenmore through the Cairngorms National Park passing east of Newtonmore and Kingussie; the A86 merges with the A9 near Kingussie;*
- ***Kincraig to Dalraddy:*** *Single carriageway section traveling northeast from Kincraig for 7.5km within the Cairngorms National Park;*

- ***Dalraddy to Slochd:*** *Single carriageway section, 24.7km in length from Dalraddy lying west of the River Spey and the railway, also passing west of Aviemore, Kinveachy, and Carrbridge;*
- ***Slochd to Tomatin:*** *Dual carriageway section traveling northwest from Slochd for 5km and exiting the Cairngorms National Park boundary;*
- ***Tomatin to Moy:*** *Single carriageway section continuing northwest for 9.3km, lying east of Tomatin and the railway and west of the River Findhorn and Loch Moy; and*
- ***Moy to Inverness:*** *Dual carriageway section which extends 11.5km from Moy passing by Daviot to the southern limit of Inverness where the proposed corridor limits terminate at Inshes Junction.*

Sections 4.3 to 4.16 outline the main constraints and assessment outcomes for the online corridors. In general, the information in these sections is also applicable to the three offline corridors, with the exception of the area bypassed by the offline segment. An initial summary is provided in each section which is then followed by a more detailed assessment of the sections of the route.

4.3 Topography and Land Use

4.3.1 Summary

The existing A9 route from Perth to Inverness passes among alternating hills and valleys, typically constrained by the steep terrain of the Grampian and Cairngorm Mountains. The corridor encompasses a varied topography of rock formations, forest lands and river valleys. Between Killiecrankie and Slochd, nearly 60% of the A9 corridor travels within the Cairngorms National Park boundary. As the UK's largest national park, it is a vast natural sanctuary with a diverse topography and critical environmental significance.

Elevation differences vary widely along the route as it travels between highlands and lowlands. Areas of particularly steep terrain encountered by the A9 include the Passes of Birnam, Drumochter and Killiecrankie, as well as Slochd Summit. Relatively near the Passes of Killiecrankie and Drumochter, four existing snow gate locations correspond to highland areas that experience severe winter weather which has historically required A9 road closures. Restrictive features such as steep hillsides, rock faces, and elevation changes are key issues which significantly affect proposed road alignment and cross section, earthworks, drainage and construction methods.

In addition to constraints of the existing terrain, the A9 lies in the vicinity of numerous watercourses for the majority of the route; these include the Rivers Tay, Tummel, Garry, Truim, Spey, Findhorn and Nairn, as well as minor watercourses and tributaries. The carriageway often runs in parallel proximity to these watercourses, with multiple crossings as the road extends north through various river valleys and associated floodplains. Main water bodies lying close to the existing A9 include Lochs Faskally, Insh, Alvie and Moy. The presence of existing waterways is critical in relation to the proposed road alignment as well as structural and environmental features.

As the surrounding topography varies, the land use along the existing corridor represents a diverse combination of settlements, agricultural sites and sparsely populated natural areas. The A9 connects these areas for use by local and long-

distance commuters, tourists, agricultural transport and other commercial services. The transport network also includes the Highland Main Line railway, which generally follows the A9 route between Perth and Inverness. As it relates to A9 constraints, the railway involves numerous structures at crossings and sometimes lies within close proximity to the road, especially in areas restricted by mountain passes and watercourses.

The existing route currently bypasses major settlements, which include Luncarty, Bankfoot, Birnam, Dunkeld, Pitlochry, Blair Atholl, Dalwhinnie, Newtonmore, Kingussie, Aviemore and Carrbridge. Regular travel between settlements is common for local residents to access work locations, commercial areas and schools. Potential construction impacts to private properties and businesses are key considerations.

Settlements along the A9 corridor are separated by sparsely populated agricultural and natural areas. A wide range of popular tourist attractions such as scenic areas, winter sports and hunting destinations and local events are key contributors to the local economy. The Cairngorms National Park is a major attraction that holds economic and environmental importance to the area. For these reasons, maintaining access and scenic aesthetics while mitigating environmental and construction impacts are essential along the corridor length.

4.3.2 Introduction

The Red Option follows the general corridor of the existing A9, which has a varying topography and land use at present. The following outlines the topography and land use associated with each subsection of the Red Option.

4.3.3 Perth to Luncarty

This dual carriageway subsection of the corridor runs in a northerly direction from Inveralmond Roundabout in Perth to Luncarty and is primarily on embankment. There are no significant changes in elevation along this section of the A9, although the route generally rises towards the northern extents. The highest existing ground level is 75mAOD (located approximately 600m to the west of the A9 at Ch. 2100); the lowest level is approximately 10mAOD at the River Tay (450m to the east of the A9 at Ch. 500).

The route is lined along much of its length by woodlands. The River Tay lies to the east of the A9 and flat land characterises the adjacent River Tay valley. The western limits of the corridor are partially forested natural areas; there is a section of non-coniferous woodlands on high ground and in close proximity to the A9 between Ch. 1000 and 1300.

The majority of surrounding land is agricultural, comprising open fields that are used for both farming and cattle grazing. Industrial and residential properties are located along the northern limits of Perth near Inveralmond where the section begins. Residential areas of Luncarty lie to the east of the A9 at the northern extent of the section. A number of individual properties and cottages exist within close proximity to the A9. The Highland Main Line railway runs parallel along the east of the corridor within 100m of the road.

Photo 4.3.1 Existing Topography North of Perth

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, consideration should be given to industrial and residential properties located on the northern extents of the corridor and the proximity of the Highland Main Line railway to the east.

4.3.4 Luncarty to Pass of Birnam

Between the town of Luncarty and the Pass of Birnam, the A9 is a single carriageway travelling in a north-westerly direction. The route is typically situated on an embankment. On exit from Luncarty, the land is low-lying to the east and west. On approach to Bankfoot, there are gradually sloping hillsides to the east and flatlands to the west. Between Bankfoot and the Pass of Birnam, flatlands lie to the east and west. There are no severe elevation changes along this subsection.

There are woodlands along the east and west of the carriageway for a majority of this subsection. The River Tay extends northeast at Luncarty away from the A9 for the limits of this subsection, and no other major water bodies are present.

Population is concentrated in Luncarty to the east and Bankfoot to the west. There are buildings located sporadically between these centres with numerous accesses between Luncarty and Bankfoot. Immediately north of Luncarty, the Highland Main Line railway runs northeast away from the A9 corridor.

Photo 4.3.2 Existing Topography at Bankfoot

Consideration should be given to the buildings located around Luncarty and Bankfoot which may restrict the potential to widen to either side of the A9; this should be reviewed further during the DMRB Stage 3 Assessment.

4.3.5 Pass of Birnam

This dual carriageway subsection runs in a north-westerly direction through the Pass of Birnam. From Ch. 13000 to 13400, the A9 crosses a high plateau with surrounding ground levels at approximately 120mAOD to 125mAOD. The Kingswood viaduct at Ch. 13400 to 13450 takes the route over the Highland Main Line railway and a minor road. From Ch. 13450 to 13600, the road approaches a high embankment and crosses a steep-sided valley. The valley is at an elevation of approximately 100mAOD; there is an unnamed minor watercourse running through it, sourced from a small unnamed lake upstream.

From Ch. 13600 to 14600, the road bends towards the northwest within the narrow Pass of Birnam, with significant cuttings along the northbound carriageway and highest ground levels between 90 and 100mAOD. Minor embankments are present north of the road, with ground levels then falling towards the River Tay, which is at an elevation of approximately 50mAOD. Over this section, the road level reduces from approximately 110mAOD to around 80mAOD.

The surrounding area is heavily forested on both sides of the road. Vegetation includes woodland and scrub over the slopes adjacent to the road, with agricultural land on rising ground to the south.

Photo 4.3.3 Existing Topography South of Birnam

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, as the carriageway is in significant cutting along parts of this section, consideration should be given to any improvement works that may result in excavating significant amounts of material. Consideration also needs to be given to the steep terrain along this section of the route.

4.3.6 Pass of Birnam to Tay Crossing

Between the Pass of Birnam and Tay Crossing, the A9 travels in a north-westerly direction within a single carriageway cross section. The road is situated initially within a cut followed by embankment on approach to Dunkeld. Steep hills lie to the west of the A9 within the narrow Pass of Birnam approaching the River Tay crossing. There are flatlands to the east with no significant changes in elevation. This section is particularly constrained by a combination of the settlements, railway, watercourse and steep terrain.

The surrounding hillsides to the west consist of woodlands. East of the A9 there are riverside lowlands and developed areas within the southern section. The River Tay generally follows the east side of the road until the Tay Crossing near Ch. 22100, where it flows beneath the carriageway structure to continue along the west edge of the A9.

Population is concentrated within Birnam and Little Dunkeld, which are located in close proximity to the east of the A9. Dunkeld is another populated village east of the A9, separated from the existing road by the River Tay. The Highland Main Line railway generally lies along the west of the A9, until crossing to the east side of the road via a railway tunnel near Ch. 20400.

Photo 4.3.4 Existing Topography at Little Dunkeld

Consideration needs to be given to the steep hills located to the west of the A9, these will restrict the opportunities to widen to the west and could result in a significant cutting. The available options to replace/widen the Highland Main Line railway tunnel will also need to be considered within this section.

4.3.7 Tay Crossing to Ballinluig

This single carriageway section runs in a north-westerly direction from Tay Crossing to Ballinluig through the River Tay valley between steep-sided hills. The valley floor is generally flat, with ground levels rising gently along the A9 towards the north. There is a sequence of cuttings on the east side of the road and occasional embankments along the west side. The A9 route is slightly elevated compared to the valley floor, typically less than 5m higher than the river floodplain.

Terrain outside of Ballinluig is mainly woodland on the valley sides with little vegetation on the hilltops (approximately 300mAOD and above). The River Tay runs parallel along the west side of the road in close proximity, particularly in the southern limits.

The banks of the River Tay are typically shingle, with fairly flat agricultural land over the floodplain, typically used for grazing and arable farming. There are no major settlements along the route; however, there are numerous accesses to individual properties. The Highland Main Line railway runs west of the A9 and the River Tay until crossing the river near Dowally, where the railway travels in closer proximity to the road on approach to Ballinluig.

Photo 4.3.5 Existing Topography North of the Tay Crossing

Consideration needs to be given to the steep terrain to the east and the River Tay to the west of the A9. The difficult terrain may require the widening to cut into the hillside resulting in a large cut slope. The Highland Main Line railway could also restrict the widening to the west and limit the options available.

4.3.8 Ballinluig to Pitlochry

The dual carriageway section of the A9 corridor runs in a north-westerly direction between Ballinluig and the southern approach to Pitlochry along a dual carriageway. The A9 travels through the River Tummel valley between steep-sided hills. The valley floor is generally flat, with ground levels rising gently along the A9 towards the north, to approximately 70mAOD on the approach to Pitlochry. The road runs on sidelong ground with a sequence of cuttings on the east side of the road and occasional embankments along the west side. The A9 route is slightly elevated compared to the valley floor, typically less than 5m higher than the river floodplain.

Terrain outside of the two settlements is mainly woodland on the valley sides, with little vegetation on the hilltops (approximately 300mAOD and above). The River Tummel, a tributary of the River Tay, lies to the west of the A9 and the Highland Main Line railway. The banks of the River Tummel are typically shingle, with fairly flat agricultural land over the floodplain, typically used for grazing and arable farming.

Population is concentrated in the village of Ballinluig and in the southern outskirts of Pitlochry where the section terminates. There are several accesses interspersed between the population centres. The existing A9 junction at Ballinluig has recently been improved to a grade separated junction. The Highland Main Line railway lies immediately west of the A9 route within this subsection before crossing at Ch. 36400.

Photo 4.3.6 Existing Topography South of the River Tummel Crossing

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, as the carriageway is in close proximity to buildings and the River Tummel, consideration should be given to any improvement works that may be restricted due to these constraints.

4.3.9 Pitlochry to Killiecrankie

This single carriageway corridor runs in a westerly direction between Pitlochry and Killiecrankie and is primarily on embankment. The route tends to rise from the southern part of the section with the lowest point in Pitlochry (76mAOD) and the highest point in Killiecrankie (155mAOD).

There is forest on both sides of the carriageway along this section. The route of the A9 follows the course of the River Tummel until it joins the River Garry, and then follows the course of the River Garry northward. The A9 also crosses Loch Faskally near Ch. 40100.

Population is centred in Pitlochry east of the A9, with the density of buildings reducing significantly on exit from the town; however, Pitlochry is separated from the A9 corridor by the River Tummel. There are buildings sporadically located to the right and within 100m of the carriageway. The railway crosses the A9 at Ch. 36500 before continuing to run east of the river through Pitlochry, turning west and crossing under the A9 north of the settlement at Ch. 41200.

Photo 4.3.7 Existing Topography at Killiecrankie

Consideration should be given to the proximity of Loch Faskally and the buildings located along this section of the route; which may restrict the opportunities for carriageway widening.

4.3.10 Pass of Killiecrankie

The corridor is within a dual carriageway section and runs in a north-westerly direction through the relatively narrow Pass of Killiecrankie. The route tends to rise from the southern part of the section to the highest point in the Pass of Killiecrankie (155mAOD).

The A9 in this subsection is primarily comprised of the Killiecrankie Viaduct through the narrow pass. There are no significant changes in elevation along this section of the A9. The River Garry lies parallel to the west of the road. The Highland Main Line railway is located between the A9 and the river before crossing the A9 at Ch. 48000, also contributing to the constraints of this subsection.

Photo 4.3.8 Existing Topography North of Killiecrankie

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, as the River Garry and the Highland Main Line railway run to the west of the road any improvement works identified may be restricted.

4.3.11 Killiecrankie to Glen Garry

This single carriageway corridor runs in a westerly direction from Killiecrankie to Glen Garry and is primarily on embankment. The A9 follows the River Garry, lying south of the river between Ch. 52500 and 55050, crossing it and continuing north towards Inverness thereafter. The road gains height gradually to 280mAOD at Glen Garry.

The surrounding area is characterised by the slopes of Glen Garry rising to surrounding hills (<500mAOD). The Highland Main Line railway between Perth and Inverness also passes through Glen Garry, which the A9 crosses between Bruar and Calvine at Ch. 56500.

The general land use along this section of the A9 is forestry and moorland. The settlements of Bruar (Ch. 55500 to 55800), Calvine (Ch. 57000 to 57500) and Struan (Ch.57300) are present in this section and are noted to have tourist facilities. The road also passes Clunes Lodge (Ch. 60000) and Dalnamein Lodge (Ch. 64000).

Photo 4.3.9 Existing Topography at Glen Garry

The surrounding slopes of Glen Garry should be considered when assessing the options for widening the A9 as these may result in the need for significant cut and embankment slopes.

4.3.12 Glen Garry

The corridor runs in a north-westerly direction through Glen Garry within a dual carriageway along the southern boundary of Cairngorms National Park. The section lies primarily on embankment and generally rises from 280mAOD at Ch. 66020 to 450mAOD at Ch. 75000, which approaches the high point at the Pass of Drumochter. Snow gates are located at Ch. 67000m on the northbound carriageway. The A9 is located on the valley floor bordered on both sides by hills, typically rising to greater than 500mAOD between Ch. 66020 to 69700. Dalnacardoch Wood lies to the north of the A9 (Ch. 66020 to 69600) and the River Garry and Highland Main Line railway are located to the south.

The terrain steepens to the north of Ch. 69700 after Dalnacardoch Wood to such an extent that the A9 splits, with the southbound carriageway elevated and following a separate alignment to the northbound carriageway. Several rock cuttings are located along both carriageways. In addition, the River Garry and Highland Main Line railway run along the narrow valley floor adjacent to the northbound carriageway of the A9. Both the river and railway are within close proximity (<100m) to the A9 carriageway from Ch. 70000 to Ch. 75000. Overhead electricity lines run parallel to the southbound carriageway (<50m distant) with several concrete retaining walls for the pylon structures along the route.

General Wade's Military Road is located approximately 50m to the south of the A9 between Ch. 66500 and 67000 before crossing and running parallel to the north of the A9 for the remainder of the section, approximately 10-20m distant.

The A9 crosses several small watercourses along this section. These typically drain from north to south into the River Garry. Edendon Bridge is located at Ch. 67800 where the A9 crosses Edendon Water. There are no settlements and few accesses are present along the sparsely populated corridor.

Photo 4.3.10 Existing Topography North of Blair Atholl

Although this section is already dual carriageway, the steep terrain, rock, River Garry and the Highland Main Line railway could make any improvement works extremely difficult to construct and result in both large cutting and embankment slopes. Additional consideration needs to given to the river, SSE Beauly to Denny power line and the railway which may restrict the opportunities for improvement works.

4.3.13 Glen Garry to Crubenmore

The corridor runs in a northerly direction along a single carriageway from Glen Garry to Crubenmore. This section follows a remote, largely uninhabited valley through the Pass of Drumochter, which is noted to be the highest point of the A9 (460mAOD). This section of the A9 is generally bound on either side by steep hills, with the road running along the eastern side of the valley floor for the majority of the route.

Photo 4.3.11 Existing Topography at Dalnaspidal

Between Ch.75000 and 78000 the road sits approximately 30m above the valley floor. The valley is bounded to the east by the hill sides of A'Bhuidheanach Bheag and to the west by the slopes of Meall an Dobharchain. The Highland Main Line railway is located on the valley floor between Allt Dubhaig and the A9. The A9 lies on sidelong ground with cuttings from Ch. 75000 to 75250 (east slope) and from Ch. 77200 to 77600 (both sides of the carriageway). Embankment runs along the western side of the road along the majority of this section. Rock is exposed in cuttings along the southbound carriageway at Ch. 75000 to 75200, 77160 to 77560. Between Ch. 78000 and 85700 the road sits approximately 5m above the valley floor, to the east of the River Truim and the railway.

With the exception of a few localised areas of woodland and a few isolated residential properties, the surrounding area is remote upland, consisting of heather and grass cover. Cuttings in this section are from Ch. 79800 to 80700 along the southbound carriageway, with rock exposed between Ch. 79880 to 80620. Embankments are present along the northbound carriageway. A SAC bounds the carriageway to the east between Ch. 75500 and 85700, consisting of grassland and localised wooded coniferous areas.

Two major watercourses flow parallel to the west side of the A9 route. The Allt Dubhaig flows in a southerly direction towards Glengarry (Ch. 75500 to 78000), and the River Truim flows north toward and beyond Dalwhinnie (from Ch. 79000 and continuing along the length of the site). Minor watercourses feed into these rivers from the hills to the east, culverted beneath the A9.

There are only a few local residences along this section including: Dalnaspidal Lodge, south of Ch. 75500, Balsporran Cottages, west of Ch. 82000 and Drumochter Lodge, east of Ch. 82500. The snow gates across the A9 and historical Wade Bridge are located at the far northern end of the site at Ch. 85700.

The topography along this section of the route is seen to fall from a high point of 390mAOD near Wade Bridge (Ch. 85250) to 369mAOD in Glen Truim valley opposite Dalwhinnie (Ch. 88000). Beyond Ch. 88000 the level continues to reduce gently towards the north, reaching 344mAOD at Ch. 90700 and 322mAOD at Ch.93450.

The original route of the A9 was known as 'General Wade's Military Road' – a section of this road has now been developed as a cycle path which lies to the east and slightly upslope of the A9 between Ch. 75500 to 78000 which in order to accommodate will present construction issues and result in large cuttings and embankment slopes.

The topography of the surrounding land should be considered when assessing widening options. This section consists of steep terrain which may present construction issues and result in both large cutting and embankment slopes. Consideration should also be given to the Highland Main Line railway which may restrict opportunities to widen to the east and to the new SSE Beauly to Denny power lines that will be constructed parallel to the east of this section.

4.3.14 Crubenmore

This dual carriageway section travels in a northerly direction and is situated within a cut on the southern end and embankment on the northern end. There are no significant changes of elevation along this section.

Initially there is a rock cut to the east and flatlands to the west. At approximately halfway along the section, the topography on the east changes to midlands. This continues to the end of the section. The River Truim, the Highland Main Line railway and an unclassified road all lie adjacent to the west of the carriageway. There are existing pylons adjacent to the carriageway at points along this section that will be removed as part of the SSE Beauly to Denny power line works.

There are small settlements at the beginning and end of the section. Population is sporadic and this section is within Cairngorms National Park.

Photo 4.3.12 Existing Topography South of Newtonmore

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, as rock is present along parts of this section, consideration should be given to any improvement works that may result in blasting. Consideration also needs to be given to the Highland Main Line railway to the west of the A9.

4.3.15 Crubenmore to Kincraig

The corridor runs in a north-easterly direction between Crubenmore and Kincraig along a single carriageway. Based on ground levels on borehole logs and contours provided on Ordnance Survey mapping, the road level falls to 230mAOD at Lynchat (Ch. 111000) and then rises to approximately 240mAOD at the end of the study area (Ch. 115000).

The topography of this section can be characterised as a wide river valley bounded to the west by steep, craggy hills attaining a maximum height of 756mAOD; these slopes are frequently forested. To the east of the river valley, the hills are more rounded with generally moorland vegetation, reaching a maximum height of 450mAOD.

The area is a popular tourist destination lying northwest of the Cairngorms National Park. The environmentally designated Loch Insh (National Nature Reserve/SSSI) is located to the north of the study area. This is fed by the River Spey, which is prone to flooding and lined with flood defence embankments to the south of Loch Insh (Ch. 109000 – 115500). The road crosses the River Spey at Ch. 109200, southeast of Kingussie. The environmentally designated Insh Marshes (National Nature Reserve/SSSI/Ramsar/SPA and SAC) site runs along the eastern side of the existing A9. Ruthven Barracks (Scheduled Monument) can also be seen from the A9 at approximately Ch. 108500.

The Highland Main Line railway is also located within the river valley, typically on embankment immediately to the west of the A9 between Ch. 99100 and Ch. 101500, diverging towards Newtonmore and Kingussie before crossing beneath the A9 at Ch. 109600. To the north the railway is approximately 50-100m east of the A9.

The original route of the road was constructed in the 18th century and is known as General Wade's Military Road. The construction of the A9 and A86 (which runs parallel with the A9 connecting Kingussie and Newtonmore to the A9 at Ch. 109900) uses parts of this military road, with other parts forming sections of a cycle path network.

Photo 4.3.13 Existing Topography South of Aviemore

The surrounding hills should be considered when assessing the options for widening the A9 as these may result in the need for significant cut and embankment slopes. Consideration should be given to the Highland Main Line railway which may restrict the opportunities for widening to west of the A9 and the SSSI present at this location.

4.3.16 Kincraig to Dalraddy

Between Kincraig and Dalraddy, this single carriageway subsection travels in a generally north-easterly direction and is situated on an embankment. There are no severe changes of elevation along this section. The B9152 runs adjacent to the east of the carriageway.

There are flatlands to the east and west of the carriageway for this section. The River Truim and the Highland Main Line railway also sit to the east of the A9. This

section is populated by Kincraig, Dalraddy and the Alvie Estate. There is one listed building within 50m of the carriageway.

Photo 4.3.14 Existing Topography North of Aviemore

The topography and land use is unlikely to cause any major issues during the dualling of the A9, however consideration should be given to the listed building when selecting a route alignment.

4.3.17 Dalraddy to Slochd

This single carriageway corridor initially runs in a northerly direction, turning west between Dalraddy and Slochd. The A9 runs from low lying areas of the River Spey valley in the south, to the west of Aviemore. There it continues north at the foot of Carn Mór and Beinn Ghuilbin, located to the west and northwest of the Cairngorm Mountains. At Kinveachy the ground level is approximately 285mAOD, descending towards the River Dulnain floodplain at Carrbridge. After the crossing of the River Dulnain, the A9 rises towards the north to the high point of this section at Slochd Summit, where ground level is approximately 405mAOD.

The surrounding land at the south of the section is characterised by the low lying and relatively flat area of the Loch Alvie between Ch.122500 and 123000. This is followed by the slopes of the adjacent hills to the west and the low lying and slightly undulating areas of the River Spey valley to the east of the road up to Kinveachy at Ch.134000. From Kinveachy, the road continues northward toward Inverness. The River Dulnain crosses perpendicular to the A9 at Carrbridge (Ch. 138840) and runs in a typically northwest direction.

The dominant land use along this section of the route comprises forestry and agriculture. A section of moorland is located between Ch.122500 and 126000 to the east and west of the A9. Aviemore is the largest developed area along the route located to the east of the A9 between the B9152 Junction at Ch.125400 and the A95

Junction at Ch.130950. Carrbridge is the only other main settlement within this section.

The Highland Main Line railway lies to the east of the A9 through this section and both the railway line and the A9 encounter sections of embankments and cuttings. The railway crosses underneath the A9 at Ch. 144000 to continue along the western side of the A9 for the remaining length. The railway, road and the national cycle network occupy a very narrow corridor (50m) at Slochd Summit to navigate between the steep elevated sections in this area. Rock cuttings are present on the northbound carriageway (Ch. 143650 to 143800, 144075 to 144275 and 145900 to 146050) and the southbound carriageway (Ch. 145500 to 146100).

The topography of the land should be considered when widening the A9. Initially widening may be restricted due to Loch Alvie. Consideration should also be given to the floodplain of the River Dulnain as this may present difficulties when constructing in this location. Consideration should also be given to the Highland Main Line railway which may restrict opportunities to widen to the east.

Photo 4.3.15 Existing Topography South of Slochd

4.3.18 Slochd to Tomatin

The corridor runs in a north-westerly direction from Slochd to Tomatin along a dual carriageway and passes a number of isolated properties and farmland areas. The A9 sits at a level of approximately 350mAOD, flanked by grassed hillsides and shallow rock cuttings along the southbound side of the road. The cuttings continue along the length of the dual carriageway section until Ch.150500 where the surrounding land opens out and the road crosses the River Findhorn. The dualled section (which crosses the river and passes Tomatin) sits at approximately 320mAOD before gradually dropping elevation at Ch. 152000. This section ties back in with the single carriageway section and surrounding ground level, which is fairly uniform and at a level of 285mAOD. The single carriageway section continues

towards the village of Moy, running almost at grade within the river valley containing the River Findhorn, Funtack Burn and Loch Moy, where it passes farmland areas.

The route passes over and alongside a number of watercourses and water bodies, the most notable of which is the River Findhorn (crossed by the route at Ch. 151100). The Highland Main Line railway runs for the majority of this section in close proximity to the western side of the A9. At Tomatin, the railway line veers west away from the road (Ch.150500).

Photo 4.3.16 Existing Topography South of Tomatin

Although this section is already dual carriageway, the steep terrain, rock and River Findhorn could make any improvement works extremely difficult to construct and result in both large cutting and embankment slopes. Consideration should also be given to the Highland Main Line railway which runs to the west of A9.

4.3.19 Tomatin to Moy

The corridor runs in a northerly direction in a single carriageway subsection, passing between the small villages of Tomatin and Moy (Ch. 156500 to 159000) past a number of isolated properties and farmland areas. The route crosses the River Findhorn as it passes to the east of Tomatin.

The A9 is flanked by woodland for much of its length except between Ch. 155000 to 157000 and around Ch. 159000. The route passes over and alongside a number of watercourses and water bodies. The most notable of which are the River Findhorn and Loch Moy (passed at Ch. 157000 to 158500).

The Highland Main Line railway runs for the majority of this section in close proximity to the western side of the A9. At Tomatin the railway line veers west away from the road and then east to join the road again (Ch. 153500). Just south of Moy

(Ch. 156600) the railway line passes underneath the A9 viaduct and continues along the eastern side of the road. At Moy (Ch. 159000) the A9 veers towards the west as the railway line continues northward.

Widening of the A9 in this section is mainly restricted due to the number of watercourses which will have to be negotiated. Furthermore, consideration should also be given to the Highland Main Line railway which may restrict opportunities to widen to the west.

Photo 4.3.17 Existing Topography South of Moy

4.3.20 Moy to Inverness

This dual carriageway route begins west of the village of Moy before it passes around the southern and western foot of Benn a'Bheurlaich. It then crosses the River Nairn and runs northwest to the outskirts of Inverness.

Photo 4.3.18 Existing Topography South of Inverness

The route tends to fall from the highest point at the start of the section (~300mAOD) to a low crossing of the River Nairn (180mAOD) before rising round Daviot (220mAOD) and falling gradually as the route approaches Inverness (ending at 40mAOD).

As this is an existing dual carriageway section, the topography and land use is unlikely to cause any major issues during the dualling of the A9. However, consideration should be given to properties running alongside the A9 which may restrict any improvement works to this section.

4.4 Geotechnical Considerations

4.4.1 Introduction

A desk study review of available geotechnical information has been undertaken and a Geotechnical Preliminary Sources Study Report (PSSR) has been produced which provides a geotechnical and geo-environmental assessment for the Red Option. Given the length of the scheme, the PSSR has been split into 13 study areas, which differs from the 18 subsection identified within this report, these study areas are outlined in **Table 4.4.1** below. Each study area is reported separately with the PSSR Reports included herein as **Appendix E**.

Sections	PSSR Study Area Section	Report Reference	Chainage (m)
Perth to Luncarty	Inveralmond to Luncarty	B1557620/GEO/PSSR/01	0-3,500
Luncarty to Pass of Birnam	*Luncarty to Birnam*	*See Note 1*	*3,400-13,000*
Pass of Birnam	Birnam	B1557620/GEO/PSSR/13	13,000-14,700
Pass of Birnam to Tay Crossing	*Birnam to Tay Crossing*	*See Note 1*	*14,700-23,000*
Tay Crossing to Ballinluig Ballinluig to Pitlochry	Tay Crossing to Pitlochry	B1557620/GEO/PSSR/02	22,800-36,300
Pitlochry to Killiecrankie Pass of Killiecrankie Killiecrankie to Glen Garry	Pitlochry to Woodend	B1557620/GEO/PSSR/03	36,300-52,500
Killiecrankie to Glen Garry	Woodend to Glengarry	B1557620/GEO/PSSR/04	52,500-65,800
Glen Garry	Glengarry	B1557620/GEO/PSSR/05	65,800-75,000
Glen Garry to Crubenmore	Glengarry to Dalwhinnie	B1557620/GEO/PSSR/06	75,000-85,700
Glen Garry to Crubenmore	Dalwhinnie to Crubenmore	B1557620/GEO/PSSR/07	85,700-95,200
Crubenmore to Kincraig	Crubenmore to Kincraig	B1557620/GEO/PSSR/08	95,200-115,500
Kincraig to Dalraddy	*Kincraig to Dalraddy*	*See Note 1*	*115,500-122,500*
Dalraddy to Slochd	Dalraddy to Kinveachy	B1557620/GEO/PSSR/09	122,500-136,300
Dalraddy to Slochd	Kinveachy to Slochd	B1557620/GEO/PSSR/10	136,300-147,200
Slochd to Moy	Slochd to Moy	B1557620/GEO/PSSR/11	147,200-161,200
Moy to Inverness	Moy to Inverness	B1557620/GEO/PSSR/12	161,200-173,248

Note 1: Early Implementation Scheme subsections not covered by PSSRs. Geotechnical analysis for these areas are included in separate assessments undertaken for the A9 Luncarty to Pass of Birnam scheme, Birnam to Tay Crossing and Kincraig to Dalraddy schemes.

Table 4.4.1 Summary of PSSR Limits

This section of the Stage 1 report summarises the main findings of the PSSRs. A general overview of corridor conditions is presented, along with separate details of each online subsection. The online summaries are divided according to the structure introduced in Section 1.4, which varies slightly from the PSSR study limits.

4.4.2 Overview of Geotechnical Conditions

The superficial deposits expected to be encountered by an online widening option have been identified as Recent and Quaternary deposits comprising mainly of the following (with increasing depth):

- *Alluvial and River Terrace Deposits associated with the frequent watercourses in the vicinity of the existing A9;*
- *Glaciofluvial sand and gravel (similarly associated with the watercourses); and*
- *Cohesive and Granular Glacial deposits.*

Peat/marshland may also be encountered locally. Peat tends to be typically <1m thick but can be thicker (3 to 4m) locally. Made Ground is present with the existing road earthworks, particularly embankments and in the vicinity of existing structures/towns/roads. There are also numerous disused quarries/sand pits scattered alongside the existing A9 and occasionally below the existing road. Some of the pits and quarries have been fully or partially infilled, although the infill material is unknown and may be potentially contaminative.

The solid geology at the far northern and southern ends of the A9 corridor (Daviot to Inverness and Perth to Birnam) is indicated to be mudstones, sandstones and conglomerates with local andesitic and basaltic lavas, belonging to the Lower and Middle Old Red Sandstone Group of Devonian Age. The majority of the remaining route is underlain by metamorphic rocks of Moinian or Dalradian age, which comprise quartzite, schists, pelitic, phyllite and psammite rocks. These rocks have been intruded by basic and acidic igneous rocks, most notably granites in the vicinity of Aviemore, Tomatin and Daviot, towards the northern part of the A9 corridor.

There are several major north-east south-west trending faults, most notably the Highland Boundary fault and Great Glen Fault present at the southern and northern ends of the A9 corridor respectively, separating the Devonian rocks from the Dalradian/Moine rocks. Many smaller faults can also be expected.

There are a number of groundwater abstraction and discharge consents (for foul and surface water) along the route and information indicates that sections of the existing A9 are at risk from flooding. However, the existing road tends to be on embankment in these areas and therefore deemed to be at lower risk.

Historical maps give an indication of the local industries that were present and which may be a potential source of contamination. These include quarrying, sand and gravel pits, lime kilns, bleach works, smithies, saw mills and scrap yards. In addition, current land uses include various agricultural and forestry activities, fuel stations/garages, sewage treatment works, railways, rifle ranges, distilleries and associated works.

Information provided by Envirocheck indicates a low to high risk of landslides. These are typically associated with river banks (which could be an issue locally where undercutting at the toe of an embankment may threaten its stability) but they can also be associated with steeper cut slopes in soil and rock and may impact on the existing A9. Data obtained from Transport Scotland's Routine Maintenance Management System (RMMS) also indicates a number of road closures resulting from soil and rock landslides. In general the existing A9 earthworks are in good condition. However, cut slopes showing evidence of historic instability or

incorporating slope drainage, rockfill blankets, rock netting, mesh and dowels and dentition were noted during site walkovers.

4.4.3 Online Corridor Conditions

Made Ground has been discussed below for each section only where significant thicknesses are anticipated based upon geological maps or historical ground investigations. However, unrecorded Made Ground is anticipated to be encountered across the area associated with previous road/rail earthworks or historical developments.

(a) Perth to Luncarty

This section of the existing A9 is predominantly underlain by Alluvium (typically sandy gravels with layers of clay and silt) at the southern end, Raised Marine Deposits (firm sandy silty clay) in the central area and Glaciofluvial Deposits at the north end (sand and gravel). Localised areas of Alluvium are also noted around watercourses which pass under the existing road. Glacial Till (stiff sandy clay with cobbles) underlies the whole section at depth.

The solid geology underlying this section comprises sandstones, mudstones and siltstones of Lower Devonian age belonging to the Scone Sandstone and Cromlix Mudstone Formation.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils (alluvium) at the southern end of the route at Ch. 0 to 1800 and Ch. 2450 to 2600. The risk of this may be slightly greater if the road or junctions were to be widened to the east, given the proximity of the River Tay;*
- *Potential for high groundwater which may affect excavations;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly infilled gravels pits at Ch. 1100, 2200, 2400 and 2800; and*
- *Potential for flooding between Ch. 0 – 500m.*

(b) Luncarty to Pass of Birnam

This section is subject to a separate DMRB Stage 3 Assessment. A geotechnical investigation has been undertaken to inform the design of the scheme. Therefore no PSSR has been undertaken for the Luncarty to Pass of Birnam section.

The superficial geology predominantly comprises granular Glaciofluvial Deposits overlying Glacial till from Luncarty to Bankfoot. North of Bankfoot, surface deposits of Glacial Till predominate. Alluvium is present where tributaries of the River Tay flow adjacent to the west side of the existing road or pass underneath it (Shochie Burn and Ordie Burn at Luncarty and Garry Burn south of Bankfoot). Localised peat deposits (surface and buried) are present to the east and west of the existing road north of Bankfoot.

The solid geology underlying this section is of Lower Devonian age. From the southern end of the section to Gelly Wood, bedrock predominantly comprises

sandstones, mudstones and siltstones of Lower Devonian or Emsian age belonging to the Cromlix Mudstone, Teith Sandstone and Scone Sandstone Formations. From Gelly wood to the Northern end of the section, bedrock comprises conglomerate of the Craighall Conglomerate Formation. Two east-west trending faults at Muir of Thorn mark the boundary between the Cromlix Mudstone and Scone Sandstone Formations. Minor igneous dykes (quartz microgabbro) cross the road at three locations between Luncarty and Bankfoot, which form part of the Central Scotland Late Carboniferous Dyke Swarm of Silesian age.

Geotechnical constraints include:

- *Slope stability considerations for the widening of several existing soil and soil/rock cuttings, some with a recent history of slope stability problems/failures and known artesian/sub-artesian conditions;*
- *Potential to encounter weak, compressible soils, most notably associated with peat and alluvium deposits;*
- *High groundwater which may affect general excavation works particularly adjacent to existing watercourses;*
- *Potential for flooding associated with watercourses in the area;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly a sewage works and several disused sand and gravel pits or quarries; and*
- *Slope stability considerations and potential requirement for widening of several existing cuttings along this section.*

(c) Pass of Birnam

Ground conditions at this section of the existing A9 generally comprise either Glacial Till (silty fine sand or sandy silt) or Glaciofluvial Deposits (dense silty sand and gravel with some cobbles and boulders). A thin layer of peat was encountered site-wide with localised thicker deposits of peat up to 2m depth.

The solid geology underlying this section comprises sandstone, siltstone and conglomerates of Early Devonian age from the Scone Sandstone Formation and the Craighall Conglomerate. Rock was typically encountered in boreholes between 2 and 8m below ground level. Two thin west-east trending dykes are noted at approximate Ch. 14000 and 13750, comprising quartz microgabbro from the Central Scotland Late Carboniferous Tholeiitic Dyke Swarm. Two faults run southwest to northeast across the north end of this section associated with the Highland Boundary Fault.

This section of the A9 corridor is already dual carriageway and therefore constraints were identified relating to any upgrading works or new junctions that may be required in the future. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils associated with localised areas of Peat;*
- *Potential for high groundwater; and*
- *Potential for landslides in some areas resulting from steep cuttings or undercutting by the River Tay.*

(d) Pass of Birnam to Tay Crossing

This section is subject to a separate DMRB Stage 2 Assessment that will provide a more detailed assessment than this DMRB Stage 1 Assessment. The ground conditions are summarised below based on geological and current Ordnance Survey maps.

The superficial geology predominantly comprises granular Glaciofluvial Deposits from Pass of Birnam to Dunkeld, then Alluvium and River Terrace Deposits at the north end of the route where the A9 lies within the floodplain of the River Tay and the River Braan (a tributary of the Tay). Localised areas of peat are noted over high ground to the west of the A9, although the majority of the high ground is underlain by Glacial Till or bedrock close to the surface.

The solid geology underlying this section is dominated by the Highland Boundary Fault, comprising a number of smaller east-west trending faults south of Birnam. The rocks south of the fault zone comprise conglomerate and andesite of the early Devonian Craighall Conglomerate Formation. North of the faulted zone, the bedrock comprises metamorphic metasandstone, metamudstone, psammite and slaty pelites belonging to the Birnam Slate and Grit, Southern Highland Group and Ben Ledi Grit Formations, which are of mid-Cambrian to Neoproterozoic age. A few minor igneous dykes (quartz microgabbro) are noted in the vicinity of the road, which form part of the Central Scotland Late Carboniferous Dyke Swarm of Silesian age.

Geotechnical constraints are likely to include:

- *Potential to encounter weak, compressible soils, most notably associated with peat and alluvium deposits;*
- *High groundwater which may affect excavations, particularly adjacent to existing watercourses;*
- *Potential for flooding associated with watercourses in the area;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly railway land and large disused quarries to the west of the road near Birnam and Inver; and*
- *Slope stability considerations and potential requirement for widening of several existing cuttings and embankments along this section.*

(e) Tay Crossing to Ballinluig

The ground conditions over this section of the existing A9 include Granular Alluvium (fine silty sand/sandy silt, locally peaty) and isolated regions of River Terrace Deposits (silty gravelly cobbly sand) associated with the floodplain of the River Tay. Glaciofluvial Deposits were encountered site-wide either at the surface or underlying the Alluvium/River Terrace Deposits, typically comprising very dense sand and gravel with cobbles. Owing to its location at the eastern edge of the floodplain, the A9 route typically follows the boundary between the Alluvium/River Terrace Deposits and the Glaciofluvial Deposits.

The solid geology underlying this section comprises metamorphic bedrock of Dalradian age belonging to the Southern Highland group, comprising banded garnetiferous mica-schist and coarse pebbly psammite. Rock was typically encountered in boreholes at 10m to 25m below ground level over the valley floor,

although it may be closer to the surface over higher ground. No faults are indicated in this area.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils (alluvium), particularly if the road were to be widened to the west rather than the east, given the anticipated prevalence of alluvium. Thick deposits of alluvium are anticipated associated with infilled former river channels either underlying (Ch. 28500 to 28900) or adjacent to the road (Ch. 24300 to 25200);*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly a gravel pit located 50m east of the road at Ch. 27200;*
- *High groundwater levels which may restrict excavations;*
- *Potential for flooding over sections of the A9, particularly where the road is close to the River Tay (Ch. 22800 to 30600); and*
- *Slope stability considerations within cuttings and adjacent to the river channel where erosion may affect slopes, particularly where embankments or cuttings are to be widened.*

(f) Ballinluig to Pitlochry

The superficial deposits over this section of the existing A9 include Granular Alluvium (fine silty sand/sandy silt, locally peaty) and isolated regions of River Terrace Deposits (silty gravelly cobbly sand) associated with the floodplain of the River Tummel. Glaciofluvial Deposits were encountered site-wide either at the surface or underlying the Alluvium/River Terrace Deposits, typically comprising very dense sand and gravel with cobbles. Owing to its location at the eastern edge of the floodplain, the A9 route typically follows the boundary between the Alluvium/River Terrace Deposits and the Glaciofluvial Deposits.

Made Ground was recorded in several exploratory holes in the Ballinluig Junction area, typically less than 3.5m thick and comprising silty sandy gravel or gravelly sand with cobbles and ash.

The solid geology underlying this section comprises metamorphic bedrock of Dalradian age belonging to the Southern Highland group, comprising banded garnetiferous mica-schist and coarse pebbly psammite. Rock was typically encountered in boreholes at 10m to 25m below ground level over the valley floor, although it may be closer to the surface over higher ground. No faults are indicated in this area.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils (alluvium), particularly if the road were to be widened to the west rather than the east, given the anticipated prevalence of alluvium. Thick deposits of alluvium are anticipated associated with infilled former river channels adjacent to the road (Ch. 32600 to 33550);*

- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly a disused gravel pit located 50m east of the road at Ch.34300;*
- *High groundwater levels which may restrict excavations;*
- *Potential for flooding, as the route lies close to the River Tummel for the whole section; and*
- *Slope stability considerations within cuttings and adjacent to the river channel where erosion may affect slopes, particularly where embankments or cuttings are to be widened.*

(g) Pitlochry to Killiecrankie

The superficial deposits over this section of the existing A9 predominantly comprise Alluvial and River Terrace deposits associated with the River Tummel, typically described as fine to medium sand or gravel with variable cobble and boulder content.

The solid geology over this section predominantly comprises metasedimentary rocks belonging to the Dalradian Supergroups, generally indicated to comprise schists, quartzites and psammites, with localised areas of metamorphic limestone and metamorphic volcanic rocks.

The desk study review recorded a number of constraints to the route selection, including:

- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly railway land, hydroelectric power station, a saw mill, laboratory, two burial grounds, lime kilns and several disused quarries or gravel pits;*
- *Potential to encounter landslip hazards, particularly in alluvial soils;*
- *Potential to encounter running sand hazards;*
- *Potential to encounter weak, compressible soils, particularly with the anticipated presence of alluvium;*
- *Slope stability considerations within cuttings, particularly where these are to be widened;*
- *High groundwater level which may restrict excavations; and*
- *Potential for flooding over sections of the A9, particularly where the road is close to the River Tummel.*

(h) Pass of Killiecrankie

The superficial deposits over this section of the existing A9 predominantly comprise Glacial Till with a localised area of alluvium at the south end associated with the confluence of the River Garry and River Tummel. Superficial deposits are indicated to be thin or absent between Ch. 43100 and 43750. Glaciofluvial Deposits are indicated to be present over rising ground to the south and southwest. Localised peat deposits up to 0.6m thick were occasionally encountered.

The solid geology comprises metasedimentary schists, semi-pelites and psammites belonging to the Carn Mairg Quartzite and Killiecrankie Schist Formations (part of the Dalradian Supergroup).

The desk study review recorded a number of constraints to the route selection, including:

- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, including railway land and lime kilns within 50m of the A9;*
- *Potential to encounter running sand hazards;*
- *Potential to encounter weak, compressible soils, particularly with the anticipated presence of alluvium and localised areas of peat;*
- *Landslip hazards (particularly within alluvial soils and where existing landslips have occurred) and slope stability considerations within cuttings, particularly where these are to be widened;*
- *High groundwater table which may restrict excavations; and*
- *Potential for flooding associated with the River Garry.*

(i) Killiecrankie to Glen Garry

The superficial geology underlying this section of the existing A9 predominantly comprises Glacial Till (particularly over higher ground), Alluvium and River Terrace Deposits associated with the River Garry adjacent to the A9. Superficial deposits are indicated to be thin or absent between Ch. 47100 and 47400 and between Ch. 57000 and 62000. Both alluvial and glacial deposits were described as sand and gravel with variable silt and cobble/boulder content. A thin layer of peat (up to 0.9m thick) was also encountered at the north end of this section from Ch. 60900 onwards.

The solid geology underlying this section predominantly comprises metamorphic schists, metalimestones, psammite and semipelites of the Grampian Group, of Precambrian Neoproterozoic age. These belong to various formations including the Killiecrankie Schist, Blair Atholl Dark Limestone, and Lochaber Subgroup. Thin igneous intrusions (microdiorite and felsite) cross the existing road at several locations over the north end of this section, forming part of the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite. Numerous faults are noted over the north end of this section, crossing the existing A9 in a north-south or northeast-southwest orientation. Bedrock was typically encountered at shallow depth (0 to 6m) over this section, but was generally much deeper where the route crosses watercourses such as the River Garry.

The desk study review recorded a number of constraints to the route selection, including:

- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses, particularly railway land, a gas works, lime kilns and several infilled sand and gravel pits or quarries;*
- *Potential to encounter running sand hazards;*
- *Potential to encounter weak, compressible soils, particularly with the anticipated presence of alluvium and localised areas of peat;*

- *Landslip hazards (particularly within alluvial soils and associated with erosion of the riverbank) and slope stability considerations within cuttings, particularly where these are to be widened;*
- *Existing retaining walls within rock cuttings;*
- *High groundwater table which may restrict excavations; and*
- *Potential for flooding over sections of the A9 associated with the River Garry.*

(j) Glen Garry

The superficial geology underlying this section of the existing A9 predominantly comprises moraine or till of glacial origin (typically described as very silty or clayey sand and gravel with cobbles and boulders). Alluvium and River Terrace Deposits (sand and gravel) associated with the River Garry are indicated within the river flood plain, lying under or adjacent to the south side of the existing road between Ch. 65800 to 68000 and 71000 to 75000. In addition, thin peat deposits up to 1.5m deep were encountered in several exploratory holes.

The solid geology underlying this section predominantly comprises metamorphic quartzite, psammite and semipelites of the Grampian Group, of Precambrian Neoproterozoic age. Minor igneous intrusions of microdiorite and pegmatite are indicated to cross the A9 at several locations, from the North Britain Dyke Suite age. There are three faults which cross the alignment in a north to south orientation at Ch. 68000, 70000 and 71500. The bedrock is exposed in a number of rock cuttings along the route, particularly on the southbound carriageway.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils, particularly alluvium associated with the River Garry to the south of the A9 and localised peat deposits;*
- *High groundwater levels which may restrict excavations;*
- *Potential for flooding over sections of the A9, particularly where the road is close to the River Garry;*
- *Potential requirement to modify or extend several concrete or masonry retaining walls for pylon structures along the route (Ch. 70500 to 73400);*
- *Potential for landslides associated with areas of compressible ground comprising alluvium and areas where erosion of the river bank is likely to have occurred, particularly adjacent to the southbound carriageway at Ch. 66500 and 67200;*
- *Slope stability considerations within soil and rock cuttings, particularly where the terrain steepens from Ch. 69700 to 75000 and where cuttings are to be widened. Fifteen historic landslide events have been identified in this area associated with both soil and rock cuttings, one of which necessitated a road closure; and*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including two disused quarries at Ch.70200 to 70550, railway land, a water pipeline, several dams and a tank.*

(k) Glen Garry to Crubenmore

The superficial geology underlying this section of the existing A9 predominantly comprises Hummocky (Moundy) Glacial Deposits or Glacial Till (sands and gravels, silty in parts, with a significant cobble and boulder content) with isolated deposits of Alluvium, Glaciofluvial Deposits and Head deposits. A thin layer of peat was encountered site-wide, with occasional localised thicker deposits extending to between 1.9m and 3.4m depth. Alluvium was generally associated with the floodplain of the River Truim and its tributaries where these pass underneath or close to the existing road. The alluvium varied in thickness from 0.5 to 9.0m, typically thicker in the southern part of this section.

A small area of Made Ground was identified on geological maps at Ch. 92100, corresponding to the area of a former quarry. In addition, a few exploratory holes encountered engineered Made Ground (sand and gravel) which is expected to be site wide as it is associated with the construction of the road and rail aqueduct embankments.

The solid geology underlying this section comprises metamorphic psammite and semipelites of the Grampian Group, Fara and Gaick Psammite Formations, of Precambrian Neoproterozoic age. Minor intrusions of pegmatite of Silurian and early Devonian age from the Scottish Highland Ordovician Minor Intrusion Suite are indicated at Ch. 86000. The bedrock is exposed in a number of rock cuttings along this section, and was encountered at depths of 1.0m to 14m Below Ground Level (BGL) in exploratory holes, generally becoming shallower over higher ground.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective, these include:

- *Potential to encounter weak, compressible soils, most notably associated with alluvium on the west side of the A9 and peat deposits on both sides of the A9;*
- *High groundwater levels which may restrict excavations;*
- *Landslip hazards, particularly where existing problems have been identified due to erosion adjacent to watercourses. Widening to the west will bring the route closer to bends in the river where erosion rates will be highest;*
- *Widening to the east will require more soil and rock cuttings, and may increase exposure to potential landslips arising from steeply rising ground to the east of the alignment;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including railway land and infilled quarries or gravel pits; and*
- *Flood risk associated with the River Truim and its tributaries, which is likely to be exacerbated if road was to be widened to the west towards the major watercourses located in the valley floor.*

(l) Crubenmore

The superficial geology underlying this section of the existing A9 predominantly comprises Glaciofluvial Deposits (sand and gravel with cobbles and boulders), with localised areas of peat particularly at the north end of the site, extending beneath

the existing road at Ch. 98500 to 99600. Glacial Till is indicated immediately southeast of the existing A9 from Ch. 98000 onwards.

The solid geology underlying this section comprises metamorphic psammite and semipelites of the Falls of Phones, Gaich, Creag Dhubh and Torna Truim Formations of Neoproterozoic age. Thin igneous intrusions of Silurian and early Devonian age are also mapped in the vicinity of the A9 at several locations. Rockhead was typically encountered at shallow depth, at between 2.3m and 7.5m over this section. Faults are indicated at approximate Ch. 95500, 96800 and 99000 but are not indicated to cross beneath the existing A9.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective, these include:

- *Potential to encounter weak, compressible soils, most notably associated with peat deposits on both sides of the A9;*
- *High groundwater levels which may restrict excavations;*
- *Landslip hazards, particularly where existing problems have been identified, and slope stability considerations within cuttings, particularly where these are to be widened; and*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including railway land.*

(m) Crubenmore to Kincraig

The superficial geology predominantly comprises Glaciofluvial Deposits (sand and gravel with cobbles and boulders), with Glacial Till indicated immediately southeast of the existing A9, particularly at the south end of the site. Alluvium (silty sand and gravel with cobbles) was encountered where the route lies close to the River Truim and River Spey, and a large deposit of Lacustrine clays and silts is located to the south of Loch Insh between Ch. 113000 and Ch. 115500. Localised areas of peat have also been identified at several locations along this section, up to 1.9m thick. Engineered Made Ground (dense sand and gravel with some cobbles and boulders) was encountered beneath the existing road between Ch. 95200 and Ch. 100000.

The solid geological maps indicate that the majority of the site is underlain by metamorphic psammite and semipelites of the Creag Dhubh and Loch Laggan Psammite Formations of Neoproterozoic age. A fault is indicated at approximate Ch. 101100 but is not indicated to cross beneath the existing A9.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective, these include:

- *Potential to encounter weak, compressible soils, most notably associated with peat, lacustrine deposits and alluvium on both sides of the existing A9. Widening in the direction of the major watercourses (River Spey and Truim) will increase the potential to encounter alluvium and widening towards Loch Insh will increase the potential to encounter lacustrine deposits;*
- *There is potential for flooding over certain sections of the existing road, particularly adjacent to the River Spey and Loch Insh;*

- *Infilled quarries and gravel pits, buried foundations and peat are likely to affect widening on either side of the alignment to a smaller extent.*
- *High groundwater which may affect excavations, particularly around Loch Insh;*
- *Landslip hazards, particularly where existing problems have been identified at Ch. 101500,104300 to 105000 and 114300 to 114500.*
- *Slope stability considerations within cuttings, particularly where these are to be widened; and*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including railway land, a scrap yard, sewage works and potentially infilled ground associated with disused gravel pits and quarries (Ch. 101500, 107250, 108000 and 114250).*

(n) Kincraig to Dalraddy

This section is subject to a separate DMRB Stage 3 Assessment that will provide a more detailed assessment than this DMRB Stage 1 Assessment. The ground conditions are summarised below based on geological maps.

The superficial geology predominantly comprises Glaciofluvial Deposits, with localised outcrops of Peat and Alluvium particularly associated with watercourses. At the south end of the site, Lacustrine Deposits (silt and clay) are indicated to the southeast of the route, associated with Loch Insh. An area of Made Ground is shown immediately north of the road at Ch. 115000 associated with a quarry.

The solid geology underlying this section predominantly comprises metamorphic psammite, semipelite and metalimestone rocks of Neoproterozoic age, belonging to the Loch Laggan Psammite, Kincraig and Glen Banchor Succession Formations. At the north end of this section at Dalraddy, the bedrock comprises igneous porphyritic granite of Silurian age belonging to the Monadhliath Pluton. A fault is indicated at approximate Ch. 115500 but is not indicated to cross beneath the existing A9.

Geotechnical constraints are likely to include:

- *Potential to encounter weak, compressible soils, most notably associated with peat and alluvium deposits on both sides of the A9;*
- *High groundwater which may affect excavations, particularly around Insh Marshes and Loch Insh/Loch Alvie;*
- *Potential for flooding associated with watercourses and lochs in the area;*
- *Potentially contaminated ground or poor ground conditions/ buried obstructions associated with historical land uses particularly the quarry on the north side of the A9 at Ch. 115000; and*
- *Requirement for widening of several existing cuttings along this section.*

(o) Dalraddy to Slochd

The superficial deposits underlying this section of the existing A9 are predominantly of Glacial origin, generally comprising Hummocky Glacial Deposits or Glacial Till (both described as silty sand and gravel or sandy gravelly silt/clay, with a moderate cobble and boulder content). Glaciofluvial Deposits (medium dense sand and gravel) underlie the Glacial Till within valleys and over lower ground.

Localised Alluvial/River Terrace Deposits (sands and gravels) are indicated close to major watercourses along the route. A thin layer of peat (1-2m thick) is anticipated site-wide, with thicker deposits of up to 4m encountered in certain locations (Ch. 125000 to 127600, 137580 to 143400 and Ch. 146700 to 147200). In addition, engineered Made Ground (typically silty, very sandy gravel) was encountered in recent exploratory holes associated with road embankments.

The solid geology underlying this section predominantly comprises metamorphic psammite, schist and semipelite rocks of Dalradian Neoproterozoic age, belonging to a number of different formations. Igneous intrusions of Silurian and early Devonian age also cross the existing A9 at several locations. Five faults cross the existing road in a southwest to northeast orientation at Ch.135200, 136250,144125, 144150 and 144200, in addition a fault crosses the A9 in a west to east orientation at Ch. 133250. The majority of exploratory holes did not prove the depth to rockhead in this area, although the rock is exposed in a number of cuttings along this section.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective, these include:

- *Potential to encounter weak, compressible soils, most notably peat outcrops on both sides of the A9, and alluvial deposits associated with the River Spey and River Dulnain;*
- *High groundwater which may affect excavations;*
- *Potential for flooding over sections of the A9, particularly associated with Loch Alvie, River Spey and River Dulnain and where minor watercourses are culverted beneath the route;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including former landfill sites (Ch. 136850, 138900, 140100 and 145050) and infilled ground associated with gravel pits and quarries, particularly at Ch. 144300 and Ch. 145000;*
- *Widening north of Aviemore will require significant rock excavation and cuttings, particularly over the northern section at Slochd; and*
- *Landslip hazards (particularly around previously recorded landslides at Ch. 137680, 137700, 140000, 142750 and 144400) associated with erosion in the vicinity of watercourses and steep slopes/cuttings, particularly within the steeply rising ground to the east of the alignment and where cuttings are to be widened.*

(p) Slochd to Tomatin

This section of the existing A9 is predominantly underlain by Glacial Till deposits (firm to stiff sandy silty gravelly clay or very gravelly clayey sand), with the exception of a narrow band of Alluvium (silty sands/sandy silts with gravel, cobbles and boulders) and Glaciofluvial deposits (silts, sands and gravels with cobbles and boulders) associated with the River Findhorn. There are also pockets of peat indicated at the start and end of this section (Ch. 147100 to 148550 and 152250 to 152300), which are typically 1m to 3.4m thick.

The solid geology underlying this section comprises psammite and semipelite rocks of Dalradian age over the southern area, belonging to the Beinn Bhreac, Creag

Buidhe and Slochd Formations. North of Ch.149700, igneous intrusive (granitic) rocks are indicated on maps, associated with the various phases of the Findhorn Pluton Formation. A fault trending north east to south west is indicated to cross the existing road near the Findhorn Viaduct at Ch. 150600. The bedrock was typically recorded at depths of between 14 and 25m below ground level.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils of Peat and Alluvium on both sides of the road;*
- *High groundwater levels which may restrict excavations including artesian water in the Findhorn area;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including railway land, a distillery, a former fuel station and infilled ground associated with gravel pits and quarries, particularly at Ch.150875 and 150900;*
- *Flooding risk from the River Findhorn and other watercourses;*
- *Landslip hazards (particularly around previously recorded landslides at Ch.147250, 148300, and 151250) and slope stability considerations within cuttings, particularly where these are to be widened; and*
- *Potential requirement for rock cuttings especially if widening to east at the southern end of the site.*

(q) Tomatin to Moy

The superficial deposits underlying this section of the existing A9 are predominantly of Glacial origin, comprising Glaciofluvial Deposits (silts, sands and gravels with cobbles and boulders) and Glacial Till (firm to stiff sandy silty gravelly clay or very gravelly clayey sand). Local areas of Alluvium (silty sands/sandy silts with gravel, cobbles and boulders) are also noted corresponding to minor watercourses. Localised areas of peat are also frequently recorded typically up to 1m thick, lying beneath or close to the existing road at several locations.

The solid geology underlying the south end of this section comprises igneous intrusive (granitic) rocks associated with the various phases of the Findhorn Pluton Formation. North of Ch. 153800, the route is underlain by metasedimentary psammite and semipelite rocks of Dalradian age over the southern area, belonging to the Slochd Formation and Dava Succession. A fault crosses beneath the A9 at Ch. 154200 (north of Tomatin), trending north east to south west and is located between the Slochd Psammite Formation and the Dava Succession Formation. The bedrock was typically 14 to 25m below ground level, except around Loch Moy where it was encountered at or just below the surface.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils of Peat and Alluvium on both sides of the existing road;*
- *High groundwater levels which may restrict excavations;*

- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including infilled ground associated with gravel pits and quarries;*
- *Potential for flooding over sections of the A9, particularly where watercourses are culverted beneath the route; and*
- *Landslip hazards (particularly around previously recorded landslides at Ch. 153100, 153900 and 155000) and slope stability considerations within cuttings, particularly where these are to be widened.*

(r) Moy to Inverness

The superficial deposits underlying this section of the A9 are predominantly of Glacial origin, comprising Glacial Till (very dense silty sand and gravel) and Glaciofluvial Deposits (sands and gravels with variable quantities of clay/silt, cobbles and boulders). Where the route crosses the River Nairn, the superficial deposits comprise River Terrace Deposits (loose to medium dense sand with varying silt, gravel and cobble content) or bedrock close to the surface (Ch. 165250 to 166300). In addition, peat deposits were frequently encountered in boreholes up to 4.2m thick between Ch. 161500 to 162000, 162400 to 163000 and 166200 to 167200.

The solid geology underlying this section is divided into two sections by the Great Glen Fault at Daviot. Between Loch Moy and Daviot, the bedrock geology comprises metasedimentary rocks of the Moine Supergroup comprising Dava Succession schists and gneissose psammite and semipelite and occasional minor igneous intrusions (predominantly quartz-feldspar). North of Daviot, the bedrock comprises sandstones and conglomerates of the Middle Old Red Sandstone.

The desk study review recorded a number of constraints to the route selection. From a geotechnical perspective these include:

- *Potential to encounter weak, compressible soils, particularly with the anticipated presence of alluvium and localised areas of peat;*
- *Landslip hazards (particularly within alluvial soils) and slope stability considerations within cuttings, particularly where these are to be widened;*
- *High groundwater table which may restrict excavations;*
- *Potential for flooding over sections of the A9, particularly where the road crosses the River Nairn and where watercourses are culverted beneath the route;*
- *Potentially contaminated ground or poor ground conditions/buried obstructions associated with historical land uses including infilled ground associated with historical ponds, mill dams or quarries and historical industrial land uses e.g. quarries, mills, and garages; and*
- *Potential to encounter running sand hazards.*

4.4.4 Recommendations

Preliminary recommendations in relation to the geo-environmental and geotechnical assessment and associated risks are provided in the PSSRs. In summary these comprise:

- *Carry out a ground investigation to allow route corridor selection to be finalised with a robust cost estimate. The timing and scope of this investigation will be dependent on the method of procurement of the A9 Dualling and fixity of route corridor selection, (i.e. it may be possible to proceed directly to a detailed investigation for an area with only one alignment, whereas a preliminary ground investigation may be required to allow assessment of alternative route corridor options, which would be supplemented by a detailed investigation once the alignment is finalised.) Each PSSR has summarised aspects that would benefit from additional investigation;*
- *Review preliminary engineering recommendations in light of additional investigation; and*
- *Consult with Network Rail once details of the crossings are more developed.*

The desk study review recorded a number of constraints to an online widening of the existing A9. From a geotechnical/geo-environmental point of view, these include:

- *The potential to encounter soft, compressible soils. The risk of this may be slightly greater where the road is to be widened towards the main watercourses. This may require additional or special geotechnical solutions depending on the proposed works;*
- *The potential for high groundwater which may restrict excavations and/or require additional groundwater control measures;*
- *Infilled quarries/gravel pits introducing potential contamination and/or high total and differential settlements;*
- *Flooding risk that will require further modelling;*
- *Risk of encountering buried foundations, although considered to be low and localised;*
- *Retaining wall structures for pylons carrying overhead power lines;*
- *The potential to encounter infilled river channels underlying the road (Ch. 28500 to 28900, or adjacent to the west side of the road at Ch.24300 to 25200 and 32600 to 33550);*
- *Slope stability considerations within soil and rock cuttings, particularly where these are to be widened and particularly where historical instability is known;*
- *Landslide/debris flow risk from natural slopes above the A9;*
- *Risk of encountering contaminated land (considered to be low but requires further investigation); and*
- *Risk of requiring specialist geotechnical solutions (e.g. piling, ground improvement) to accommodate bridge widening/replacement, specifically to limit differential settlements and transfer load between new and existing foundations and their approach embankments given their usual location in alluvial flood plains. Alternatively space restrictions may require oversteepened cut slopes and use of soil nails for example, to facilitate the temporary works for foundation and bridge construction.*

4.5 Water Environment, Hydrology, and Drainage

4.5.1 Summary

The A9 corridor encompasses numerous watercourses and water bodies identified within the surrounding environment. The existing road interfaces with these surface water features through pavement runoff flow, often conveyed to drainage system outfalls, bridges and culverts. Existing drainage facilities include kerbs and gullies, over the edge, filter drains and ditches; the majority of these are not compliant with SEPA requirements for runoff treatment and sustainable drainage systems (SUDS).

Dualling improvements will involve taking account of key issues related to both pollution and flooding risks. Major proposed drainage system modifications and replacements will be required to meet current standards for treatment as well as water management and flood mitigation. In this DMRB Stage 1 Assessment, preliminary water quality standards and vulnerability to runoff pollution have been determined for major watercourses along the route. Existing flood risks and protection measures were also identified using available information.

Current water quality levels are known for several major watercourses, ranging from Bad (Rivers Almond, Garry) to Excellent (Rivers Tay, Tummel). The majority of watercourses along the route are vulnerable to pollution from surface water runoff. For proposed carriageway dualling, SEPA have confirmed they require a minimum of two levels of SUDS treatment. The proposed treatment approach incorporating SUDS will significantly improve the existing water environment.

Existing flood risk locations vary along the route subsections for each watercourse. Very few flood protection measures are currently in place. The River Spey has flood defence embankments south of Kincraig, where flood risk is high. In other areas, the vertical alignment naturally protects the existing road from flooding. Proposed drainage system design and capacity analysis will proceed according to DMRB highway drainage standards in consultation with SEPA and SNH.

There are numerous watercourse crossings along the existing A9 which will likely require bridge widening or culvert extension or replacement. The design philosophy for these locations will involve extending structures to provide for the dual carriageway cross section. New watercourse crossings are also anticipated. Controlled Activity Regulations (CAR) and related CAR licence requirements must be considered when the water environment is disturbed within areas of construction. As assessment progresses throughout future stages, development of a 'Water Environment' guidance document would provide a consistent approach for drainage systems along the various route subsections.

Additional recommendations have been identified within the SEA. The need for a SFRA has been identified to better analyse and manage flooding along the entire route, this assessment is currently being undertaken by Transport Scotland under a separate commission. CAR licence guidance has also been provided in the SEA to ensure the design complies with the regulations. General SEA water environment objectives include maintaining and improving water quality; avoiding or minimising impacts to natural water processes; improving resilience to climate change and extreme weather conditions; minimising water consumptions and abstractions; and designing SUDS with consideration for ecological improvements.

4.5.2 Introduction

The water, hydrology and flood risk features along the route have been identified within various online sections as outlined below. General information on rainfall and infiltration is provided for the whole route. For each subsection, an overview of pollution level status and flood risk is presented for main water bodies identified within Section 4.3 of the report. Pollution levels have been identified from the SEPA River Basin Management Plans where possible. The flood risk associated with each section was identified from the SEPA Flood Risk Mapping, which is displayed on the Key Constraints Plans in **Appendix A**. Further details regarding structures at watercourses are provided in Section 4.9.

Rainfall data along the route was reported from the nearest monitoring stations at Braemar, Ardnaltaig, and Kinloss, based on Met Office records within the time period of 1981 to 2010. Details are listed as follows by station:

- ***Braemar*** *(40 miles north east of Pitlochry)*
  - *Average annual rainfall: 932mm/year*
  - *Driest month: April (54.3mm)*
  - *Wettest month: October (113.6 mm)*
- ***Ardnaltaig*** *(On Loch Tay, 22 miles west of the site)*
  - *Average annual rainfall: 1401.5 mm/year*
  - *Driest month: June (71.5mm)*
  - *Wettest month: January (186.8 mm)*
- ***Kinloss*** *(30 miles north east of Inverness)*
  - *Average annual rainfall: 664.6 mm/year*
  - *Driest month: April (41.4 mm)*
  - *Wettest month: October (71.1 mm)*

The infiltration throughout the route is likely to be controlled by ground cover characteristics. The surface water runs off asphalt into localised road drainage systems. The area surrounding the route is predominately forest, grass and soil ground cover. The majority of surface water is therefore likely to infiltrate into the superficial deposits with some surface runoff to local watercourses.

The existing drainage along the route comprises of various drainage systems ranging from kerbs and gullies to drainage ditches. It is likely the existing systems will not provide the levels of treatment and attenuation expected under current standards; however, proposed upgrades will include a minimum of two levels of treatment under SUDS guidance and early engagement with SEPA. As the existing drainage run-off is not well managed in relation to treatment and attenuation, proposed drainage systems will significantly improve the water environment throughout the route.

4.5.3 Hydrology and Surface Water Features

The hydrology and surface water features for each of the route subsections are summarised in **Table 4.5.1**. This table identifies the major and minor watercourses,

their pollution level status as indicated by the SEPA River Basin Management Plans and if they are vulnerable to surface water pollution.

Photo 4.5.1 River Tay running alongside the A9

Subsection	Cross Section	Major Watercourse *(Local Quality if Known)*	Presence of Minor Watercourse/ Other Water Bodies	Vulnerable to Runoff Pollution *(If Known)*
Perth to Luncarty	Dual	• River Tay *(Moderate)* • River Almond *(Bad)*	• Numerous minor watercourses	✓
Luncarty to Pass of Birnam	Single	• No major watercourse present	• Ordie Burn • Garry Burn	
Pass of Birnam	Dual	• River Tay *(Excellent)*	• Three minor watercourses and a small unnamed Loch	✓
Pass of Birnam to Tay Crossing	Single	• River Tay *(Excellent)*	• Numerous minor watercourses	✓
Tay Crossing to Ballinluig	Single	• River Tay *(Excellent)* • River Tummel *(Excellent)* • River Braan	• Numerous minor watercourses	✓
Ballinluig to Pitlochry	Dual	• River Tummel *(Excellent)*	• Numerous minor watercourses	✓
Pitlochry to Killiecrankie	Single	• River Tummel *(Excellent)* • Loch Faskally	• Numerous minor watercourses	✓
Pass of Killiecrankie	Dual	• River Tummel *(Excellent)*	• Numerous minor watercourses	✓
Killiecrankie to Glen Garry	Single	• River Garry *(Bad)*	• Numerous minor watercourses	✓
Glen Garry	Dual	• River Garry *(Bad)*	• Numerous minor watercourses	✓
Glen Garry to Crubenmore	Single	• River Truim *(Excellent)* • Allt Dubhaig • Loch Ericht	• Aqueduct carrying water from Loch Cuaich to Loch Ericht	✓
Crubenmore	Dual	• River Truim *(Excellent)*	• Numerous minor watercourses	
Crubenmore to Kincraig	Single	• River Truim *(Excellent)* • River Spey • Loch Insh	• River Calder • Numerous minor watercourses	
Kincraig to Dalraddy	Single	• River Spey • Loch Alvie	• Numerous minor watercourses	✓
Dalraddy to Slochd	Single	• River Spey • Allt an Fhearna • Allt na Criche • River Dulnain	• Numerous minor watercourses	✓
Slochd to Tomatin	Dual	• River Findhorn	• Numerous minor watercourses	✓
Tomatin to Moy	Single	• River Findhorn • Funtack Burn • Loch Moy	• Numerous minor watercourses	✓
Moy to Inverness	Dual	• River Nairn • Dalraich Burn • Inshes Burn • Cairnlaw Burn	• Numerous minor watercourses	✓

Table 4.5.1 Summary of Hydrology and Surface Water Features

4.5.4 Flood Risk

The flood risk summary in **Table 4.5.2** identifies the watercourses that pose a flood risk to the A9, including the severity of the risk. This table also identifies any known existing flood defence features and the sections that are vulnerable to flash flooding.

Subsection	Cross Section	Watercourse and Location *(Risk Level)*	Presence of Flood Protection	Vulnerable to Flash Flooding
Perth to Luncarty	Dual	• River Almond near Inveralmond Roundabout *(High)*	• None	✓
Luncarty to Pass of Birnam	Single	• Ordie Burn at A9 Crossing *(Moderate)*	• None	✓
Pass of Birnam	Dual	• River Tay *(No risk)*	• None	✓
Pass of Birnam to Tay Crossing	Single	• River Tay *(No risk)*	• None (Vertical alignment protects from flooding)	✓
Tay Crossing to Ballinluig	Single	• River Tay *(High)* • River Tummel *(High)* • River Braan *(High)*	• None	✓
Ballinluig to Pitlochry	Dual	• River Tummel *(Low)*	• None	✓
Pitlochry to Killiecrankie	Single	• River Tummel *(Moderate)* • Loch Faskally *(Moderate)*	• None	✓
Pass of Killiecrankie	Dual	• River Tummel *(No risk)*	• None	✓
Killiecrankie to Glen Garry	Single	• River Garry *(High)*	• None	✓
Glen Garry	Dual	• River Garry *(No risk)*	• None	✓
Glen Garry to Crubenmore	Single	• River Truim *(Low)*	• None	✓
Crubenmore	Dual	• River Truim *(No risk)*	• None	✓
Crubenmore to Kincraig	Single	• River Truim *(High)* • River Spey *(High)*	• The River Spey has flood defence embankments.	✓
Kincraig to Dalraddy	Single	• River Spey *(No Risk)* • Loch Alvie *(Low risk from tributary running into Loch)*	• None	
Dalraddy to Slochd	Single	• River Spey *(Moderate)* • River Dulnain *(High)*	• None	✓
Slochd to Tomatin	Dual	• River Findhorn *(Moderate)*	• None	✓
Tomatin to Moy	Single	• River Findhorn *(No risk)* • Funtack Burn *(No risk)*; small tributary connecting to burn may represent a risk of flooding. • Loch Moy *(No risk)*	• None	✓
Moy to Inverness	Dual	• River Nairn *(Moderate)* *Flooding from culvert blockages and filter drain issues have caused A9 road closures on this section*	• None	

Table 4.5.2 Summary of Flood Risk

The Strategic Flood Risk Assessment (SFRA) followed by more detailed Flood Risk Assessments at a local level will aim to ensure that there is no net increase in flood risk. It is expected that once the SFRA is completed the following information will be produced:

- *Areas identified as a flood risk;*
- *Flood risk management options; and*
- *Recommendations for drainage and SUDS considerations*

4.5.5 Existing Drainage

A number of existing surface water drainage facilities exist on the route. These include kerbs and gullies, over the edge, filter drains and ditches.

The existing drainage systems that comply with current standards will be retained where possible; however at this stage, it is envisaged that only major drainage structures may be retained/extended or combined with new systems. It is expected that existing road drainage systems consisting of kerbs and gullies will be replaced on single carriageway sections, as they are likely be substandard in relation to levels of treatment or may not work with proposed drainage systems. On the sections of the A9 already dualled, the drainage systems will require a further assessment to determine any improvement works required.

Further review of the existing drainage will be required to identify all drainage systems on the route and assess them against current design standards and legislation.

4.5.6 Overview of Treatment Level

The treatment of surface water runoff by SUDS is a legal requirement for most forms of development and as such should be considered at an early stage of the design. The SUDS requirements are regulated by the CAR set out by SEPA.

Early engagement with SEPA has identified that a minimum of two levels of SUDS for the road is likely to be required.

A number of acceptable, individual levels of SUDS facilities can be used such as a filter drain, detention basin and permeable paving or swales as one level of treatment. The SUDS design will be developed in accordance with the CIRIA Sustainable Drainage Systems Design Manual for Scotland and consultation with SEPA and SNH.

The surface and subsurface drainage design will be developed in accordance with the standards for surface and subsurface drainage set out in the DMRB, Volume 4, Section 2, Part 3 of HD 33/06 and through consultation with SEPA. HD 33/06 provides guidance on the type of surface and subsurface drainage appropriate to highway schemes.

4.5.7 Design Philosophy for Watercourse Crossings

Existing culverts and bridge structures for watercourses will require widening. The preferred option is to increase the length of these structures to cater for the widened dual carriageway cross section. This will provide consistency along the route and should minimise environmental impact, land acquisition and traffic disruption.

As the extension of existing culverts and bridges will require access to the watercourse, consideration of CAR should be given at an early stage. The regulations are in place to protect Scotland's water environment and are a legal requirement.

The CAR licence is granted for specific activities associated with the water environment such as discharging in water and ground water, undertaking engineering activities in or near water bodies and impounding watercourses.

The works likely to be associated with this project will include the extension of existing culverts and new watercourse crossings.

Further engagement with SEPA identified that new structures that are 'open box' in design would be preferable as it would potentially reduce the environmental impact on the watercourse.

4.5.8 Conclusion and Next Steps

The SEA scoping report identified the need for a route-wide SFRA which has been commissioned separately by Transport Scotland.

Further to the SFRA, the SEA identified a number of Environmental Objectives in relation to the water environment as follows:

- *Maintain and improve water quality;*
- *Avoid and minimise effects on natural processes, particularly natural flood management and catchment processes through sensitive design and consultation;*
- *Adapt and improve resilience to the effects of climate change, particularly flood risks associated with extreme weather;*
- *Minimise water consumption/abstractions; and*
- *Design SUDS to facilitate ecological improvement/ enhancement where possible.*

These objectives will need to be considered during the next stages of the DMRB Assessment to ensure they are met where possible.

Consideration should also be given to the extension of existing culverts and bridges in order to minimise impact on the water environment. Existing culverts and bridges should also be assessed to ensure they meet current storm capacity requirements as per the guidelines in the DMRB.

Early consideration to the development of a 'Water Environment' guidance document would be advantageous. This would help ensure consistency in the development and design of surface water drainage systems over the whole route.

Further review of the existing sections of the route to identify existing outfalls will aid in the detailed design stage of the scheme.

During the development of any offline sections, further review to identify possible outfalls for surface water drainage should be considered.

4.6 Alignment

4.6.1 Summary

The existing A9 corridor consists of single and dual carriageway sections, which were designed in accordance with "Layout of Roads in Rural Areas" which was the engineering design standard relevant at the time of construction in the late 1970's and early 1980's. As such, lengths of existing single and dual carriageway sections do not conform to current DMRB standards.

This chapter presents an assessment of the existing alignment of the A9 trunk road between Perth and Inverness; the road alignment is assessed to determine the extent to which the existing road complies with the current geometric design standards outlined within the DMRB for the existing road's Design Speeds (100Akph for single carriageway sections and 120Akph for dual carriageway sections) and recommendations identified for development of the proposed corridor.

The assessment of the road geometry was undertaken based on LiDAR survey information, which provided contour data at 5m intervals. It should be noted that there may be a limited degree of accuracy with respect to this survey information. However, more detailed survey data will be sourced for future assessment work at DMRB Stage 2.

In terms of the existing geometric standards of the A9, approximately 7% of the length of the existing single carriageway sections contains Departures from Standards for a 100Akph Design Speed, whilst approximately 27% of the length of the existing dual carriageway sections contains Departures from Standards for a 120Akph Design Speed. This equates to approximately 12% of the entire route length containing Departures from Standards for the current geometric standards. Therefore, the assessment indicates the geometry within the existing road is broadly compliant with the current geometric standards throughout most of its length.

The assessment has identified one single carriageway section and three dual carriageway sections that are considerably below current standards as outlined below:

- *Pitlochry to Killiecrankie (existing single carriageway); 68% of the length contains Departures from Standard;*
- *Pass of Birnam (existing dual carriageway); 31% of the length contains Departures from Standard;*
- *Ballinluig to Pitlochry (existing dual carriageway); 54% of the length contains Departures from Standard; and*
- *Pass of Killiecrankie (existing dual carriageway); 87% of the length contains Departures from Standard.*

Further details of the assessment are contained in the following section along with considerations for improving / removing the Departures from Standard in development of the corridor.

4.6.2 Engineering Design Standards

Trunk Roads in Scotland are designed to the requirements set out in the DMRB. These guidelines include desirable minimum requirements for each element of road

geometry design whilst outlining the flexibility that a design organisation can apply at its discretion to the desirable minimum requirements (these are described as Relaxations). Varying degrees of Relaxations (identified by the number of steps below the desirable minimum benchmark) are permitted for different design aspects.

If Relaxations in excess of the number of steps permitted are present, or if combinations of Relaxations occur at the same location which are in excess of the number of steps permitted, a Departure from Standards is required. Departures from Standards must be approved by the Overseeing Organisation, which in this case is Transport Scotland. Relaxations and Departures from Standards are assessed in terms of their effects on the safety of the road user, their environmental impact and the economic benefit that would occur with the Departure from Standards included in the design, before deciding whether or not they should be implemented.

The geometric assessment of the existing route was undertaken to establish the extents of the corridor which are not in accordance with current standards for the existing road's Design Speeds (100Akph for single carriageway sections and 120Akph for dual carriageway sections).

A schedule identifying the existing road's Departures from Standard is contained in **Appendix F**.

(a) Horizontal Alignment

The horizontal alignment of a road is how it would appear on a plan or map, for example, an aerial view of the road showing how a road is formed of curves and straight sections. The horizontal alignment of a trunk road is designed to Volume 6, Section 1, Part 1 of the DMRB: TD9/93 Highway Link Design.

It should be noted that one step Relaxations for both horizontal curvature and stopping sight distance (SSD) may be coincident without a Departure from Standards being required; a Relaxation in horizontal curvature that is coincident with a Relaxation in any other element of road geometry design (i.e. except SSD) is not permitted and must be considered as a Departure from Standards.

(b) Vertical Alignment

The vertical alignment of a road is the crests (or hills), sags (or dips) and longitudinal gradient; this is effectively viewing the road as a long section or profile. The vertical alignment of a trunk road is also designed to Volume 6, Section 1, Part 1 of the DMRB: TD9/93 Highway Link Design.

(c) Stopping Sight Distance

SSD is the distance a driver needs to be able to see in order to stop safely; SSD is checked in both the horizontal and vertical planes, discussed above. It must be assessed for both directions of travel on the A9 i.e. in northbound and southbound directions.

(d) Combinations of Relaxations

With regard to horizontal curvature, vertical curvature and SSD, SSD Relaxations of up to one design speed step below desirable minimum may be coincident with horizontal curvature Relaxations of up to one design speed step below desirable

minimum; all other combinations of Relaxations are not permitted and where present are Departures from Standards.

(e) Departures on the Approaches to Junctions

Relaxations below desirable minimum for SSD and vertical crest curves, and absolute minimum for sag curves are not permitted on the immediate approaches to junctions. This assessment includes a review of alignment standards on the approach to junctions.

It should be noted that when determining Departures on the approach to junctions, all grade separated junctions, including compact grade separated junctions were included in the assessment, along with all left in left out accesses where there is both a diverge taper (or auxiliary lane) and a merge taper (or auxiliary lane). No other at-grade junctions or accesses were included e.g. at-grade junctions or accesses without a diverge taper (or auxiliary lane) and/ or a merge taper (or auxiliary lane). Further, the location of proposed junctions was not considered. Potential exists for existing junctions to be rationalised as part of the dualling works and some Departures listed at existing junctions may be removed; on the other hand, with the incorporation of new grade separated junctions there may be some additional Departures that are not identified at present.

4.6.3 Corridor Assessment for Existing Design Speed

Each section of the corridor has been assessed for compliance with the current geometric standards for the section's existing Design Speed i.e. 100Akph for single carriageway sections and 120Akph for dual carriageway sections as outlined in the following.

(a) Perth to Luncarty

This section is currently dual carriageway, with an approximate length of 3.4km. It contains a series of horizontal curves each switching direction from the last interlinked with straights, of at least 150m or longer, provided between every horizontal radius.

There are currently five Departures from Standard for a 120Akph Design Speed within this section, constituting approximately 26% of the section length. Four of the Departures are due to relaxations in SSD on the approaches to junctions, with the remaining Departure due to combinations of Relaxations (including an SSD Relaxation). The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

The sub-standard geometry that represents approximately 26% of the section length is only slightly below the threshold required to eliminate the Departures present.

(b) Luncarty to Pass of Birnam

This section is currently single carriageway, with an approximate length of 9.4km; it is currently being progressed through a DMRB Stage 2 and 3 scheme assessment under a separate commission. It has already been determined that online widening is the most suitable form of upgrading this section of road to D2AP carriageway standard.

There is currently one Departure from Standards within this section for a 100Akph Design Speed. Consequently, it has been determined that less than 1% of the section length contains Departures from Standards.

The assessment therefore indicates that large sections of the road geometry within this existing single carriageway section is compliant with the current standards for a 100Akph Design Speed.

(c) Pass of Birnam

This section is currently dual carriageway, with an approximate length of 1.8km. The alignment of this section is formed of four constituent parts: two left hand horizontal curves leading into a 300m long straight, which connects to a right hand horizontal curve.

There are four Departures from Standards for a 120Akph Design Speed within this section, all of which are due to combination Departures; three of the combination Departures are due to Relaxations in vertical curvature and SSD, whilst the remaining Departure is due to a combination of horizontal curvature and SSD relaxations. These Departures occupy approximately 31% of the section length; however, the majority of the Relaxations creating the Departures are not considerably below the thresholds required to eliminate the Departures.

The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

(d) Pass of Birnam to Tay Crossing

This section is currently single carriageway, with an approximate length of 8.4km; it is presently being progressed through a DMRB Stage 2 scheme assessment under a separate commission.

There are currently three Departures from Standards within this section for a 100Akph Design Speed, due to combinations of relaxations. The three Departures all include relaxations in SSD. Consequently, it has been determined that approximately 6% of the section length contains Departures from Standard.

Therefore, the assessment indicates that large sections of the road geometry within this section is compliant with the current standards required for a 100Akph Design Speed.

(e) Tay Crossing to Ballinluig

This section is currently single carriageway, with an approximate length of 7.6km. The alignment over this section is formed of a series of opposing direction horizontal curves with two instances of same direction horizontal curves, in addition to one straight of 980m length.

There are currently twenty Departures from Standards within this section for a 100Akph Design Speed, of which 17 are combinations of Relaxations. Two of the remaining Departures are for SSD, with one further Departure due to a vertical crest curvature. Consequently, it has been determined that approximately 8% of the section length contains Departures from Standards. The Departures are concentrated in the last 1.7km of the section. Many of the combination Relaxations Departures are as a result of only one or two step relaxations. Approximately, the

final 0.9km length of the section (the final 11% of the section length) contains Departures that are more onerous than the foregoing Departures (i.e. mainly three step relaxations).

The assessment therefore indicates that large sections of the road geometry within this existing single carriageway section is compliant with the current standards for a 100Akph Design Speed.

(f) Ballinluig to Pitlochry

This section is currently dual carriageway, with an approximate length of 5.8km. The existing A9 alignment over this section begins with two right hand horizontal curves switching directly to a left hand horizontal curve, from which point the route moves progressively further west through a series of left hand curves interlinked with straights.

There are 48 Departures from Standard within this section for a 120Akph Design Speed, constituting approximately 54% of the section length: all the Departures are due to either combinations of Relaxations (17) or Relaxations on the approaches to junctions (30), except for one Departure which is due to SSD.

The assessment therefore indicates the road geometry within this existing dual carriageway section is considerably below the current standards for a 120Akph Design Speed.

(g) Pitlochry to Killiecrankie

This section is currently single carriageway. The existing A9 alignment over this 6.2km length predominantly comprises sections of opposing direction horizontal curves interlinked with straight sections as well as individual horizontal curves connected by straights at either end.

It has been determined that approximately 68% of the section length contains Departures from Standards for a 100Akph Design Speed. The Departures appear to be evenly spread throughout the extents of the section.

In total there are 25 departures from standard within this section, of which twelve are due to Relaxations in either one or all of the following: horizontal curvature, vertical curvature and SSD on junction approaches. The thirteen remaining Departures are due to combinations of Relaxations.

The assessment therefore indicates the road geometry within this section is considerably below the current standards required for a 100Akph Design Speed.

(h) Pass of Killiecrankie

This section is currently dual carriageway. The existing A9 alignment over this 1.7km length predominantly comprises sections of opposing direction horizontal curves interlinked with straight sections as well as individual horizontal curves connected by straights at either end.

In total there are four Departures from Standards within this section for a 120Akph Design Speed, all of which are combinations of Relaxations. It should be noted that all four Departures contain Relaxations in SSD. The Departures constitute approximately 87% of the section length.

The assessment therefore indicates the road geometry within this existing dual carriageway section is considerably below the current standards required for a 120Akph Design Speed.

(i) Killiecrankie to Glen Garry

This section is currently single carriageway. The existing A9 alignment over this 21.8km length predominantly comprises sections of opposing direction horizontal curves interlinked with straight sections as well as individual horizontal curves connected by straights at either end.

It has been determined that approximately 6% of the section length contains Departures from Standard for a 100Akph Design Speed. The Departures appear to be evenly spread throughout the extents of the section.

In total there are 27 Departures from Standards within this section, of which 21 are due to combinations of Relaxations. A further three Departures are due to Relaxations in either one or all of the following: horizontal curvature, vertical curvature and SSD on junction approaches. The remaining Departures relate to two vertical curvature Departures and one SSD Departure.

The assessment therefore indicates that large sections of the road geometry within this section are compliant with the current standards required for a 100Akph Design Speed.

(j) Glen Garry

This section is currently dual carriageway and consists of split level carriageways for northbound and southbound traffic. The section has an approximate length of 9km. The alignments of northbound and southbound split level carriageways differ slightly, as a result of the varying topography they experience, though they generally both follow a relatively straight path through the glen. In spite of this, the horizontal alignment is formed largely of opposing direction horizontal curves, several of which utilise radii larger than the desirable minimum, with only a few failing to satisfy this standard.

Twelve existing Departures have been identified on the northbound carriageway for a 120Akph Design Speed. The northbound carriageway Departures constitute approximately 18% of the section length. These Departures are evenly spread over the entire section. All except two of the Departures within this section are due to combinations of Relaxations; one is due to sub-standard vertical curvature, whilst the remaining Departure is due to sub-standard SSD. The numerous instances of vertical alignment and SSD Relaxations in this area emphasises the difficult topography upon which this section of carriageway has been constructed.

The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

(k) Glen Garry to Crubenmore

This section is currently single carriageway, with an approximate length of 20.5km. For approximately 15km of the 20.5km length of this section the existing A9 runs approximately parallel to the railway line. As the road and railway pass Dalwhinnie,

the road passes to the east of Dalwhinnie whilst the railway passes to the west of Dalwhinnie.

It has been determined that the section contains no Departures from Standard for a 100Akph Design Speed.

Therefore, the assessment indicates that the road geometry within this section is compliant with the current standards required for a 100Akph Design Speed.

(l) Crubenmore

This section is currently dual carriageway, with an approximate length of 3.7km. The alignment travels in a north-east direction with sections of the horizontal alignment formed by opposing direction curves.

There are a total of five Departures from Standards within this section for a 120Akph Design Speed, all of which are combinations of Relaxations. All five Departures contain Relaxations in SSD, whilst four of the five Departures contain Relaxations in vertical curvature. Approximately 19% of the length of this section contains Departures. It should be noted that four of the five combination Relaxation Departures comprise two-step relaxations. Even if these two-step Relaxations were reduced to one-step Relaxations they would still be Departures from Standard.

The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

(m) Crubenmore to Kincraig

This section is currently single carriageway. Throughout this 15.9km long section the road rotates further east progressing slowly north. The horizontal alignment adopts only a few straight elements with the majority of the alignment formed of opposing direction horizontal curves.

It has been determined that approximately 7% of the section length contains Departures from Standards. The Departures appear to be evenly spread throughout the length of the section. However, shortly after the start of the section, there is a length in excess of 4km where there are no Departures; approximately the final 3.1km length of the section also does not contain any Departures.

In total there are eighteen Departures from Standards within this section, of which eleven are combinations of Relaxations. The remaining Departures comprise two Departures due to Relaxations on the approach to a junction, three Departures relating to vertical curvature and two Departures relating to SSD.

Therefore, the assessment indicates that large sections of the road geometry within this section are compliant with the current standards required for a 100Akph Design Speed.

(n) Kincraig to Dalraddy

This section is currently single carriageway, with an approximate length of 7.5km and is currently being progressed through a DMRB Stage 3 scheme assessment under a separate commission. It has already been determined that online widening is the most suitable form of upgrading this section of road to D2AP carriageway standard.

It has been determined that less than 1% of the section length contains Departures from Standards. The Departures commence approximately 1km north of Kincraig.

There are two Departures from Standards within this section, both of which are due to combinations of Relaxations in vertical curvature and SSD.

Therefore, the assessment indicates that large sections of the road geometry within this section are compliant with the current standards required for a 100Akph Design Speed.

(o) Dalraddy to Slochd

This section is currently single carriageway, with an approximate length of 24.7km. The alignment direction changes significantly over this section, initially travelling east until reaching Aviemore where it then travels north until turning west after passing Carrbridge.

It has been determined that approximately 3% of the section length contains Departures from Standards. The Departures are evenly spread throughout the length of the section.

All eight Departures present within the section are due to combinations of Relaxations.

Therefore, the assessment indicates that large sections of the road geometry within this section are compliant with the current standards required for a 100Akph Design Speed.

(p) Slochd to Tomatin

This section is currently dual carriageway, with an approximate length of 5km. The alignment generally weaves throughout this section, as it passes Tomatin, initially travelling north-west then north before turning north-west again.

Approximately 15% of the length of this section contains Departures from Standards for a 120Akph Design Speed. There are five existing Departures, all combinations of Relaxations. All five Departures include Relaxations in SSD, whilst four of the five Departures contain Relaxations in horizontal geometry. It should be noted that the SSD values are considerably below the current standard required for a 120Akph Design Speed i.e. four of the five SSD Relaxations are three-step Relaxations, with the fifth SSD Relaxation being a two-step Relaxation.

The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

(q) Tomatin to Moy

This section is currently single carriageway, with an approximate length of 9.3km. The alignment initially travels in a north-west direction for a short length (approximately 1km), before turning north for approximately a further 1km, and finally turning in a north-west direction for the remaining length of the section where the A9 travels past Loch Moy.

It has been determined that the section contains no Departures from Standards for a 100Akph Design Speed.

Therefore, the assessment indicates that the road geometry within this section appears to be compliant with the current standards required for a 100Akph Design Speed.

(r) Moy to Inverness

This section is an existing 11.5km long dual carriageway section. The first 7.6km length of the section comprises a series of horizontal right and left hand curves (with no straight sections). The A9 then passes Daviot where the horizontal curvature is to a slightly lesser standard. As the road approaches Inverness, the horizontal geometry improves with a series of curves and straights.

There are fourteen existing Departures from Standards within this section for a 120Akph Design Speed, constituting approximately 18% of the section length: thirteen of the fourteen Departures are as a result of combinations of Relaxations, with the remaining Departure due to Relaxations on the approach to a junction. It should be noted that all fourteen Departures include Relaxations in SSD.

The assessment indicates that a significant proportion of the section is not compliant with current standards for a 120Akph Design Speed.

4.6.4 Proposed Geometric Standards

The route is to be a Category 7A All-Purpose Dual Carriageway, with a 120Akph Design Speed, in accordance with the DMRB. In particular, the following sections of the DMRB (or subsequent revisions) will be referenced for a 120Akph Design Speed:

- *TD 9/93 – Highway Link Design*
- *TD 27/05 – Cross Sections and Headrooms*
- *TD 22/06 – Layout of Grade Separated Junctions*
- *TD 41/95 – Vehicular Access to All-Purpose Trunk Roads*
- *TD 42/95 – Geometric Design of Major/ Minor Priority Junctions*

The following outline the proposed horizontal, vertical, SSD and longitudinal gradient standards for a 120Akph Design Speed:

- *Desirable minimum horizontal curvature for a 120Akph Design Speed is a radius of 1,020m;*
- *Desirable minimum radius for a vertical crest curve is 18,200m;*
- *Absolute minimum radius for a sag curve is a 3,700m radius curve;*
- *Desirable minimum SSD is 295m;*
- *Desirable maximum longitudinal gradient for an all-purpose dual carriageway road is 4%; and*
- *Although the DMRB does not state a minimum longitudinal gradient below which is considered a Departure, it does state that a minimum gradient of 0.5% should be maintained wherever possible to aid in effective drainage.*

As discussed in Section 4.6.3, there are Departures from Standards present in sixteen of the eighteen sections when assessed against their existing Design Speed. In many cases, these Departures will be exacerbated by increasing the Design Speed to 120Akph without a corresponding improvement in the alignment standards. Of particular concern is the Pitlochry to Killiecrankie existing single carriageway section, where currently 68% of the section length constitutes Departures from Standards for a 100Akph Design Speed.

To attempt to remove (or reduce the severity) of the Departures from Standards when dualling the A9, the following measures should be considered at DMRB Stage 2 when assessing the upgrade of these sections to the standards for a 120Akph Design Speed:

- *improving the horizontal alignment, where possible, when widening;*
- *improving junction standards and reviewing junction locations to avoid coincidental Departure locations;*
- *incorporating wide central reserves and/ or verges to improve SSD; and*
- *the adoption of alternative corridors.*

4.7 Cross Section

4.7.1 Summary

In general, the majority of existing single and dual carriageway sections meet the respective standard requirements, with the exception of structures with several of them having a narrower cross section than the current standards. The proposed cross section will provide dual two-lane all-purpose (D2AP) standards for a rural road. DMRB standard dimensions are provided for berm, slope, verge, hard strip, lane, and central reserve widths. Further assessment will determine areas which require widths greater than the specified minimum. These wider carriageway dimensions may be needed to accommodate the required visibility or localised lane widening around horizontal curves, as well as above or below ground roadside and drainage features. A split carriageway is an option to be considered in areas of challenging topography and elevation differences. Overall, the existing topographical features and road alignment are the key constraints to achieving a standard D2AP cross section along the route.

4.7.2 Introduction

Road cross sections are designed in accordance with Volume 6, Section 1, Part 2 of the DMRB: TD27/05 Cross Sections and Headrooms. The standard includes the minimum cross sectional dimensions for each category of road, taking into account the route location. For example, the minimum cross section dimensions for a particular type of road can vary between urban settings and rural settings.

4.7.3 Existing Cross Section

Existing single carriageway sections account for approximately 75% of the length of the A9 corridor between Perth and Inverness. There are short sections of the route where a lane has been added to single carriageway sections in one direction of travel to provide overtaking opportunities. The remaining length between Perth and Inverness consists of dual carriageway cross section. These sections should comply with the minimum cross sectional dimensions for a rural dual 2-lane all-purpose (D2AP), as illustrated in **Figure 4.7.1**. The majority of the existing dual carriageway

sections are compliant with the exception of the hard strips, which are generally approximately 0.7m, rather than the 1m required as per DMRB. The dual carriageway section at Glen Garry has a split carriageway.

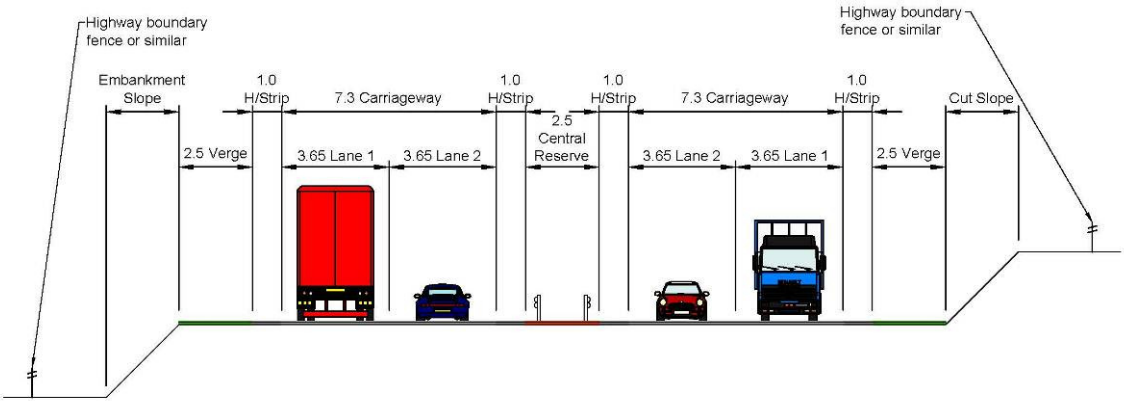


Figure 4.7.1 Minimum Cross Section Dimensions for a Dual Carriageway

4.7.4 Proposed Cross Section

The full length of the A9 from Perth to Inverness will be upgraded, where possible, to a rural D2AP cross section as shown in **Figure 4.7.1**. It should be emphasised that there are elements of this cross section that display fixed dimensions and others that display minimum dimensions. The following bullet points summarise where the cross-sectional dimensions of a rural D2AP are fixed and where they may need to be increased beyond the minimum requirements:

- ***Berm / Slope width*** *– This value will vary significantly along the length of the route depending on whether the proposed road is being built above, below or at the same level as the existing ground. Given the steep terrain and landslip history along many parts of the route, route selection and detailed geotechnical design will dictate this width.*
- ***Verge width*** *– There may be a need to widen the verge beyond 2.5m, for example, to allow for driver visibility (refer to Section 4.6), drainage (particularly if swales are proposed), road furniture (traffic signs, road restraint systems, etc.), public utilities and environmental mitigation measures (noise bunds / fences).*
- ***Hard strip width*** *– 1m standard width. The hard strip provides a number of functions including providing an area for surface water run-off to collect outwith the carriageway boundaries, pavement integrity, an overrun area to mitigate the risks of driver error and a separation from vegetation.*
- ***Lane width –*** *3.65m is a standard value although small increases are sometimes required on horizontal curves to accommodate the swept path of long vehicles.*
- ***Central Reserve width –*** *Similar to the verge, the central reserve may need to be widened beyond 2.5m to accommodate driver visibility, drainage, street furniture or to suit the existing topographical, geotechnical and other*

constraints. The need to widen the central reserve can be particularly significant on horizontal curves where the position of the road restraint systems impact driver visibility.

It should also be noted that split carriageways may be considered in particular areas of the route where the topography and ground conditions are particularly challenging.

4.8 Pavement

4.8.1 Summary

Existing pavement data has been obtained from the SERIS to aid in the DMRB Stage 1 Assessment. The pavement along the existing A9 consists of a varied range of material composition and estimated remaining useful life, known as residual life. Materials in use include the original flexible composite and the fully flexible pavement in areas of maintenance improvement. Preliminary SERIS predictions show that approximately 50% of the existing pavement has less than 20 years of residual life, of which approximately 25% of the route has less than 10 years residual pavement life.

Areas of particular concern have been identified within the analysis. Locations with notably poor pavement conditions are included within the following subsections: Perth to Luncarty (dual); Luncarty to Pass of Birnam (single, Early Implementation Scheme); Tay Crossing to Ballinluig (single); Kincraig to Dalraddy (single, Early Implementation Scheme); Dalraddy to Slochd (single); Slochd to Tomatin (dual); and Moy to Inverness (dual). Potential treatment options for existing sections which are upgraded as online improvements could include a 100mm inlay; full bituminous replacement; crack and seat treatment; and full reconstruction.

A thorough investigation in future assessment stages is required to verify preliminary SERIS results. To address the key issue of poor existing pavement condition, detailed analysis is needed to confirm critical sections with low residual life, followed by a targeted improvement strategy. Further assessment will also determine route-wide pavement condition and the optimum treatment approach required.

4.8.2 Introduction

The existing pavement condition of the route has been assessed using the information on Transport Scotland's SERIS database. SERIS is used to log and predict the current condition of the trunk road network in Scotland and contains information on pavement conditions such as surface profile, skidding resistance, and deflectograph results. This information allows the system to predict the residual life of each part of the network and any maintenance interventions that may be required. It is also used to log any maintenance that has already been undertaken on the trunk road network.

The use of deflectograph data should not be used in isolation when considering the structural integrity of a pavement. Information from visual inspections, core data and any other available data should also be considered. The estimation of the residual life from deflectograph data is limited by the accuracy of the input data in SERIS and may result in incorrect prediction of residual life.

There is sometimes no clear correlation between deflectograph data and other types of pavement condition indicators such as visual surveys or cores. This can result

from a number of factors such as errors in measurement of road temperature, the presence of particularly strong pavement subgrade, or superficial surface course deterioration which does not result in higher than expected deflections.

4.8.3 Existing Pavement Overview

Analysis of the SERIS data indicated that the pavement throughout the route consists of fully flexible and flexible composite sections. A fully flexible pavement generally consists of a granular base with asphalt upper layers. Flexible composite pavements consist of a cement bound base (CBM) and asphalt upper layers.

The existing A9 was constructed as a flexible composite pavement in the 1970 – 1980s. However, sections have had maintenance interventions over the years and fully flexible sections have since been implemented as the preferred method of construction. Due to the climatic conditions normally experienced in Scotland, flexible composite construction is generally no longer considered as the CBM layer can be prone to cracking.

The flexible composite construction on the route comprises of approximately 135mm bituminous and 175mm cementitious material. The fully flexible areas generally consist of bituminous thickness of 255mm and 150mm of granular material. It should be noted that these values are approximate and represent the average and do vary from section to section.

The deflectograph data from SERIS is used to assess the structural condition of the pavement. A loaded wheel is passed over the pavement and the pavement deflects under the load and the size of the deflection is measured. The deflection along with the layer type and layer thickness is then used to calculate the residual life remaining in the pavement. Upon review of the deflectograph results provided by SERIS, the residual pavement life throughout the scheme for both northbound and southbound carriageways is summarised in **Table 4.8.1**. These results indicate that half of the scheme has a residual life of less than 20 years.

Residual Life (Years)	Percentage of Existing Carriageway Length (%)	Existing Carriageway Length (km) (includes NB and SB lengths)
<5	14	51.6
5 to 9	10	32.4
10 to 14	11	39.0
15 to 19	15	52.7
>19	50	172.4

Table 4.8.1 Estimated Residual Life throughout the Scheme

The following sections summarise the preliminary residual life for each online subsection.

Subsection	Cross Section	Carriageway	Pavement Construction (Local Quality if Known)	SERIS Residual Life (Years)	Comment
Perth to Luncarty	Dual	NB	Flexible Composite	< 5	Further analysis to confirm SERIS data and progress suitable maintenance intervention
		SB	Fully Flexible (mainly) Flexible Composite (partially)	< 10	
Luncarty to Pass of Birnam	Single	NB	Flexible Composite & Fully Flexible	5 - 10	Pavement investigation analysis in form of Falling Weight Deflectometer (FWD) test, Ground Penetrating Radar (GPR) and coring has been undertaken.
		SB		10 - 15	
Pass of Birnam	Dual	NB	Flexible Composite	> 20	-
		SB			
Pass of Birnam to Tay Crossing	Single	NB	Flexible Composite (mainly), Fully Flexible (partially)	> 20	-
		SB			
Tay Crossing to Ballinluig	Single	NB	Flexible Composite (mainly), Fully Flexible (partially)	5 - 15	Condition varies with some sections of less than 5 years and some of more than 20. Further analysis would be recommended of the poorer sections.
		SB		10 - 20	-
Ballinluig to Pitlochry	Dual	NB	Flexible Composite (mainly), Fully Flexible (partially)	< 10	-
		SB	Fully Flexible (mainly), Flexible Composite (partially)	15 - 20	-
Pitlochry to Killiecrankie	Single	NB	Flexible Composite (mainly), Fully Flexible (partially)	> 20	-
		SB			-
Pass of Killiecrankie	Dual	NB	Flexible Composite	15 - 20	-
		SB	Flexible Composite & Fully Flexible		-
Killiecrankie to Glen Garry	Single	NB	Flexible Composite & Fully Flexible	15 - 20	-
		SB			-
Glen Garry	Dual	NB	Flexible Composite	10 - 20	-
		SB	Flexible Composite (mainly), Fully Flexible (partially)		-
Glen Garry to Crubenmore	Single	NB	Fully Flexible (mainly), Flexible Composite (partially)	10 - 20	-
		SB			-
Crubenmore	Dual	NB	Fully Flexible (mainly), Flexible Composite (partially)	> 20	-
		SB			-
Crubenmore to Kincraig	Single	NB	Flexible Composite & Fully Flexblie	10 - 20	It should be noted that a section of residual life data at the start of this section is missing and therefore not included in the assessment of residual life.
		SB			
Kincraig to Dalraddy	Single	NB	Flexible Composite (mainly), Fully Flexible (partially)	5 - 10	-
		SB			
Dalraddy to Slochd	Single	NB	Flexible Composite (mainly), Fully Flexible (partially)	10 - 20	Dalraddy to Carrbridge residual life
		SB		5 - 10	Carrbridge to Slochd residual life

Subsection	Cross Section	Carriageway	Pavement Construction (Local Quality if Known)	SERIS Residual Life (Years)	Comment
Slochd to Tomatin	Dual	NB	Flexible Composite	5 - 20	-
		SB	Flexible Composite & Fully Flexible (small section southern end)		-
Tomatin to Moy	Single	NB	Fully Flexible (mainly), Flexible Composite (partially)	15 - 20	Short section to northern end considered to have a residual life of 5 years or less.
		SB			-
Moy to Inverness	Dual	NB	Fully Flexible (mainly), Flexible Composite (partially)	5 - 20	-
		SB			-

Table 4.8.2 Existing Pavement Condition

Photo 4.8.1 Existing Pavement condition at Moy

4.8.4 Areas of Concern

A number of areas above have poor residual life and it would be advisable to undertake further intrusive analysis to confirm the condition of these sections. It is noted that a programme of pavement reconstruction along the A9 is being undertaken as a result of excessive wear of certain sections. The following sections of the route are likely to be subject to improvement works, with additional areas potentially identified in the near future;

- *Luncarty North*
- *Kincraig to Dalraddy*
- *Ballinluig – Pitlochry*
- *Pitlochry North*
- *Lynwilg Junction*
- *Moy wind farm*

Photo 4.8.2 Existing Pavement condition at Carrbridge

4.8.5 Treatment Options

The existing pavement along the length of the scheme will require to be upgraded where the proposed route alignment overlaps the existing. A combination of various treatment options will be considered for such sections and new pavement construction will be required elsewhere.

Pavement upgrade and new design will be carried out in compliance with the following design standards:

- *HD 26/06 (DMRB 7.2.3) – "Pavement Design"*
- *HD 24/06 (DMRB 7.2.1) – "Traffic Assessment"*
- *HD 29/08 (DMRB 7.3.1) – "Data for Pavement Assessment"*
- *HD 30/08 (DMRB 7.3.3) – "Maintenance Assessment"*
- *TS2010 Surface Course Specification and Guidance*

Given that the SERIS deflectograph results indicate that half of the existing A9 corridor has a residual life of less than 20 years it is inevitable that the majority of the route which can be reused will need some form of treatment. The following

maintenance options have been identified as possible solutions for pavement interventions.

- ***100mm Inlay*** *– Involves removal of the surface and binder layers of the pavement and reinstatement of these layers with new material.*
- ***Full Bituminous Replacement*** *– This type of treatment is applicable to the flexible composite sections. It removes the bituminous layers above the cement bound base and reinstates them with new bituminous material.*
- ***Crack and Seat*** *– This type of treatment is applicable to the flexible composite sections. It involves the removal of the bituminous material to expose the underlying cement bound material. The cement bound material is cracked and seated in place before reinstating the bituminous layers with new material.*
- ***Full Reconstruction*** *– Full removal of all pavement layers with an appropriate new pavement constructed in its place.*

Further detailed analysis of the route will be required in order to determine which type of treatment from the above list is suitable at a particular location. Furthermore, the options will apply to any future assessment of do-minimum options. For baseline assessment purposes, improving the residual life of the pavement could be considered along with other safety based interventions that avoid the need to upgrade the full route to dual carriageway.

4.8.6 Conclusion

The information from SERIS indicates that half of the existing A9 corridor has a residual pavement life of less than 20 years and around 25% of the route has less than 10 years life remaining. Further intrusive investigation of these areas should be considered to verify the information from SERIS and confirm the remaining life of these sections to allow for a robust design solution. Locations where pavement condition is particularly poor should be considered in the procurement strategy such that the particular section affected is upgraded at the earliest possible opportunity. Low cost interventions may also be considered if absolutely necessary in advance of letting a construction contract for the full road upgrade of that section.

4.9 Structures

4.9.1 Introduction

The information on existing structures along the route has been taken from the SERIS database. This section of the report summarises existing features of the major structures within the 18 online subsection designations. Detailed information including description, condition and a comparison to standards is listed for both major and minor structures in **Appendix H,** Structure Location Plans are also included. The general approaches of this review process for both dual and single carriageway sections are explained as follows:

- ***Dual carriageway:*** *The available records have been reviewed to consider whether the existing structure provision is in accordance with current standards; summary of the conclusions drawn for each structure is presented; and*
- ***Single carriageway:*** *Consideration has been given to the structure and its immediate location, with the objective of identifying any factors that may be significant in terms of dualling the A9; available records have also been reviewed to consider whether the existing structure provision is in accordance with current standards.*

4.9.2 Perth to Luncarty

In this section there are 2 bridges, 2 culverts and 2 sign gantries. The road is dual carriageway throughout the section limits. The major structures are summarised in Table 4.9.1 below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
River Almond Underbridge (A9 340)	3	*16*	*25*	*16*	-	-	57	25	Reinforced concrete beam and slab	Cross section width below standard.
Luncarty Overbridge (A9 350)	2	*23*	*22*	-	-	-	45	12	Reinforced concrete slab deck	Acceptable cross section; pier to be assessed if cross section is adjusted

Table 4.9.1 Perth to Luncarty Major Structures

4.9.3 Luncarty to Pass of Birnam

In this section there are 3 bridges and 3 culverts. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.2** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Shochie Underbridge (A9 360)	2	*4.5m*	*4.5m*	-	-	-	9m	46m	Twin cell in-situ reinforced concrete box culvert	Cross section width below standard
Ordie Underbridge (A9 370)	2	*4.5m*	*4.5m*	-	-	-	9m	30m	Twin cell in-situ reinforced concrete box culvert	Cross section width below standard
Hunters Lodge Underbridge (A9 380)	1	*13.5m*	-	-	-	-	13.5m	13.3m	Reinforced concrete slab deck	Cross section width below standard

Table 4.9.2 Luncarty to Pass of Birnam Major Structures

4.9.4 Pass of Birnam

In this section there is 1 bridge and 3 culverts. The road is dual carriageway throughout. The major structures are summarised in **Table 4.9.3** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Kingswood Road Rail Underbridge (A9 390)	2	*12.4m*	*10.4m*	-	-	-	22.8m	24.1m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section width below standard

Table 4.9.3 Pass of Birnam Major Structures

4.9.5 Pass of Birnam to Tay Crossing

In this section there are 6 bridges, 2 culverts and 3 retaining walls. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.4** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Birnam Glen Underbridge (A9 400)	2	*15m*	*15m*	-	-	-	30m	13.35m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section width below standard
River Braan Underbridge (A9 410)	1	*29m*	-	-	-	-	29m	13.6m	Weathering steel Universal Beams composite with a reinforced concrete slab deck	No cross section details available
Inver Mill Lade Underbridge (A9 420)	1	*3.5m*	-	-	-	-	3.5m	40.5m	Reinforced concrete box	No cross section details available
Inver Rail Underbridge (A9 430)	1	*8m*	-	-	-	-	8m	42.1m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section details available
Inch Rail Underbridge (A9 440)	1	*10.3m*	-	-	-	-	10.3m	87m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section details available
River Tay Underbridge (A9 450)	3	*69.5m*	*87m*	*69.5m*	-	-	226m	13.37m	Continuous steel plate girders composite with a reinforced concrete deck slab	Cross section width below standard; load carrying capacity verified

Table 4.9.4 Pass of Birnam to Tay Crossing Major Structures

4.9.6 Tay Crossing to Ballinluig

In this section there are 1 bridge, 22 culverts and 2 retaining walls. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.5** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Kindallachan Underbridge (A9 460)	1	*9m*	-	-	-	-	9m	13.2m	Reinforced concrete slab deck	Cross section width below standard

Table 4.9.5 Tay Crossing to Ballinluig Major Structures

4.9.7 Ballinluig to Pitlochry

In this section there are 6 bridges, 9 culverts and 3 retaining walls. The road is dual carriageway throughout. The major structures are summarised in **Table 4.9.6** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Ballinluig Box Culvert (A9S 467)*	1	*3.9m*	-	-	-	-	3.9m	47.8m	Reinforced concrete box	No cross section details or inspection reports available
Ballinluig Junction Rail Underbridge 1 (A9S 468)	1	*35.2m*	-	-	-	-	35.2m	15.9m	Steel girders composite with a reinforced concrete slab deck	No cross section details or inspection reports available
Ballinluig Junction Rail Underbridge 2 (A9S 469)	1	*19.5m*	-	-	-	-	19.5m	17.5m	Steel girders composite with a reinforced concrete slab deck	No cross section details or inspection reports available
Dalnabo Overbridge (A9 470)	5	*18m*	*24.5m*	*24.5m*	*19m*	*15m*	101m	11.6m	Reinforced concrete voided slab	Cross section width below standard; load carrying capacity verified
Loch Broom Burn Underbridge (A9 500)	1	*4.5m / 6.78m*	-	-	-	-	4.5m / 6.78m	39.86m	Reinforced concrete box culvert abutting a masonry arch structure	No cross section details available
Dalshian Rail Underbridge (A9 520)	1	*12.6m*	-	-	-	-	12.6m	135m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section details available

** The SERIS database has classified Ballinluig Box Culvert as a bridge structure, this classification has also been used within this assessment.*

Table 4.9.6 Ballinluig to Pitlochry Major Structures

4.9.8 Pitlochry to Killiecrankie

In this section there are 5 bridges, 7 culverts and 1 retaining wall. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.7** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Tummel Underbridge (A9 530)	3	-	-	-	-	-	157m	13m	Steel girders composite with a reinforced concrete slab deck	Cross section width below standard

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Foss Road Underbridge (A9 540)	1	*11.75m*	-	-	-	-	11.75m	13.3m	Reinforced concrete slab deck	Cross section width below standard
Clunie Underbridge (A9 550)	3	-	-	-	-	-	147.5m	13.2m	Twin steel box girders composite with a reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified
Craighulan Underbridge (A9 560)	1	*22.5m*	-	-	-	-	22.5m	27.4m	Precast, pre-tensioned concrete beams with composite in-situ concrete infill	Cross section review not available
Tigh na Beithe Rail Underbridge (A9 570)	1	*9.6m*					9.6m	150m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section review not available

Table 4.9.7 Pitlochry to Killiecrankie Major Structures

Photo 4.9.1 Existing Structure over the River Tummell

4.9.9 Pass of Killiecrankie

In this section there are 3 bridges, 3 culverts and 4 retaining walls. The road is dual carriageway throughout. The major structures are summarised in **Table 4.9.8** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Tynatied (Burn B) (A9 580)	1	*3.2m*	-	-	-	-	3.2m	62.2m	Reinforced concrete box	Cross section width below standard
Killiecrankie Viaduct Northbound (A9 590)	41	*41 @ 15m*	-	-	-	-	615m	12.5m	Precast, pre-tensioned concrete beams with composite in-situ concrete infill	Cross section width below standard
Killiecrankie Viaduct Southbound (A9 600)	19	*19 @ 15m*	-	-	-	-	285m	12.5m	Precast, pre-tensioned concrete beams with composite in-situ concrete infill	Cross section width below standard

Table 4.9.8 Pass of Killiecrankie Major Structures

4.9.10 Killiecrankie to Glen Garry

In this section there are 13 bridges, 2 Underpasses, 35 culverts, 1 retaining wall and 1 sign gantry. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.9** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Eachainn Underbridge (Burn C) (A9 610)	1	*3.2m*	-	-	-	-	3.2m	87m	Reinforced concrete box	No cross section details available
Old Faskally Underpass (A9 620)	1	*4.5m*	-	-	-	-	4.5m	23.2m	Reinforced concrete box	No cross section details available
Allt Girnaig Underbridge (A9 640)	3	*24m*	*35m*	*24m*	-	-	83m	13.2m	Weathering steel beams composite with a reinforced concrete deck slab	No cross section details available; load carrying capacity verified
Glen Girnaig Underpass (A9 650)	1	*6.5m*	-	-	-	-	6.5m	20.1m	Reinforced concrete box	No cross section details available
Allt Chluain Underbridge (A9 660)	1	*26.5m*	-	-	-	-	26.5m	13.2m	Precast, pre-tensioned concrete beams composite with a reinforced concrete deck slab	Cross section width below standard

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Essangal Underbridge (A9 670)	4	*40.46m*	*42m*	*42m*	*42m*	-	166.46m	13.2m	Continuous weathering steel beams composite with a reinforced concrete deck slab	No cross section details available; load carrying capacity verified
Allt Bhaic Underbridge (A9 680)	1	*11.5m*	-	-	-	-	11.5m	13.2m	Reinforced concrete slab deck	No cross section details available
Pitaldonich Underbridge (A9 690)	3	*25.5m*	*28.6m*	*25.5m*	-	-	79.6m	13.2m	Precast, pre-tensioned concrete beams composite with a reinforced concrete deck slab	No cross section details available; load carrying capacity verified
Pitagowan Road Underbridge (A9 700)	1	*17.5m*	-	-	-	-	17.5m	13.2m	Precast, pre-tensioned concrete beams composite with a reinforced concrete deck slab	No cross section details available
Pitagowan Rail Underbridge (A9 710)	1	*17.9m*	-	-	-	-	17.9m	104.4m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section review not available
Allt A'Crombaidh Underbridge (A9 720)	1	*9.94m*	-	-	-	-	9.94m	14.5m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section details available
Clunes Burn Underbridge (A9 730)	1	*6m*	-	-	-	-	6m	41m	Reinforced concrete portal frame	Cross section review not available
Allt Cram Bhruthaih Underbridge (A9 740)	1	*8.3m*	-	-	-	-	8.3m	13.5m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section details available
Dalnamein Underbridge (A9 750)	3	*13.85m*	*19.45m*	*13.85m*	-	-	47.15m	13.7m	Reinforced concrete slab deck	No cross section details available
Allt Geilleidh Underbridge (A9 760)	1	*9.96m*	-	-	-	-	9.96m	23m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section review not available

Table 4.9.9 Killiecrankie to Glen Garry Major Structures

Photo 4.9.2 Existing Essangal Crossing

4.9.11 Glen Garry

In this section there are 6 bridges, 57 culverts and 11 retaining walls. In addition, there are 10 footbridges, which include all footbridges within the online corridor, and are not restricted to structures crossing the A9. The road is dual carriageway throughout. The major structures are summarised in **Table 4.9.10** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Edendon Water Underbridge (A9 790)	1	*12m*	-	-	-	-	12m	72m	Reinforced concrete arch	No cross section review or inspection reports available
Allt an Stalcair Northbound Underbridge (A9 800)	1	*8.3m*	-	-	-	-	8.3m	34.7m	Reinforced concrete arch	No cross section review or inspection reports available
Allt an Stalcair Southbound Underbridge (A9 810)	1	*7.94m*	-	-	-	-	7.94m	58.5m	Reinforced concrete arch	No cross section review or inspection reports available

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Allt an Bhathaich Northbound Underbridge (A9 820)	1	*8.1m*	-	-	-	-	8.1m	13.6m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	No cross section review or inspection reports available
Allt an Bhathaich Southbound Underbridge (A9 830)	1	*6.3m*	-	-	-	-	6.3m	29m	Reinforced concrete arch	No cross section review or inspection reports available
Allt Choarach Mor Underbridge (A9 840)	1	*3m*	-	-	-	-	3m	90.5m	Reinforced concrete box	No cross section review or inspection reports available

Table 4.9.10 Glen Garry Major Structures

4.9.12 Glen Garry to Crubenmore

In this section there are 11 bridges, 55 culverts and 1 retaining wall. In addition, there are 28 footbridges, which include all footbridges within the online corridor, and are not restricted to structures crossing the A9. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.11** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Allt Coire Mhic Sith Underbridge (A9 850)	1	*8m*	-	-	-	-	8m	48m	Reinforced concrete arch	No cross section details available
Allt A'Chaorruinn Underbridge (A9 860)	1	*6m*	-	-	-	-	6m	38m	Reinforced concrete arch	No cross section details available
Allt Dubhaig Underbridge (A9 870)	1	*6.2m*	-	-	-	-	6.2m	12m	Reinforced concrete slab deck	No cross section details available; assessed HB capacity (40) below original load (45)
Allt Chuirn Underbridge (A9 880)	1	*9.5m*	-	-	-	-	9.5m	13.2m	Precast, pre-tensioned concrete beams with composite in-situ concrete infill	Cross section width below standard; load carrying capacity verified
Allt nan Cisteachan Underbridge (A9 890)	1	*5.3m*	-	-	-	-	5.3m	13.2m	Reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Allt Uilleim Underbridge (A9 900)	1	*5.3m*	-	-	-	-	5.3m	18.6m	Reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified
Allt Bhathaich Underbridge (A9 910)	1	*5.4m*	-	-	-	-	5.4m	13.2m	Reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified
Aqueduct Underbridge (A9 920)	1	*35.8m*	-	-	-	-	35.8m	13.2m	Steel girders composite with a reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified
Allt Cuaich Underbridge (A9 930)	1	*19.9m*	-	-	-	-	19.9m	13.2m	Precast, pre-tensioned concrete beams composite with a reinforced concrete deck slab	Cross section width below standard; load carrying capacity verified
Allt Garbh Underbridge (A9 940)	1	*5m*	-	-	-	-	5m	13.2m	Reinforced concrete slab deck	Cross section width below standard; load carrying capacity verified
Allt na Ceardaich Underbridge (A9 950)	1	*5.4m*	-	-	-	-	5.4m	26.3m	Reinforced concrete box	Cross section width below standard; load carrying capacity verified

Table 4.9.11 Glen Garry to Crubenmore Major Structures

4.9.13 Crubenmore

In this section there are 2 culverts. The road is dual carriageway throughout.

The culverts are both single span structures of unknown construction, constructed circa 1975 and 1998.

4.9.14 Crubenmore to Kincraig

In this section there are 7 bridges, 2 Underpasses, 24 culverts and 1 sign gantry. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.12** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Nuide Cattle Creep Underbridge (A9 960)	1	*3.1m*	-	-	-	-	3.1m	32.9m	Corrugated steel pipe	No cross section details available
Inverton Underbridge (A9 970)	3	*5m*	*5m*	*3.9m*	-	-	13.9m	48.8m	Corrugated steel pipe	No cross section details available
Knappach Underpass (A9 980)	1	*3.7m*	-	-	-	-	3.7m	26.6m	Reinforced concrete box	No cross section details available
Ruthven Road Underbridge (A9 990)	1	*23.7m*	-	-	-	-	23.7m	13.2m	Precast, prestressed concrete 'M' beams composite with a reinforced concrete slab deck	Cross section width below standard
Spey River Underbridge (A9 1000)	7	*5 @ 18m*	*30m*	*18m*	-	-	138m	13.2m	Weathering steel plate girders composite with a reinforced concrete slab deck	No cross section details available
Kingussie Rail Underbridge (A9 1010)	1	*19.5m*	-	-	-	-	19.5m	15m	Precast, prestressed concrete 'M' beams composite with a reinforced concrete slab deck	Cross section width below standard
Kerrow Underbridge (A9 1020)	3	*11.25m*	*17.5m*	*11.25m*	-	-	40m	13.2m	Steel girders composite with a reinforced concrete slab deck	Cross section width below standard
Chapelpark Underpass (A9 1030)	1	*4.6m*	-	-	-	-	4.6m	22.4m	Corrugated steel pipe	No cross section details available
Raitts Burn Underbridge (A9 1040)	1	*8m*	-	-	-	-	8m	13.2m	Reinforced concrete portal frame	Cross section width below standard

Table 4.9.12 Crubenmore to Kincraig Major Structures

4.9.15 Kincraig to Dalraddy

In this section there are 1 bridge, 4 Underpasses and 4 culverts. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.13** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Wildlife Park Underpass (A9 1050)	1	*10.3m*	-	-	-	-	10.3m	13.2m	Precast, prestressed concrete 'T' beams with composite in-situ concrete infill	Cross section width below standard
Dunachton Burn Underpass (A9 1060)	1	*6.6m*	-	-	-	-	6.6m	32.5m	Reinforced concrete box	No cross section details available
Kincraig Farm Underpass (A9 1070)	1	*3.8m*	-	-	-	-	3.8m	33.25m	Corrugated steel pipe	No cross section details available
Alvie Estate Underpass (A9 1080)	1	*3.8m*	-	-	-	-	3.8m	37m	Corrugated steel pipe	Cross section width below standard
Allt An Fhearna Underbridge (A9 1090)	1	*7.3m*	-	-	-	-	7.3m	13.4m	Reinforced concrete box	Cross section width below standard

Table 4.9.13 Kincraig to Dalraddy Major Structures

4.9.16 Dalraddy to Slochd

In this section there are 6 bridges, 7 Underpasses, 28 culverts and 2 sign gantries. In addition, there are 4 footbridges, which include all footbridges within the online corridor, and are not restricted to structures crossing the A9. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.14** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Allt Chriochaidh Underbridge (A9 1100)	1	*4m*	-	-	-	-	4m	13.2m	Reinforced concrete box	Cross section width below standard
Ballinluig Pedestrian Underpass (A9 1110)	1	*3.8m*	-	-	-	-	3.8m	45m	Corrugated steel pipe	Cross section width below standard
Lynwilg Underpass (A9 1120)	1	*3.8m*	-	-	-	-	3.8m	37.8m	Corrugated steel pipe	Cross section width below standard
Criche Underbridge (A9 1130)	1	*6m*	-	-	-	-	6m	13.2m	Reinforced concrete box	Cross section width below standard

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Craig Dhu Underpass (A9 1140)	1	*3.7m*	-	-	-	-	3.7m	33.6m	Corrugated steel pipe	Cross section width below standard
Craigellachie National Nature Reserve Underpass (A9 1150)	1	*3.8m*	-	-	-	-	3.8m	33.75	Corrugated steel pipe	Cross section width below standard
Milton Caravan Site Underbridge (A9 1160)	1	*5.9m*	-	-	-	-	5.9m	40.95m	Corrugated steel pipe	Cross section width below standard
High Burnside Underpass (A9 1162)	1	*9.6m*	-	-	-	-	9.6m	13.8m	Reinforced concrete slab deck	No cross section details available
Granish Underpass (A9 1170)	1	*3.8m*	-	-	-	-	3.8m	35.7m	Corrugated steel pipe	Cross section width below standard
Carrbridge Underpass (A9 1180)	1	*8.1m*	-	-	-	-	8.1m	13.44m	Reinforced concrete slab deck	Cross section width below standard
Dulnain Underbridge (A9 1190)	3	*25m*	*34.3m*	*23m*	-	-	82.3m	13.2m	Weathering steel plate girders composite with a reinforced concrete slab deck	No cross section details available; load carrying capacity verified
Baddengorm Underbridge (A9 1200)	1	*13.7m*	-	-	-	-	13.7m	13.2m	Reinforced concrete slab deck	No cross section details available
Slochd Beag Underbridge (A9 1210)	3	*40m*	*65m*	*40m*	-	-	145m	13.2m	Weathering steel plate girders composite with a reinforced concrete slab deck	No cross section details available; load carrying capacity verified

Table 4.9.14 Dalraddy to Slochd Major Structures

Photo 4.9.3 Existing Slochd Beag Underbridge

4.9.17 Slochd to Tomatin

In this section there are 1 bridge and 2 Underpasses. The road is dual carriageway throughout. The major structures are summarised in Table 4.9.15 below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Soilshan Underpass (A9 1220)	1	*4.4m*	-	-	-	-	4.4m	35.5m	Corrugated steel pipe	No cross section details or inspection reports available
Findhorn Underbridge (A9 1230)	5	*45m*	*53m*	*53m*	*53m*	*45m*	249m	24.9m	Weathering steel plate girders composite with a reinforced concrete slab deck	No cross section details or inspection reports available
Tomatin House Underpass (A9 1240)	1	*5m*	-	-	-	-	5m	72m	Corrugated steel pipe	No cross section review or inspection reports available

Table 4.9.15 Slochd to Tomatin Major Structures

Photo 4.9.4 Existing Findhorn Underbridge

4.9.18 Tomatin to Moy

In this section there are 3 bridges, 15 culverts and 1 footbridge. The road is single carriageway throughout. The major structures are summarised in **Table 4.9.16** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Allt Na Frithe Underbridge (A9 1250)	1	*4.5m*	-	-	-	-	4.5m	33m	Corrugated steel pipe	No cross section details available
Dalmagarry Underbridge (A9 1260)	1	*13.7m*	-	-	-	-	13.7m	13.4m	Reinforced concrete slab deck	No cross section details available; load carrying capacity verified
Moy Rail Underbridge (A9 1270)	1	*20m*	-	-	-	-	20m	13.4m	Precast, prestressed concrete 'M' beams composite with a reinforced concrete slab deck	No cross section details available

Table 4.9.16 Tomatin to Moy Major Structures

4.9.19 Moy to Inverness

In this section there are 2 bridges, 1 underpass, 13 culverts, 1 retaining wall and 1 sign gantry. The road is dual carriageway throughout. The major structures are summarised in **Table 4.9.17** below:

Structure	No. Spans	Span Lengths (m)					Total Span Length (m)	Total Span Width (m)	Form of Construction	Review Summary
Lairgandour Underpass (A9 1280)	1	*4.3m*	-	-	-	-	4.3m	51.8m	Corrugated steel pipe	No cross section review or inspection reports available
Daviot New Underbridge (A9 1290)	1	*24.4m*	-	-	-	-	24.4m	25m	Weathering steel plate girders composite with a reinforced concrete slab deck	Cross section width below standard
Mattar Underbridge (A9 1295)	1	*11.3m*	-	-	-	-	11.3m	27m	Reinforced concrete box	No cross section review or inspection reports available

Table 4.9.17 Moy to Inverness Major Structures

4.9.20 Structures Assessment Summary

In conclusion, the existing structures along the A9 corridor between Perth and Inverness are generally in good condition. The assessment results do not suggest prioritising any section(s) based on elements of structural design. However, the existing structures on the A9 corridor were designed to the standards relevant at the time of construction in the late 1970s and early 1980s and, as such, the cross section widths of the majority of the existing single carriageway structures do not conform to current DMRB standards. This should be further reviewed during the DMRB Stage 2 Assessment.

4.10 Junctions and Accesses

4.10.1 Summary

This section of the report considers the proposed junction strategy and junction locations when dualling the A9. The existing at-grade and grade separated junctions were assessed to determine if they comply with the current DMRB design standards. The proposed standards of the junctions were also examined before a design strategy was produced to assist in deciding on proposed junction locations and to ensure a consistent approach is adopted over the length of the A9.

The first stage in the junctions and access assessment was to undertake an assessment on the 259 existing junctions and accesses, the standards included in the assessment were horizontal and vertical curvature and visibility. It was found during the assessment that the 4 existing grade separated junctions that are located on existing dual carriageway sections of the A9 do not comply with current standards and additional works would be required to bring these up to standard.

As the A9 is to be designed to a Category 7A road, only grade separated junctions are permitted with isolated left-in, left-out junctions, therefore all existing at-grade junctions will need to be upgraded or closed.

A broad strategy has been developed for the treatment of existing junctions and accesses along the A9. The strategy states that A and B class roads with direct access to the A9 will remain open and the C Class, unclassified and private and agricultural accesses will be closed unless on a local scale at specific locations a strong case could be made to justify retaining such a junction or access.

The strategy therefore assesses the junction and accesses in three tiers as follows:

- *Tier 1 – A and B Class Roads*
- *Tier 2 – C and Unclassified Roads*
- *Tier 3 – Private and Agricultural Access Roads*

A decision chart based on the three tiers assisted in the assessment to determine if a grade separated junction is required. The strategy ensures that the environmental impacts, severance, length of detour and economics are considered when decisions on the junctions are made.

The A9 Junction and Access Strategy identified 24 potential junction locations, within these proposals, the 5 existing grade separated junctions on dual carriageway sections will be retained. At this stage of the assessment the exact location of the junctions has not been examined and further work will be required at DMRB Stage 2 and 3 with regards to the preferred locations.

4.10.2 Introduction

The A9 between Perth and Inverness currently has 259 access points along its length which are a combination of grade separated, left-in/left-out, major/minor junctions and field accesses. The existing junctions provide access to villages, community facilities, private access, agricultural accesses and other trunk road networks. This section of the report describes the current provision and standards of junctions on both the existing single and dual carriageway sections of the A9.

A design philosophy and strategy for progressing the design of the junctions and accesses is outlined which was used in determining potential junction locations for the A9 Dualling. The engineering standards for both the junctions and accesses will also be summarised.

4.10.3 Junction Standards

The existing junctions within the online corridor were designed based on the relevant standards at the time of construction. As such, there are several areas where the geometric standards provided do not comply with the current design standards proposed for the upgraded dualled sections. **Table 4.10.1** below outlines the various junction types and the number of them within the corridor.

Junction Type	Number of Junctions/Accesses (Single Carriageway)	Number of Junctions/Accesses (Dual Carriageway)
Grade Separated Junctions	2	4
Left-in/Left-out Junctions	2	1
Major/Minor Junctions	28	6

Table 4.10.1 Junction/Access Classification

Although the junctions and accesses located on single carriageway sections of the A9 are likely to be upgraded to a grade separated junction or be closed, an assessment has been undertaken to determine the current design standards. The assessment identified the types of existing junctions, relevant DMRB design standard and visibility; the full assessment can be found in **Appendix I**.

The junctions within dual carriageway sections were assessed to determine compliance with the current DMRB Standards. These junctions below current standards can be found in **Table 4.10.2** and will be reviewed further at the DMRB Stage 2 Assessment. For existing dual carriageway sections, the grade separated junctions have been assessed to determine if they are in accordance with DMRB - TD 22/06 Layout of Grade Separated Junction, rural all-purpose road and a design speed of 120Akph.

Junction Name	Junction Layout	Slip Road	Horizontal Curvature (m)	Merge / Diverge Details					Visibility (m)
				Merge/ Diverge Taper (m)	Merge Nose Ratio	Diverge Nose Ratio	Merge Nose Length (m)	Diverge Nose Length (m)	
			min. 50m diverge/min. 30m merge	min. 150m	min. 1:30	min. 1:15	min. 85m	min. 70m	min. 70m
Perth to Luncarty									
Luncarty/ Battleby Junction	Compact Grade Separated (Basic merge with hook Diverge)	NB Diverge	-	-	-		-	45	
		NB Merge		15	0	-	0	-	-
		SB Merge	-	-	20	-	-	-	-
Ballinluig to Pitlochry									
Ballinluig Junction	Compact Grade Separated	NB Diverge	-	-	-		-	55	-
		NB Merge	-	-	25	-	80		45
		SB Diverge	35	-	-	5	-	5	-
		SB Merge	-	-	5	-	5	-	35
Pitlochry to Killiecrankie									
Pitlochry South Junction	Half diamond grade separated	NB Diverge	-	-	-	10	-	50	50
		SB Merge	-	-	5	-	40	-	40
Pitlochry North Junction	Left-In/ Left-Out	NB Diverge	-	110	-	1	-	10	60
		NB Merge	20	-	5	-	20	-	25
		SB Diverge	-	-	-		-	55	-
		SB Merge	25	-	5	-	15	-	40
Moy to Inverness									
Drumossie Junction	Compact Grade Separated	NB Diverge	25	115	-	5	-	10	-
		NB Merge	30	100	5	-	20	-	45
		SB Diverge	30	-	-	5	-	15	40
		SB Merge	30	-	5	-	20	-	-

Table 4.10.2 Junction Standards and Departure Summary

As outlined in Section 4.6, the A9 will be designed as a Category 7A All-Purpose Dual Carriageway, in accordance with the DMRB. Within the standards for this type of road, a grade separated junction is the preferred junction layout which will assist in producing a high quality, strategic route. This category of road does not allow the use of an at-grade minor junction but does allow limited access via a left-in/left-out junction. It is also worth noting that the adoption of a compact grade separated junction is not permitted for a Category 7A road.

On the A9 Dualling, to seek to ensure consistency in standards adopted, a standard approach to the design of the junctions will be adopted where possible. It is only not likely to be adopted in areas where there are specific constraints. The grade separated junction proposed on the A9 will comply with DMRB, TD 22/06 Layout of grade separated junctions. A typical example of a grade separated junction with loops can be found below in ***Figure 4.10.1***. This type of junction layout is generally considered to be suitable for constrained corridors such as the A9.

This is an indicative junction layout and further assessment will be required on a case by case basis to determine the most suitable junction location and layout. This should consider issues including, but not limited to, the mainline alignment, side road layout, topography and geotechnical conditions, traffic levels and any environmental constraints. This work should be progressed as part of the DMRB Stage 2 Assessment process.

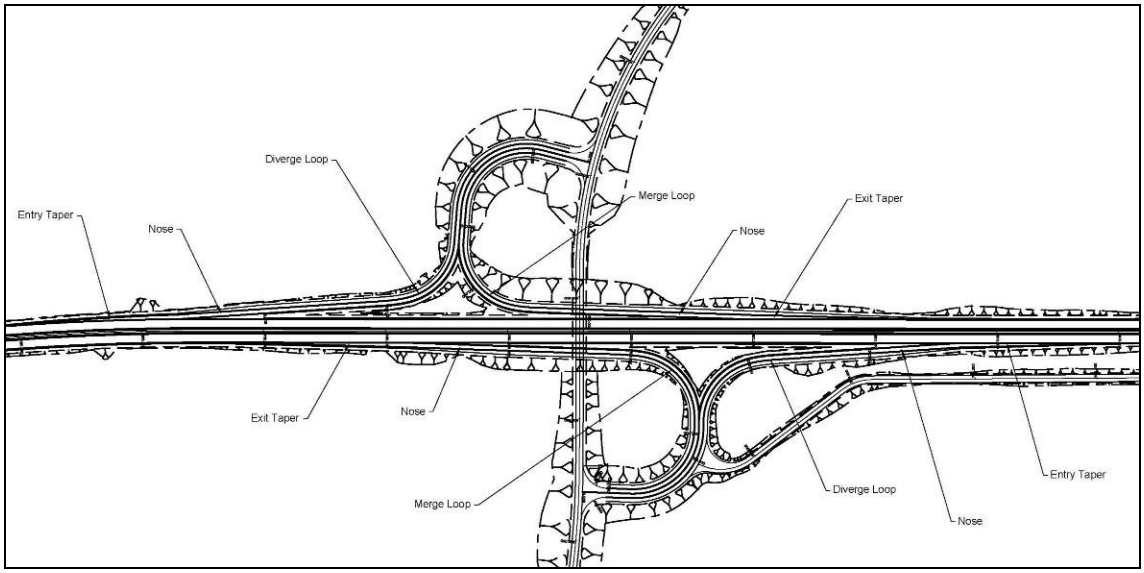


Figure 4.10.1 Typical Grade Separated Junction Arrangement with Loops

For the layout above, the junction standards to be adopted would provide a minimum loop radii of 30m on the merge slip and 50m on the diverge. Both the merge and diverge would be designed to an all-purpose road standard. A summary of the junction standards to be adopted on the A9 are detailed in **Table 4.10.3** as follows:

Slip Road/Design Standard	Minimum Loop Radii (m)	Length of Entry/Exit Taper (m)	Nose Ratio	Nose Length (m)
Merge Standards	30	150	1:30	85
Diverge Standards	50	150	1:15	70

Table 4.10.3 Junction Design Standards Summary

As the design of the A9 progresses, site constraints may result in the loop being problematic or economically unfeasible. An alternative junction configuration may present itself as the best option at these locations and the junction layout should be assessed on an individual basis as they arise.

4.10.4 Junction and Access Strategy

A strategy was developed to provide a consistent approach with regard to the provision of access to the A9 corridor. The main principles are:

- *A junction will be provided where an A or B road currently accesses the existing A9 unless it can be combined with another A or B road junction; and*
- *All C class roads, unclassified roads and accesses are closed and an alternative connection is provided to connect the existing road to the A9 and local facilities unless particular site specific issues can be demonstrated to justify need.*

The Junction and Access Strategy can be found in **Appendix J**.

The strategy is split into three main elements including the junction strategy decision process chart, tiers/areas to consider and the strategy matrix. Part of the assessment requires the junctions and accesses to be split into three tiers as follows:

- *A and B classification roads are considered under Tier 1;*
- *C class and unclassified are Tier 2; and*
- *Private/field accesses are considered under Tier 3.*

Where an alternative connection is specified within the strategy, this is a new side road that will provide a connection from the existing junction/access being assessed to the next proposed junction location.

Each stage of the Junctions and Access Decision Process Chart is described in greater detail below:

- *A review is undertaken to identify all of the existing junctions and accesses and to determine the road's classification;*

- *Three routes are available on the Decision Process Chart dependant on the road classification as a Tier 1, Tier 2 or Tier 3 Junction and Access.*

Tier 1

- *All junction and accesses require a Cost Criteria Matrix Assessment to be undertaken. This assesses the cost of providing a grade separated junction against an alternative connection to the next Tier 1 junction; the most economically advantageous option is then selected as the preferred option.*

- *On B classified roads where the traffic volume is less than 500 AADT, an additional assessment is required which considers the environmental and engineering impact of providing the alternative connection. If the assessment results in a high impact then the provision of a grade separated junction is selected as the preferred option.*

Tier 2

- *An alternative connection to a Tier 1 or the closest Tier 2 junction is assessed against environmental, engineering and economic impacts. If the assessment results in a high impact or the cost is greater than providing a grade separated junction then the provision of a grade separated junction is selected as the preferred option.*

- *If the decision process chart states that a junction is not to be provided at a location, an option is available for justification to be provided with regards to location specific constraints or reasons for providing a grade separated junction.*

Tier 3

- *An alternative connection to a Tier 1 or Tier 2 junction is assessed against environmental, engineering and economic impacts. If the assessment results in a high impact then this forms justification to be provided to maintain/provide an access.*

Additional constraints may arise which impact the final locations, particularly where there is limited land availability. There are many constraints along the route as presented on Key Constraints Plans in **Appendix A.** For example, the route is constrained by rock formations and embankments, which require flexibility and constructability considerations due to difficult ground conditions.

Over the length of the route all Tier 1 and 2 junctions were assessed using the above strategy and the existing junction locations have been reviewed and rationalised. **Table 4.10.4** outlines the proposed grade separated junction locations along the route. Existing grade separated junctions will be retained where practical, provided they fit within the overall junction strategy. The existing traffic flows found in the Indicative Junction Location drawings within **Appendix K** were used within the assessment.

Section		Existing/Proposed Junction	Junction Status
Perth to Luncarty	1	Luncarty	Existing Grade Separated Junction (GSJ) *(No SB off-slip)*
Luncarty to Pass of Birnam	2	Tullybelton/Stanley Access	Indicative GSJ Location (scheme being progressed through DMRB Stage 2 and 3 Assessments under separate commission)
	3	Bankfoot (NB and SB)	Existing junction functions as a GSJ; alternative to provide new GSJ to the south
Pass of Birnam to Tay Crossing	4	Bankfoot North/Birnam	Indicative GSJ Location (scheme being progressed through DMRB Stage 2 Assessments under separate commission). Consideration to be given to combine existing at-grade junctions into one GSJ at this location
	5	Crieff/Dunkeld	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment). Consideration to be given to combine existing at-grade junctions into one GSJ at this location
	6	Dalguise	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
Tay Crossing to Ballinluig	No indicative grade separated Junctions		
Ballinluig to Pitlochry	7	Ballinluig	Existing GSJ to be retained
Pitlochry to Killiecrankie	8	Pitlochry South	NB diverge and SB merge only; retain existing arrangement or look into possible junction location between Pitlochry South and Pitlochry North
	9	Pitlochry North	Existing left-in/left-out in both directions; retain or provide GSJ as discussed for Pitlochry South
Killiecrankie to Glen Garry	10	Aldclune	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	11	Bruar/Trinafour	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment). Consideration to be given to combine existing at-grade junctions into one GSJ at this location
Glen Garry	12	Dalnaspidal Access	Provisional GSJ location due to significant diversion route to alternative junctions
Glen Garry to Crubenmore	13	Dalwhinnie Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
Crubenmore	14	Crubenbeg Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
Crubenmore to Kincraig	15	Newtonmore Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	16	Kingussie Junction	Existing GSJ to be retained
Dalraddy to Slochd	17	Aviemore South	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	18	Granish Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	19	Bogroy Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
Tomatin to Moy	20	Tomatin North and South	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment), potential to combine with Moy
	21	Moy Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment), potential to combine with Tomatin
Moy to Inverness	22	Scatraig North and South	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	23	Blackcroftwood Junction	Indicative GSJ Location (to be further developed at DMRB Stage 2 Assessment)
	24	Drumossie Junction	Existing GSJ to be retained

Table 4.10.4 Junction Status Summary

Further analysis will be required to identify the exact locations and arrangements of the junctions in later stages of the assessment process.

Due to limited information being available in relation to traffic flows, desire lines, etc., the Tier 3 accesses have not been assessed at this stage.

4.10.5 Summary of Proposed Junctions

24 potential junction locations along the A9 have been identified. This section of the report summarises the existing conditions at each of the junction locations, provides justification for the junction and highlights potential constraints.

Dalnaspidal was the only proposed junction location which was not classed as a Tier 1 or 2 junction. Reasoning and justification for this decision is discussed within Section 4.10.13.

As discussed in Section 1.6, three subsections of the A9 are at a more advanced stage of the design process. The junction locations proposed on these schemes have been assessed using the design strategy set out within this report. The junctions that are already being progressed are:

- *Luncarty/Battleby*
- *Tullybelton/Stanley*
- *Bankfoot North and South*
- *Bankfoot North / Birnam*
- *Crieff/Dunkeld*

4.10.6 Perth to Luncarty

(a) Luncarty / Battleby Junction

Whilst an existing grade separated junction connects the A9 to Luncarty via the B8099, this junction does not allow movements in all directions as it does not have a southbound diverge. As the junction connects to a B road it has been assessed under the Tier 1 strategy and concludes that a junction is required at this location.

The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB for a Category 7A road, therefore it will be required to be brought up to current standards or alternatively appropriate approvals sought for Departures from Standard. Further consideration is also required regarding the possibility of adding a southbound diverge.

4.10.7 Luncarty to Pass of Birnam

(a) Tullybelton/Stanley

The existing at-grade junctions in close proximity currently connect Tullybelton and Stanley to the A9 via local unclassified roads. As the junction connects to a B road it has been assessed under the Tier 1 strategy and concludes that a junction is required at this location. The assessment indicated that the alternative access to the A9 would not provide an economic benefit when compared to providing a new grade separated junction at this location.

The DMRB Stage 2 and 3 Assessments currently being progressed for this section are currently assessing a junction at this location. There is also potential for the Luncarty north access road to connect directly into this proposed junction.

Photo 4.10.1 Existing Junction at Stanley

(b) Bankfoot North and South

The current junction access to the north and south of Bankfoot consists of left-in/left-out junctions connected by an underbridge in the village of Bankfoot. In conjunction with the underbridge they can operate as a grade separated junction. It is worth noting that the existing northbound junction was recently upgraded to improve the safety of the junction by upgrading the slip road and preventing any right turn manoeuvres.

The junction strategy indicated that the Tier 1 junction at the south should be replaced with a new grade separated junction. The new junction would need to be located to the south of Bankfoot. However as the existing layout acts like a grade separated junction, it may be desirable to retain as is. The standard of the existing junctions will be assessed further to identify upgrades that may be required if to be retained.

4.10.8 Pass of Birnam to Tay Crossing

(a) Bankfoot North NB/Birnam Access

These junctions are in close proximity to each other and serve Bankfoot, Birnam and Dunkeld. The B867 currently connects the A9 to Bankfoot; access to Birnam is gained via a local unclassified road, as the junctions connect to a B road it has been assessed under the Tier 1 strategy. Whilst they were assessed independently for the purposes of the junction strategy, the assessment indicated that the alternative access to the A9 would not provide an economic benefit when compared to

providing a new grade separated junction at this location. On further review, the two existing junctions could be rationalised into one grade separated junction.

Initial assessment of this junction indicates that no existing constraints have a significant impact on the viability of a junction at this location but further assessment is required at DMRB Stage 2 Assessment to confirm the suitability of this location for a junction.

Photo 4.10.2 Existing Junction at Bankfoot

(b) Crieff/Dunkeld Junctions

The junction locations linking the A9 to Crieff and Dunkeld via the A822 and A923 respectively are in close proximity to each other and they were combined for the purposes of assessment. As both junctions connect A roads they have been assessed under the Tier 1 strategy.

The outcome of the assessment at this location indicates that there will be no economic benefit of providing an alternative connection to the A9 over a new grade separated junction at this location.

An initial assessment of the possibility of providing a grade separated junction at this location has indicated that this location is heavily constrained due to the existing topography. Further consideration of the topography at Crieff/Dunkeld is required at DMRB Stage 2 Assessment to confirm the suitability of this location for a junction.

(c) Dalguise Junction

The Dalguise junction links the A9 to Dalguise via the B898. The outcome of the junction assessment suggests that an alternative connection to another A or B road junction location along the A9 would not provide an economic benefit over constructing a new grade separated junction at this location.

There are a number of constraints at this site that limit the options and location of a new grade separated junction. The existing junction is situated in close proximity to the River Tay and the mainline of the A9 crosses over the Tay almost immediately after the junction to the north. The existing route of the railway further compounds the issue as it crosses beneath the A9 slightly to the north of the junction. The steep topography to the north and south make relocating the junction very difficult.

The locality of the new junction will require further review in the later stages of assessment to determine if a viable solution is available.

4.10.9 Ballinluig to Pitlochry

(a) Ballinluig Junction

The Ballinluig junction is an existing grade separated junction on a dual carriageway section of the route which connects to Ballinluig via the B827. The current junction arrangement allows for all movements and was recently constructed.

The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB for a Category 7A road, therefore will be required to be brought up to current standards or alternatively seek appropriate approvals for Departures from Standard.

4.10.10 Pitlochry to Killiecrankie

(a) Pitlochry North and South

The existing grade separated junction to the south of Pitlochry is at the north end of a section of dual carriageway that runs from Ballinluig and connects the A9 to Pitlochry via the A924. Whilst it is a grade separated junction it does not allow movements in all directions as it only has a northbound diverge and southbound merge.

As the junction is already grade separated it would be preferable to retain as much of the existing junction as possible however the limited existing traffic movements catered for and significant constraints in the area suggest there may be challenges associated with this. The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB for a Category 7A road, therefore will be required to be brought up to current standards or alternatively seek appropriate approvals for Departures from Standard.

The junction to the north of Pitlochry is an existing grade separated junction on a short section of dual carriageway that connects the A9 to Pitlochry via the A924. The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB for a Category 7A road, therefore will be required to be brought up to current standards or alternatively seek appropriate approvals for Departures from Standard.

An alternative to the junctions to the north and south of Pitlochry could be to develop a new junction between the existing two in close proximity to the existing River Tummel crossing. Further assessment and review of the viability of this option would be required in the following stages of design.

4.10.11 Killiecrankie to Glen Garry

(a) Aldclune Junction

This junction connects the A9 to Aldclune and is along the main route to Blair Atholl via the B8079. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location.

There are a number of constraints in the locality of this junction such as a watercourse and the railway line. An initial high level assessment of the area indicates that providing a junction in this location should be feasible but further consideration is required at Stage 2 to confirm the suitability of this location for a junction.

(b) Bruar/Trinafour Junction

These junctions connect the A9 to Bruar via the B8079 and to Trinafour and Calvine via the B847. They are located on a single carriageway section. In both instances, the junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location.

As a result of the initial assessment and the close proximity of the two junctions, it could be feasible to combine the two junctions into a single new grade separated junction.

4.10.12 Glen Garry

(a) Dalnaspidal Access

The access at Dalnaspidal is a Tier 3 private access outwith the north end of the Glen Garry dual carriageway section. It provides access to Dalnaspidal Lodge.

A new grade separated junction is proposed as it is approximately centred between the junction at Dalwhinnie to the north and House of Bruar/Trinafour to the south. If a junction was not provided at a location between these junctions, the diversion route would be 10km north to the junction at Dalwhinnie to facilitate access to the A9.

No significant constraints to providing a junction have been identified at this location during the initial assessment.

Photo 4.10.3 Existing Major/Minor Junction at Dalnaspidal

4.10.13 Glen Garry to Crubenmore

(a) Dalwhinnie Junction

The junction at Dalwhinnie connects the A9 to Dalwhinnie via the A899. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location. The new junction would likely be located to the south of the existing junction due to the close proximity of the River Truim.

There are a number of constraints in the locality of this junction such as the new SSE overhead power line, the River Trium and the existing aqueduct; however, an initial assessment of the area indicates that providing a junction in this location should be feasible but further consideration is required at Stage 2 to confirm the suitability of this location for a junction.

4.10.14 Crubenmore

(a) Crubenbeg Junction

This junction is located on a dual carriageway section of the A9 and connects Crubenmore and Dalwhinnie to the A9 via an unclassified road. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location.

There are a number of constraints in the locality of this junction such as the Highland Main Line railway, buildings, Geological SSSI and Topographical constraints. Further consideration is required at Stage 2 to confirm the suitability of this location for a junction

Photo 4.10.4 Existing Junction at Crubenbeg

4.10.15 Crubenmore to Kincraig

(a) Newtonmore Junction

This junction connects the A9 to Newtonmore via the B9150. The junction assessment at this location determined that an existing alternative route was available. However the increase in journey time for some movements to the A9 would be unacceptable and a new grade separated junction should be considered at this location.

There are a number of constraints in the locality of this junction such as buildings and the Highland Main Line railway; however, an initial assessment of the area indicates that providing a junction in this location should be feasible but further consideration is required at Stage 2 to confirm the suitability of this location for a junction.

(b) Kingussie Junction

This is an existing grade separated junction on a single carriageway section of the A9 with full movements in all directions. It connects the A9 to Kingussie and Newtonmore via the B9150.

The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB, therefore will be required to be brought up to current standards or alternatively seek appropriate approvals for Departures from Standards.

4.10.16 Dalraddy to Slochd

(a) Aviemore South Junction

This junction connects the A9 to Aviemore via the B9152. It is situated on a single carriageway section of the A9, providing the major access from the south to Aviemore.

The junction assessment at this location determined that an existing alternative route was available via the Kingussie Junction and the B9152. However, due to the high traffic volumes currently using this junction and the impact this may have on the local communities, justification to provide a junction at this location should be provided in accordance with the strategy.

During initial assessment of this location no significant constraints to providing a junction were identified. Further consideration is required at DMRB Stage 2 assessment to confirm the suitability of this location for a junction.

Photo 4.10.5 Existing Junction at Aviemore South

(b) Granish Junction

This junction is situated on a single carriageway section of the A9 and connects the A9 to Aviemore North via the A95 and B9152. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location.

During initial assessment of this location no significant constraints with providing a junction were identified. Further consideration is required at DMRB Stage 2 assessment to confirm the suitability of this location for a junction.

(c) Bogroy Junction

This junction is situated on a single carriageway section of the A9 and connects the A9 to Carrbridge via the A938.

The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location.

During initial assessment of this location no significant constraints with providing a junction were identified. Further consideration is required at DMRB Stage 2 assessment to confirm the suitability of this location for a junction.

4.10.17 Tomatin to Moy

(a) Tomatin North and South Junction and Moy

These junctions are situated on a single carriageway section of the A9 and connect to Tomatin via a local unclassified road. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at this location. The assessment of the Moy junction to the north also indicated that this was the same. It may be feasible to provide a grade separated junction between Moy and Tomatin that serves both areas, thereby rationalising these two junctions.

A number of constraints are in close proximity to the A9 at this location including the Highland Main Line railway to the west of the A9 and the River Findhorn to the east. Further assessment and review of the viability of this option would be required in the following stages of assessment.

Photo 4.10.6 Existing Junction at Tomatin South

Photo 4.10.7 Existing Junction at Moy

4.10.18 Moy to Inverness

(a) Scatraig North and South and Blackcroftwood

These junctions are situated on a dual carriageway section of the route and connect the A9 to Fort Augustus via the B851. The junction assessment indicated that there would be no economic benefit of an alternative connection to the A9 when compared to providing a new grade separated junction at Scatraig. However the junction assessment at the Blackcroftwood junction to the north also indicated that this was the same case. Therefore it may be feasible to provide a grade separated junction between Blackcroftwood and Scatraig that serves both areas and would rationalise the two junctions. There is also potential to provide for a connection to Daviot depending on the final location of the rationalised junction.

A number of constraints are in close proximity to the A9 at this location including the River Nairn and dwellings. Further assessment and review of the viability of this option would be required in the following stages of design.

(b) Drumossie Junction

This is an existing compact grade separated junction on a dual carriageway section of the A9 that connects to Milton Leys via B9177.

The current geometric standards of the existing junction do not meet existing design standards specified within the DMRB for a Category 7A road, therefore will be required to be brought up to current standards or alternatively seek appropriate approvals for Departures from Standard.

4.10.19 Conclusion

The indicative junction locations identified within section of the report will need to be assessed further in the DMRB Stage 2 Assessment. During Stage 1, the mainline and junction layouts were not developed to determine if the junction can be located within the key constraints identified.

This assessment was undertaken for Tier 1 and Tier 2 classified roads. During this assessment, the impacts in closing existing junctions and providing an alternative connection to another junction or side roads have been assessed. However, the alternative connections will need to be assessed in greater detail during the DMRB Stage 2 Assessment.

Private and business accesses which have direct access to the A9 have not been assessed at this time and will need to be examined in greater detail during the DMRB Stage 2 Assessment when additional information is available to confirm the junction proposals for each section.

4.11 Parking and Bus Lay-bys

4.11.1 Introduction

Lay-bys are paved areas adjacent to carriageways that are used for short term or emergency stops while maintaining mainline traffic flows. There are two types of lay-by used on the existing A9 corridor:

- ***Parking lay-bys*** *- paved areas adjacent to the main carriageways for road users making short-term stops for both resting and emergency break-downs; and*
- ***Bus lay-bys*** *– similar to parking lay-bys allowing buses to stop and pick up or drop off patrons in relative safety.*

This section provides an overview of the current standards for lay-by design, an assessment of the current lay-by provision along the A9 corridor and a strategy to deliver a compliant route wide lay-by design. Given the high severity rate associated with accidents at lay-bys, siting lay-bys in safe locations in accordance with current standards is particularly important; however, identifying safe locations will also be challenging, particularly at constrained sections of the route. As such the strategy must be considered at an early stage in the DMRB Stage 2 and Stage 3 Assessment process to ensure that the optimum solution can be found.

There are three important factors having particular relevance to the A9 that will be addressed within the strategy to deliver a compliant route wide lay-by design:

- ***Viewpoints –*** *Consideration will be given to the route's outstanding natural landscape character;*
- ***Access to NMU routes –*** *Existing A9 lay-bys provide direct access to popular NMU routes; and*
- ***Bus Stops –*** *Consideration needs to be given to existing bus lay-by locations and their use as school pick up and drop off points.*

4.11.2 Design Standards – Layout

The principal standard used for lay-by design is TD 69/07 of DMRB which then provides links to various other standards within DMRB for specific design elements such as kerbs and traffic signs. Transport Scotland's Roads for All Good Practice Guide for Roads must also be adhered to, a requirement for all trunk road works.

With regard to parking lay-bys, TD69/07 specifies which layout should be used based on the speed limit, traffic volume and carriageway cross section. A standard layout is also provided for bus lay-bys which is used on all road types. The lay-by layouts proposed for the A9 are as follows:

- ***Type A with merge taper:*** *Used only on dual carriageways with a speed limit greater than 40mph. This layout is the same as a Type A with the addition of a merge taper to allow a safer entry to the main carriageway and is shown in* ***Figure 4.11.1****. Given the above criteria this layout shall be used for the A9 dualling;*

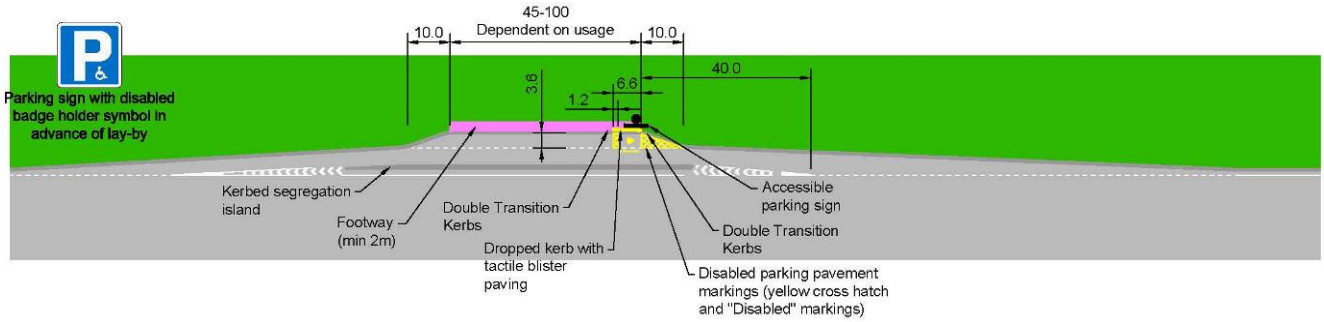


Figure 4.11.1 – Type A with merge taper

- ***Bus Lay-By:*** *Consideration needs to be given to the appropriateness of providing bus lay-bys on the A9 corridor and, where they are to be provided, consideration needs to be given to the appropriateness of the standard layout given that it does not contain a separation island.*

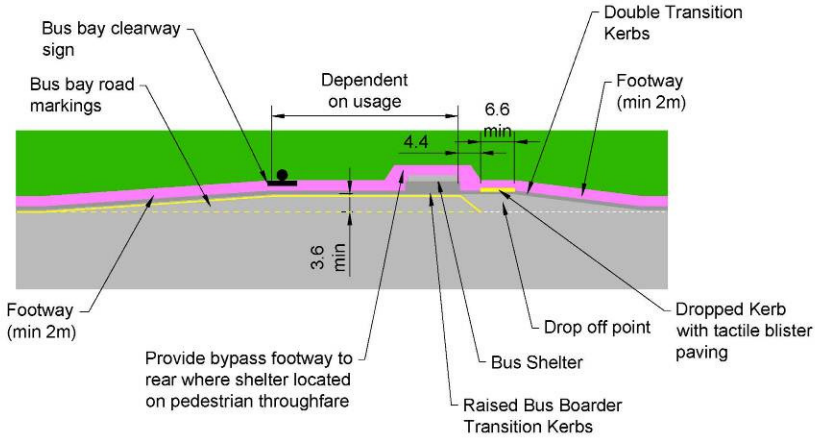


Figure 4.11.2 – Bus Lay-by

Photo 4.11.1 Existing Type A Lay-By

Photo 4.11.2 Existing Type A Lay-By

Photo 4.11.3 Existing Type B Lay-By

Photo 4.11.4 Existing Bus Lay-By on the A9

The Transport Scotland Roads for All Good Practice Guide for Roads includes some additional design requirements not specified within TD69/07 that ensure safety and accessibility for disabled people. For example, the following key features are illustrated in **Figure 4.11.1** and are additions to the basic DMRB layouts:

Type A Lay-by with Merge Taper

- *Minimum width of parking area: 3.6m as opposed to 3.5m;*
- *Disabled parking space with dropped kerb; and*
- *Special signage and markings.*

Bus Lay-by

- *Minimum width of parking area: 3.6m as opposed to 3.5m;*
- *Dropped kerb; and*
- *Drop-off point.*

Importantly, there is a degree of flexibility common to both DMRB and Roads for All standards whereby the length of each lay-by layout can be varied depending on usage. This will be of benefit to the lay-by strategy, particularly where the lay-by is located at a particularly scenic viewpoint or where access is provided to adjacent NMU routes.

Additional lay-by features discussed in TD69/07 that should be considered further in the DMRB Stage 2 and Stage 3 Assessment include:

- *Diverge/merge tapers;*
- *Advance signing and pavement markings;*
- *Footway and kerbing;*
- *Bus Shelters;*
- *Trading facilities;*
- *Emergency telephones; and*
- *Lighting.*

4.11.3 Design Standards and Aspirations – Siting and Frequency

TD69/07 specifies, either directly or by cross referencing other DMRB standards, the following requirements for siting lay-bys on dual carriageways:

- *Sight distance for approaching and exiting vehicles:*
    - *Conform to visibility standards for major/minor junction; and*
    - *Desirable Minimum Stopping Sight Distance: 295m.*
- *Proximity to upstream and downstream lay-bys, junction or access:*
    - *Spacing between lay-by and grade separated junction: 1km; and*
    - *Spacing between lay-by and other junctions/accesses: 450m.*

- *Spacing between lay-bys in one direction:*
    - *Recommended maximum spacing: 2.5km.*
- *Proximity to other features such as housing and rail or bus interchanges:*
    - *Consider noise and visual impacts and safety; and*
    - *Consider long-term parking restrictions for large goods vehicles.*
- *Location within a horizontal curve:*
    - *Minimum curve radius: 2,040m*

4.11.4 Additional Design Considerations

In addition to the requirements of TD 69/07 and Transport Scotland Roads for All Good Practice Guide for Roads, there are a number of factors that will be considered in the strategy with regard to siting lay-bys. For example, consideration will be given to available land, environmental impacts and existing lay-by locations in addition to scenic viewpoints, bus services and access to NMU routes which are discussed in greater detail below:

- ***Viewpoints*** *– A list of 19 key roadside viewpoints has been developed as part of the SEA identified to take advantage of the routes outstanding natural landscape character and promote tourism. Consideration will be given to locating lay-bys at viewpoints, potentially with enhanced features. Further consultation on these proposals will be undertaken during DMRB Stage 2 Assessments. Specific risk assessments on a case by case basis would need to consider the adequacy for parking and the risk of vehicles parking outwith the designated areas and impacting traffic flows on the A9 mainline.*
- ***Bus Services*** *– As discussed in Section 2.8, the existing bus facilities are concentrated at the southern and northern extents of the existing A9 corridor. There are a total of 21 bus lay-bys along the carriageway, half of which are located within existing dual carriageway sections. Retaining the bus stop locations should consider usage, availability of alternative locations off the trunk road, safe access, and their use as pick up or drop off points for school children.*
- ***Access to NMU Routes*** *- The functional usage of existing parking lay-bys was subject to high level assessment to determine which locations may be commonly utilised for recreational access by NMUs. Locations were identified based on their proximity to scenic locations and known NMU paths, as discussed further in Section 4.13. The assessment identified seven lay-by locations with expected above average usage due to the proximity of NMU paths. Similarly to viewpoints specific risk assessments on a case by case basis would need to consider the adequacy for parking and the risk of*

vehicles parking outwith the designated areas and impacting traffic flows on the A9 mainline.

4.11.5 Existing Provision

The existing lay-bys along the A9 between Perth and Inverness are based on the relevant standards at the time of construction and vary depending on their usage and the standards of the single or dual carriageway sections they serve.

A summary of the lay-by layouts found along the existing A9 corridor are identified in **Table 4.11.1**. There are 198 existing lay-bys in total and all four types of lay-by identified in Section 4.11.2 are represented plus one lay-by which combines a Type B parking lay-by with a bus lay-by. An Existing Lay-by Summary is provided in **Appendix L** which gives details of each lay-by within each of the 18 online corridor subsections. The Key Constraints Plans **(Appendix A)** also map out the existing lay-by locations.

Layout	Total
Type A	26
Type A with Merge Taper	3
Type B	148
Bus Lay-by	20
Combined Type B and Bus Lay-by	1

Table 4.11.1 Summary of Existing Lay-By Types

With regard to compliance with the standards set out in TD69/07 the following can be observed:

- *171 out of 198 of the existing lay-bys achieve a stopping sight distance on the approach to lay-bys of at least 295m, therefore satisfying the minimum standard for a 120kph design speed.*
- *For over 80% of the lay-bys, the current spacing is compliant with the recommended maximum dual carriageway spacing of 2.5km for each carriageway.*
- *Several adjacent northbound and southbound lay-bys do not comply with a recommendation regarding the proximity of adjacent lay-bys on the opposing sides of single carriageway roads. Where lay-bys are provided on both sides of the road at a particular location, they should be staggered to ensure the nearside lay-by comes first therefore minimising the likliehood of vehicles performing a u-turn to access a lay-by on the opposite carriageway. This issue will not exist when the road is upgraded to dual carriageway.*

Analysis of the following TD69/07 standards will also be required for proposed lay-by locations:

- *Visibility standards for major/minor junctions;*
- *Proximity to junctions and accesses; and*
- *The lay-by location within a horizontal curve.*

4.11.6 Lay-By Strategy

A strategy has been developed to provide a consistent approach to lay-by design and location along the A9 corridor for parking lay-bys. Lay-bys should be designed in accordance with a Type A with Merge Taper layout, as discussed in Section 4.11.2 and illustrated in **Figure 4.11.2**. However, further consideration could be given to providing enhanced features at locations such as the viewpoints identified in the SEA.

The lay-by locations will be determined in using the Lay-by Decision Process Chart provided in **Appendix M**, the main principles of which are as follows:

- *Determine if an existing lay-by will remain, be removed, or be modified;*
- *Combine lay-bys where feasible if there are no unacceptable impacts;*
- *Identify proposed locations based on the likes of user demand and viewpoints; and*
- *Assess lay-by locations against broad ranging design and environmental criteria.*

The process is an iterative one given the breadth of criteria that has to be considered and is applied to each direction of travel. Each stage of the Lay-by Decision Process Chart is described in greater detail below:

- *A review is undertaken of existing lay-by locations. Lay-bys can be located up to 2.5km apart along a particular carriageway and as such the designer is asked to identify lengths of carriageway where there are more lay-bys than the minimum required;*

- *Where there is an opportunity to combine lay-bys the designer is directed to an assessment matrix which determines if a combined lay-by would be acceptable. The matrix considers a broad range of factors including DMRB / Roads for All standards, biodiversity and consideration of existing lay-bys that would be stopped up. If closing an existing lay-by resulted in the loss of access to important NMU routes or viewpoints this would be unacceptable;*

- *Where there are no unacceptable impacts the combined location is adopted. Otherwise, the existing lay-bys are assessed further;*

- *All remaining existing lay-bys along with additional proposed lay-bys are then assessed using a second assessment matrix. Proposed lay-bys may be identified to achieve the required lay-by frequency, provide access to NMU routes or take advantage of scenic viewpoints. Again, the matrix considers a*

broad range of factors including DMRB / Roads for All standards, biodiversity and user need;

- *Where there are no unacceptable impacts the location is adopted. Where a particular location does not satisfy one of the assessment criteria, a new location is identified and reassessed in what becomes an interative process; and*

- *It is acknowledged that locations will not always be found that satisfy all the criteria, particularly where there is limited land availability, and in such circumstances the appropriate location should be discussed in more detail.*

Additional constraints may arise which impact the final locations, particularly where there is limited land availability. There are many constraints along the route as presented on the Key Constraints Plans in **Appendix A**. For example, the route is constrained by rock formations and embankments, which require flexibility and constructability considerations due to difficult ground conditions.

4.11.7 Summary of Lay-by Strategy and Challenges

There are a number of challenges associated with implementing a consistent route wide lay-by strategy. The Decision Process Chart should therefore be reviewed at the earliest possible stages of DMRB Stage 2 and Stage 3 Assessment to ensure that the optimum locations are identified. This is particularly relevant for the Type A lay-bys with merge tapers that will be used on this scheme given the land footprint occupied by the separation island, the merge and diverge tapers and the length of lay-bys where there is a need for the maximum parking provision.

Particular consideration should be given to viewpoints and access to NMU routes. As discussed within this section, each has their own particular challenges that will require a safety conscious decision making process relating to the adequacy of parking. Access to and from the lay-bys will also be a key consideration, particularly where there is a requirement to link lay-bys to the opposite side of the road.

With respect to bus stop provision there are a number of factors to be considered before a decision is made to provide bus lay-bys on the A9 mainline. Where they are provided the standard layout for a bus lay-by could be modified to provide the added safety of a separation island.

4.12 Rest Areas

4.12.1 Introduction

Rest areas incorporating picnic sites can be provided on rural trunk roads as places where drivers can safely pull off the road and stop, mitigating the accident risk associated with driver fatigue. While lay-bys provide relatively safe stopping areas for short durations, rest areas are more suitable for longer stops. Rest areas often include toilets and can also include many of the facilities normally associated with a service area such as meals and refreshments.

This section summarises the existing rest area provision along the A9 corridor and discusses the challenges associated with upgrading the route to current standards. Finding suitable locations for rest areas may be particularly problematic due to the land footprint required for their construction.

Over and above minimum standard requirements, aspirations to locate rest areas at particularly nice viewpoints should also be considered at DMRB Stage 2 Assessment.

4.12.2 Existing Provision

Currently, Ralia is the only recognised rest area on the A9 between Perth and Inverness, with local communities providing additional opportunities for longer stops. This was part of the original design philosophy before the road was constructed in the 1970s and 1980s to boost local economies. Details of all the existing provisions at Ralia and for local services within the local communities along the A9 are detailed within **Table 4.12.1**.

Photo 4.12.1 Existing Rest Area provisions at Ralia

Rest Area Reference	Location	Chainage	Direction	Other Details
Bankfoot Local Services	Off the A9 along the B857	8,450	Northbound / Southbound	Services: Café facilities, restaurants, tourist information and hotels / B&Bs
Birnam / Dunkeld Local Services	Off the A9 along the A923	16,900	Northbound / Southbound	Services: Tourist Information, Tourist Attractions
Ballinluig Local Service	Off the A9 along the A827	31,200	Northbound / Southbound	Local Services: Fuel, Restaurants, and hotels / B&B
Pitlochry Local Services	Off the A9 along the A924	39,000	Northbound / Southbound	Local Services: Fuel, Restaurants, tourist information and hotels / B&Bs
Killiecrankie Local Services	Off the A9 along the B8019	41,800	Northbound / Southbound	Services: Café facilities, restaurants, tourist information and hotels / B&Bs
House of Bruar	North junction with the B8079	55,400	Northbound / Southbound	Possible location for rest area before Ralia; limited HGV provisions
Dalwhinnie Local Services	Off the A9 along the A889	87,500	Northbound / Southbound	Services: Fuel facilities, restaurants and hotels / B&Bs
Rest Area 1	Ralia: Highland Gateway Centre	100,900 – 102,000	Northbound / Southbound	Services: coffee shop (Ralia Café Scottish tourist attraction), toilets, information centre, picnic site, telephone and internet. Local services in Newtonmore 1 mile away from rest area with fuel and a popular truck stop
Kingussie / Newtonmore Local Services	Off the A9 along the A86	104,000	Northbound / Southbound	Services: café facilities, toilets, fuel, hotels / B&Bs, restaurants, caravan park and camping site
Aviemore Local Services	Off the A9 along B9152	127,900	Northbound / Southbound	Services: tourist information, toilets, restaurants and hotels / B&Bs
Carrbridge Local Services	Off the A9 along A95 or along the A938	138,100	Northbound / Southbound	Services: fuel, tourist information, toilets, restaurants and hotels / B&Bs
Tomatin Local Services	Off the A9 along the	153,000	Northbound / Southbound	Services: restaurants and hotels / B&Bs
Inverness Local Services	Just off the A9	170,100	Northbound / Southbound	Services: tourist information, Toilets and picnic

Table 4.12.1 Rest Area/Local Services on the A9 between Perth and Inverness

4.12.3 Proposed Standards

Rest areas should be designed in accordance with the following standards:

- *DMRB, Vol 6, Section 3, TD 69/07, "The Location and Layout of Lay-bys and Rest Areas" – withdraws Chapter 3 of TA 57/87 "Roadside Features"; and*
- *Transport Scotland, "Roads for All: Good Practice Guide for Roads".*

It is recommended within the DMRB that rest areas are provided, as a minimum, every 45km and no more than 30 minutes driving time apart. Based on this criteria, at least 2 additional rest areas would be required on the A9 in the northbound direction and three in the southbound direction, although this provision could be reduced if rest areas were accessed from a side road junction and available to both directions of traffic.

In addition, consideration is also being taken of the approaches adopted by the Norwegian Public Roads Administration who are committed to constructing viewpoint rest areas along 18 selected Norwegian roads and have commissioned over 45 architecture and landscaping firms to produce designs for panoramic viewpoints, picnic spots, rest areas and other installations.

4.12.4 Viewpoints

A list of key roadside viewpoints has been developed as part of the SEA. The locations take advantage of the outstanding natural landscape character along the route and as such, rest areas should be located at viewpoints wherever possible. In addition to road safety, this would bring key benefits to the tourism industry.

Close consultation would be required with local authorities, CNPA and Transport Scotland to agree location and service provision and careful design would be required to complement the landscape character and also to ensure adequate parking for the fatigued drivers, including HGVs. At present 19 viewpoints have been identified, which is more than the minimum number of rest areas required. An assessment should therefore be made against the strategy outlined below to determine those suitable for further consideration.

4.12.5 Strategy

The following factors shall be considered in the identification and design of rest areas and the level of provision within rest areas:

- *Due to the constrained nature of many parts of the route and the land footprint required to construct rest areas early identification of suitable locations is recommended;*
- *Opportunities could be explored to locate rest areas on the adjacent side road network. If the rest area could be accessed via a grade separated junction facilitating both directions of traffic this would minimise the total number of rest areas required. To be effective the rest area would need to be located close to the junction so not to discourage drivers from stopping when they are feeling fatigued;*
- *Close liaison will be required with the local authorities regarding both rest area locations and rest area provisions, to minimise the impact on the*

services currently provided or proposed within local communities. An assessment could be undertaken to determine if rest areas with minimal facilities and information boards may actually benefit local services;

- *In complying with the minimum DMRB requirement regarding the frequency of rest areas, any proposed locations must also be acceptable in terms of user need, environmental impacts, visibility and proximity to junctions and lay-bys. This is similar to the approach outlined for lay-bys as discussed in Section 4.11.6;*
- *Consultation with the Scottish Freight and Logistics Advisory Group (SCOTFLAG) and HITRANS should be sought to ensure that the rest areas developed correlate well with commercial vehicle driver's requirements and demands along the route; and*
- *Provisions for bad weather parking should also be considered and their feasibility assessed regarding utilisation during severe weather events and at other times of the year.*

4.12.6 Summary of Rest Area Strategy

Rest areas are important safety features of long roads such as the A9 where drivers can pull off the mainline and park in safety, mitigating the accident risks associated with fatigue. Unlike lay-bys, rest areas are designed for longer stops and although they are less frequent they do require more land for construction. As such, it will be important to identify suitable locations for rest areas at an early stage of the DMRB Stage 2 Assessment process.

A number of additional considerations must also be considered including commercial vehicle driver requirements and provision for bad weather parking. In particular, the practicality and affordability of developing more than the minimum amount of rest areas recommended by DMRB, to accommodate viewpoints, should be discussed at the earliest possible stage with Transport Scotland to allow policy to be developed.

4.13 NMU Provision

4.13.1 Summary

This chapter presents an assessment of the existing NMU facilities within and around the A9 trunk road between Perth and Inverness and describes the strategy for addressing NMU provision within the scheme extents.

Details of current NMU facilities have been obtained from various local authorities and stakeholders, allowing NMU baseline plans to be produced. Further consultation is ongoing at the time of writing this report. NMU facilities have been identified within each of the scheme's eighteen sections. The locations of NMU facilities within different sections of the scheme vary considerably: within some sections NMU facilities are in close proximity to the existing A9, whilst other sections NMU facilities are remote from the existing A9.

Existing NMU facilities comprise core paths, which include rights of way by foot, horseback, cycle or any combination of those; rights of way and National Cycle Network routes (NCN) that are not designated as core paths; and informal NMU routes.

143 existing NMU crossing points have been identified within the scheme extents, taking the form of both grade separated and at-grade crossings. It appears that many of the NMU crossing points are utilised by all types of NMUs.

An emerging NMU strategy is being developed, to provide a consistent approach to NMU provision within the A9 corridor.

The main principles of the strategy are as follows:

- *There will be no surface crossing of the dualled A9;*
- *At crossings of the dualled A9, NMU routes will be combined where possible;*
- *Junctions and accommodation works underpasses will be utilised, where possible, to provide these crossing points;*
- *Over or under road (grade separated) crossing points solely for NMUs will be provided where site specific consideration can be demonstrated.*

4.13.2 Existing NMU Routes

The A9 between Perth and Inverness travels through or is adjacent to National Scenic Areas, areas of Ancient Woodlands, SSSI and the Cairngorms National Park. The route passes through an outstanding natural landscape, which attracts NMUs.

There are numerous recreational NMU routes present; recreational walkers, cyclists and equestrians make use of the NMU facilities in the vicinity of the A9. The Cairngorms National Park area is particularly attractive to recreational NMUs.

Many NMU routes are frequented by active travellers (walkers and cyclists), who use existing NMU routes for daily commutes. It should be noted that the demand for NMU facilities from active travellers who commute is primarily on the approaches to Perth and Inverness.

It should be noted that the majority of NMU routes identified are core paths, which, as explained in Section 2.2.3, include rights of way by foot, horseback, cycle or any combination of those. The core paths form Core Path Networks, which have been identified by Perth & Kinross Council, CNPA and The Highland Council.

As mentioned in Section 2.2.3, the NCN currently extends the length of the A9 (i.e. routes 1, 7 and 77), comprising both on-road (unsegregated from traffic) sections and off-road sections (segregated from traffic). By and large the off-road sections of NCNs 7 and 77 run in parallel with the existing A9 corridor. As a result there are a number of sections in which the NCNs are within the proposed online A9 corridor. However, there are also sections of NCN 7 and NCN 77 that are on-road sections which utilise the local road network and are outwith the proposed online A9 corridor. NCN 1 also forms part of the NCN between Perth and Inverness, albeit for a very short length to the east of Culloden. It should be noted that there are other existing NMU routes utilised by cyclists between Perth and Inverness that do not form part of the NCN. Further assessment of the impact of the proposed online A9 corridor to the existing NCNs will require to be undertaken during the DMRB Stage 2 and 3 Assessments.

Information on NMU patterns and common crossing points has been obtained from various local authorities and stakeholders, including Perth and Kinross Council, The

Highland Council, CNPA, and various walking, cycling, and equestrian groups. Currently 143 NMU crossing points have been identified along the 177km long route. The crossings primarily connect core paths, with some informal NMU routes also connected by existing NMU crossing points. The crossing points comprise a mixture of at-grade and grade separated crossings. It is believed that the majority of crossings are utilised by all types of NMUs.

The Existing NMU Provisions ***Table 4.13.1*** provides a breakdown of the NMU crossing points throughout the length of the scheme. The information contained within this table is supplemented by the Existing NMU Provisions drawings, found within **Appendix B**.

From the details provided in **Appendix B** it can be seen that there are areas within the scheme where there is a considerable gap between NMU crossing points; some exceeding 5km. It is recommended that these areas are further assessed in DMRB Stages 2 and 3 in conjunction with desire lines, to determine if any additional NMU crossing points are required.

Table 4.13.1 (below) illustrates the number of NMU crossing points within each of the scheme's eighteen subsections.

Subsection		Start and End Chainages	Length	No. NMU Crossing Points
1	Perth to Luncarty	0-3,400m	3,400m	4
2	Luncarty to Pass of Birnam	3,400m-12,780m	9,380m	6
3	Pass of Birnam	12,780m-14,600m	1,820m	1
4	Pass of Birnam to Tay Crossing	14,600m-23,000m	8,400m	10
5	Tay Crossing to Ballinluig	23,000m-30,600m	7,600m	0
6	Ballinluig to Pitlochry	30,600m-36,400m	5,800m	2
7	Pitlochry to Killiecrankie	36,400m-42,550m	6,150m	6
8	Pass of Killiecrankie	42,550m-44,230m	1,680m	1
9	Killiecrankie to Glen Garry	44,230m-66,020m	21,790m	19
10	Glen Garry	66,020m-75,000m	8,980m	2
11	Glen Garry to Crubenmore	75,000m-95,450m	20,450m	11
12	Crubenmore	95,450m-99,100m	3,650m	3
13	Crubenmore to Kincraig	99,100m-115,000m	15,900m	17
14	Kincraig to Dalraddy	115,000m-122,500m	7,500m	15
15	Dalraddy to Slochd	122,500m-147,200m	24,700m	25
16	Slochd to Tomatin	147,200m-152,200m	5,000m	5
17	Tomatin to Moy	152,200m-161,500m	9,300m	8
18	Moy to Inverness	161,500m-173,000m	11,500m	8

Table 4.13.1 Summary of NMU Crossing Points

From **Table 4.13.1** it appears that, in general, the percentage of the route length occupied by each section correlates with the percentage of NMU crossing points within each subsection i.e. there is a relatively equal spread of NMU crossing points throughout the length of the scheme. However, for Subsections 13, 14 and 15 there is a relatively high percentage of NMU crossing points for the section length, whilst for Subsections 5, 6, 11 and 18 there is a relatively low percentage of NMU crossing points for the section length. It is recommended that these areas are assessed in any future work regarding proposed NMU facilities, to ascertain whether an increase or decrease in the number of crossing points is required within these sections.

Consultation is ongoing with a number of third parties including The Highland Council, Perth and Kinross Council and CNPA, to ensure all known NMU provisions in the vicinity of the A9 between Perth and Inverness have been identified.

(a) Perth to Luncarty

NMU facilities contained within this section consist of the following:

- *An NMU route which runs parallel to the east of the existing A9;*
- *NCN 77 which crosses the A9 near Inveralmond Roundabout; and*
- *4 crossing points; 2 underbridges and 2 at-grade.*

(b) Luncarty to Pass of Birnam

NMU facilities contained within this section consist of the following:

- *An NMU route which runs parallel to the east of the existing A9 before crossing under the A9 and connecting to a core path;*
- *NCN 77 which follows the B867 alignment to the west of the existing A9; and*
- *6 crossing points; 5 at-grade, 1 underbridge.*

(c) Pass of Birnam

NMU facilities contained within this section consist of the following:

- *A core path which connects with NCN 77;*
- *NCN 77 which follows the B867 alignment to the west of the existing A9;*
- *An NMU route which passes under the A9 alongside the Highland Main Line railway; and*
- *1 underbridge crossing point.*

(d) Pass of Birnam to Tay Crossing

NMU facilities contained within this section consist of the following:

- *NCN 77 which runs parallel to the west of the existing A9 before crossing under the A9 and running parallel to the east; and*
- *10 crossing points; consisting of both at-grade and grade separated.*

(e) Tay Crossing to Ballinluig

The only NMU facility contained within this section is a route located east of the existing A9. NCN 77 is located out with the corridor on the opposite side of River Tay and the Highland Main Line railway and no crossing points have been identified.

(f) Ballinluig to Pitlochry

NMU facilities contained within this section consist of the following:

- *An NMU route which runs parallel to the east of the existing A9;*
- *NCN 77 which connects directly into NCN 7 to the west of the A9 but on the opposite side of the River Tay; and*
- *2 crossing points; an overbridge and an underpass.*

(g) Pitlochry to Killiecrankie

NMU facilities contained within this section consist of the following:

- *NMU routes which are located within the first 4km length of this section and are primarily on the east side of the existing A9, NCN 7 is included within this section;*
- *NMU routes which are located within the final 2km length of this section and are to the west of the existing A9;*
- *6 crossing points; 5 underbridges and 1 at-grade crossing.*

(h) Pass of Killiecrankie

NMU facilities contained within this section consist of the following:

- *An NMU route which is located on the east side of the existing A9;*
- *Three NMU routes which are located to the west side of the existing A9 of which one is NCN 7; and*
- *1 at-grade crossing point.*

(i) Killiecrankie to Glen Garry

NMU facilities contained within this section consist of the following:

- *NCN 7 which is located on the west side of the existing A9 for the first 3.5km of this section;*
- *Core paths, which are predominantly to the west, and NCN 7 to the east, for the next 9.4km;*
- *An NMU route which runs adjacent to the existing A9 to the west for the remainder of this section; and*
- *19 crossing points; 11 underbridges/underpasses and 8 at-grade.*

(j) Glen Garry

NMU facilities contained within this section consist of the following:

- *An NMU route that is part of the core path network and NCN 7, which runs parallel with the existing A9 to the west side; and*
- *2 crossing points; 1 underbridge and 1 at-grade.*

(k) Glen Garry to Crubenmore

NMU facilities contained within this section consist of the following:

- *An NMU route on the west side of the existing A9, which constitutes part of the core paths network and NCN 7;*
- *Two NMU routes on the east side of the existing A9 which run perpendicular to the A9; and*
- *11 crossing points; 3 underbridges/underpasses and 8 at-grade.*

(l) Crubenmore

NMU facilities contained within this section consist of the following:

- *An NMU route which runs to the west side of the existing A9 through this section for its entire length;*
- *One NMU route to the east side of the existing A9 which is perpendicular to the road; and*
- *3 at-grade crossing points.*

(m) Crubenmore to Kincraig

NMU facilities contained within this section consist of the following:

- *An NMU route which runs to the west side of the existing A9 and constitutes part of the core paths and NCN 7;*
- *NCN 7 then crosses the existing A9 in the vicinity of Ruthven Barracks and heads in an eastern direction;*
- *NMU routes for the final 7km length of this section which are on the east and west side of the existing A9 in the form of core paths; and*
- *17 crossing points; 8 underbridges and 9 at-grade.*

(n) Kincraig to Dalraddy

NMU facilities contained within this section consist of the following:

- *NMU routes, comprising core paths, on the west and east side of the existing A9, with various NMU routes on the approach to Kincraig from the south side; and*
- *15 crossing points; 6 underbridges and 9 at-grade.*

(o) Dalraddy to Slochd

NMU facilities contained within this section consist of the following:

- *NMU routes at the start of the section to the west side of the A9, in the form of core paths;*
- *Several NMU routes present in and around Aviemore on both sides of the existing A9.*
- *NCN 7 runs through Aviemore and rejoins the A9 corridor near Kinveachy and continues to run parallel to the existing A9 before accessing Carrbridge;*
- *North of Aviemore there are NMU routes located to the west of the A9;*
- *North of Kinveachy there is one NMU route on either side of the existing A9;*

- *Several NMU facilities in and around Carrbridge on the east side of the existing A9. On the west side, there are also NMU facilities present which will provide access to Carrbridge;*
- *Between Carrbridge and Slochd there is only one NMU route, which runs along the east side of the existing A9 for a distance of approximately 5km, before crossing the A9 at Slochd (in the form of an underbridge) and then runs parallel to the existing A9; and*
- *25 crossing points; 17 underbridges and 8 at-grade.*

(p) Slochd to Tomatin

NMU facilities contained within this section consist of the following:

- *An NMU route to the west which constitutes part of the core path network and NCN 7 and provides access to Tomatin as it travels northward;*
- *An NMU route to the east which runs parallel to the existing A9 before crossing the existing A9 to provide access to Tomatin; and*
- *5 crossing points; 3 underbridges and 2 at-grade.*

(q) Tomatin to Moy

NMU facilities contained within this section consist of the following:

- *An NMU route to the west which constitutes part of the core path network and NCN 7.*
- *NCN 7 which continues through Moy, before following the B9154 (adjacent to Loch Moy) away from the existing A9; and*
- *8 crossing points; 2 underbridges and 6 at-grade.*

(r) Moy to Inverness

NMU facilities contained within this section consist of the following:

- *Between Daviot and Bogbain there are core path routes located on the west side of the existing A9;*
- *On the southern outskirts of Inverness there is a single NMU facility, which crosses the A9; and*
- *8 crossing points; 3 underbridges and 5 at-grade.*

NCN 7 lies to the east of the A9 outwith the corridor and connects with NCN 1.

4.13.3 Proposed NMU Provision

The existing A9 has numerous at-grade junctions, crossings and major/ minor accesses that are utilised by both NMUs and motorised users. Where practical, on completion of dualling the A9 between Perth and Inverness, interaction between NMUs and motorised users will be eliminated.

Following feedback from stakeholder consultations, it is the intention that NMU facilities will be as direct as possible; where practicable, these facilities will be close to the dual carriageway but not immediately adjacent. Moreover, the inclusion of safe crossing facilities will also form a major part of any proposed NMU provision. It is envisaged that these crossing points will be grade separated (in accordance with DMRB design guidelines for Category 7A All Purpose Dual Carriageways).

To achieve the NMU strategy it is recommended that consideration is given to the following during DMRB Stage 2 and 3 Assessments:

- *Requirements of NMU facilities for NMU users for both recreational and commuting purposes, including considering the location of schools and community facilities;*
- *Creation of a NMU network which will facilitate sustainable transport, walking and cycling initiatives, integration with public transport facilities to ensure it satisfies the Scottish Government's aim of promoting active travel;*
- *Undertaking a thorough assessment of each NMU route comprising of environmental, engineering and economic assessments and to determine if a proposed route can be incorporated into the scheme;*
- *Ensuring that NMU design work considers the needs of the most vulnerable users and that any NMU facilities are fully compliant with the requirements of the Equality Act 2010 through the application of Transport Scotland's "Roads for All, A Good Practice Guide for Roads";*
- *Investigating opportunities to combine NMU facilities for different types of NMUs, taking account of actual and latent NMU flow to establish whether or not shared use facilities should be segregated and also the form of segregation to be use; and*
- *Undertake a review of the NCN routes and ensure an alternative route is provided.*

4.14 Roadside Features

4.14.1 Summary

The Roadside Features section of the report considers the existing infrastructure and the proposed features which will be required for the dualling of the A9. This part shall highlight the relevant standards and guidance applicable for infrastructure on the new route and, in particular, the considerations that will have to be undertaken during the future design stages of the scheme. The following highlights the key issues which will require consideration to implement the appropriate infrastructure on the new A9 route:

(a) Traffic Signs

- *Suitability of existing traffic signage for retention;*
- *Requirement for an increased number of traffic signs based on the new alignment and dualling;*
- *Determining whether traffic signage requires illumination based on the requirements of legislation and design standards;*

- *Introduction of bilingual traffic signs; and*
- *Consultation with relevant local authorities and the importance of producing a consistent sign strategy between the new route and local road network.*

(b) Road Markings and studs

- *The existing condition of road markings and suitability of retention.*

(c) Bollards and Marker Posts

- *The introduction of distance marker posts to direct users to the nearest Emergency Roadside Telephone and Network Operators to the location of carriageway defects.*

(d) Road Restraint Systems

- *Whether current Road Restraint sections on existing dual carriageway sections should be assessed under TD 19/06 'Requirements for Road Restraints Systems'; where the carriageway is not being altered permanently as part of the final scheme;*
- *Provision of Very High Containment road restraint systems being required by TD 19/06 at carriageway locations which cross or run adjacent to the Highland Main Line railway;*
- *Type of Road Restraint System to be introduced;*
- *Containment Level to be proposed for the Central Reserve; and*
- *Location of access points ('gaps') in the Central Reserve for emergency and maintenance crossing points.*

(e) Emergency Roadside Telephones (ERTs)

- *Location strategy for ERTs on the new route.*

(f) Variable Message Signs

- *Scheme wide Intelligent Transport System Strategy to be agreed between Transport Scotland and Traffic Scotland. Part of this strategy will cover the provision and location on the scheme for Variable Message Signs. Consideration shall also be made to the suitability of retaining existing equipment based on functionality, condition and the finalised route.*

(g) Snow gates and snow poles

- *The location of snow gates to be agreed as part of the scheme – this would include the suitability of each location for the provision of a facility in the central reserve to allow vehicles to perform a u-turn.*

(h) Weather Stations

- *The location of existing weather stations and equipment to be assessed for the suitability of being retained as part of the final scheme and also consideration to the introduction of new/replacement stations.*

(i) Police Observation Platforms

- *Introduction of additional Police Observation Platforms on the proposed scheme to supplement the two existing platforms.*

(j) Street Lighting

- *Assessment to determine lighting requirements.*

(k) Safety Cameras

- *A9 Safety Group to be consulted over the existing and proposed safety cameras (Average Speed cameras announced 26 July 2013 and is to be introduced between Perth and Inverness by summer of 2014) and establish safety camera requirements for the final scheme.*

(l) CCTV Cameras

- *Assessment of existing locations on the current route, whether these can be retained as part of the final scheme and also the requirement for new cameras.*

4.14.2 Introduction

There are a significant amount of roadside infrastructure features on the existing A9 corridor between Perth and Inverness. This infrastructure is important for the safe operation of the route and also assists in conveying important messages to users on the route. These roadside infrastructure features include:

- *Traffic Signs;*
- *Road Markings and Studs;*
- *Bollards;*
- *Road Restraint Systems (Safety Barriers);*
- *Emergency Roadside Telephones;*
- *Variable Message Signs (Intelligent Transport Systems);*
- *Snow Gates and Snow Poles;*
- *Weather Stations;*
- *Street Lighting; and*
- *Safety Cameras and CCTV Cameras.*

The requirement for roadside features arises from the DMRB, British Standards, Statutory Regulations and Legislation and Design Guidance documents, such as Interim Advice Notes, Local Transport Notes and policy documents (Transport

Scotland's Trunk Road Tourist Sign Policy document) which prescribe best design practice.

4.14.3 Existing Features

(a) Traffic Signs

Throughout the existing A9 corridor between Perth and Inverness, there are a significant number of traffic signs. These traffic signs provide information to traffic (joining and leaving the A9) at junctions and information such as the location of tourist attractions, maximum speed limit and warnings of specific hazards, such as an approach to a reduction in lanes from dual to single carriageway. Existing on the corridor at present are Advance Direction Signs, Directional Signs, Regulatory Signs, Warning Signs and Tourist Signs.

Photo 4.14.1 Existing Signage on the A9

(b) Road Markings and Studs

The A9 corridor features road markings and studs throughout the corridor which defines the carriageway lanes (on both single and dual carriageway sections), the extent of the carriageway width and markings for the safe operation of junctions. Examples of the road markings on the corridor include edge of carriageway markings, junction markings (Give way), box junctions, merge and diverge tapers at junctions, destination/route number markings (arrows), lane separation markings and tapered hatching markings at the start and end of dual carriageway sections. Road studs supplement these markings and assist with visibility of the markings at night.

(c) Bollards and Marker Posts

Bollards feature throughout the section of A9 between Perth and Inverness. Bollards are present to highlight the presence of traffic islands at junctions and highlight minor accesses throughout the route. Marker posts are used in the verges at a particular hazard on the route, such as lay-bys and sections where there is a tight bend in the road.

(d) Road Restraint Systems

Road Restraint Systems (RRS) are located throughout the existing A9 between Perth and Inverness. The systems mitigate the risks associated with various hazards including embankment slopes, watercourses, roadside infrastructure and, in the case of dual carriageways, cars travelling in the opposite direction.

There are a number of different types of RRS present including Tension Corrugated Beam, Open Box Beam and Wire Rope. They can be found on the near side verges of the single carriageways and also in the central reserve of dual carriageways.

In addition there are extensive sections of parapet where the carriageway is carried by structures, for example, over water bodies, adjacent carriageways and the Highland Main Line railway. Specific examples of large structures on the existing corridor which feature parapets include Killiecrankie Viaduct, River Tay Crossing, River Tummel crossing, Tomatin Viaduct and Metal Bridge at Slochd.

Over the length of the A9, the containment class of the RRS includes Normal Containment (N2), Higher Containment (H1 or H2) and Very High Containment (H4a). The containment levels are set on the basis of the maximum impact energy the RRS can withstand subject to satisfying the dynamic testing requirements prescribed by BSEN1317.

Photo 4.14.2 Existing Verge RRS on the A9

Photo 4.14.3 Existing Central Reserve Wire Rope RRS

(e) Emergency Roadside Telephones (ERTs)

There are currently 12 ERTs along the route. On single carriageway sections, 6 ERTs are provided in combination with lay-bys and the remaining two are located north of Lay-by 84 and at Snow Gate 3 as shown in **Table 4.14.1** below. All of the dual carriageways ERTs are located within existing lay-bys.

Emergency Roadside Telephone Reference	Location	Chainage	Direction	Carriageway Section Type
ERT 1	In Lay-By 8	7,900	Southbound	Single
ERT 2	In Lay-By 42	42,500	Southbound	Single
ERT 3	In Lay-By 56	57,750	Northbound	Single
ERT 4	North of Lay-By 84	82,500	Northbound	Single
ERT 5	At Snow Gate 3	85,675	Northbound	Single
ERT 6	In Lay-By 101	97,400	Northbound	Single
ERT 7	In Lay-By 137	133,900	Southbound	Single
ERT 8	In Lay-By 138	134,150	Northbound	Single
ERT 9	In Lay-By 152	147,250	Southbound	Dual
ERT 10	In Lay-By 153	147,600	Northbound	Dual
ERT 11	In Lay-By 178	167,950	Southbound	Dual
ERT 12	In Lay-by 179	168,050	Northbound	Dual

Table 4.14.1 ERTs Located on the A9 between Perth and Inverness

Photo 4.14.4 Existing ERT within Type B Lay-By

(f) Variable Message Signs

There a number of Variable Message signs (MS3) on the A9 corridor at present. These signs are operated by Traffic Scotland forming part of an Intelligent Transport System (ITS) and are primarily used to provide strategic messages to drivers but also to convey safety messages to drivers. Strategic messages include journey time information and advice of road closures across the Trunk Road Network.

The signs are located on the existing A9 between Perth and Inverness at Inveralmond (Northbound and Southbound), Killiecrankie (Northbound), Kingussie (Southbound), Alvie (Northbound), B9152 at Aviemore (Southbound), A95 at Aviemore (Westbound), Milton of Leys (southbound) and Insch Holdings (Northbound). The signs are also accompanied by communication and electrical control equipment at each location.

Photo 4.14.5 Existing VMS on the A9

(g) Snow Gates & Snow Poles

There are four areas on the route that employ snow gates (**Table 4.14.2**) which can be closed during extreme weather conditions. The gates prevent vehicles from travelling further along the route which is under prevalent weather conditions and are generally closed by the Police or the Trunk Road Operating Company under Police Instruction. This ensures the safety of vehicles and its occupants during extreme weather. It also assists response agencies (Emergency & Breakdown Services) by ensuring vehicles do not become stranded on affected sections of carriageways. The closure of sections of carriageway during extreme weather conditions also assists the Trunk Road Operating Company to clear the affected sections without having to avoid stranded vehicles.

Snow Gates Reference	Location	Chainage	Direction	Other Details
Snow Gate 1	Beside the junction with the B8079 to Blair Atholl	47,800	Northbound and Southbound	Single Carriageway; Junction area provides turning room for NB traffic and slip onto B8079 for SB traffic.
Snow Gate N2	Beside the junction to Trinafour / Dalnacardoch Estate	67,000	Northbound	Dual-Carriageway; beside a wide junction with auxiliary lane junction.
Snow Gate S2	Start of diverge taper for right turn lane at junction to Trinafour / Dalnacardoch Estate	67,300	Southbound	Dual-Carriageway; once gates closed no easy way for traffic to about turn.
Snow Gate 3	Located south of the junction with the A889 into Dalwhinnie	85,675	Northbound and Southbound	Single Carriageway; ERT phone at site; no facility for traffic to u-

				turn
Snow Gate 4	Located south of the junction with the B9150 into Newtonmore	101,900	Northbound and Southbound	Single Carriageway; no facility for traffic to u-turn

Table 4.14.2 Snow Gates Located on the A9 between Perth and Inverness

Snow poles are also located on the existing carriageway between Perth and Inverness in the areas of the Drumochter Pass and the Slochd Summit. The snow poles provide a high visibility guide of the extent of the carriageway cross section to vehicle drivers during periods of poor weather conditions (blizzards/drifting snow/fog). The poles also assist the Trunk Road Operating Companies Winter Maintenance Operatives when clearing the road of snow.

Photo 4.14.6 Existing Snow Gate on the A9

(h) Weather Stations

The A9 between Perth and Inverness is a lowland to highland route, which provides a large variance in altitude across the route. This variance in altitude can provide differing weather conditions across the length of the route and to adequately assess the weather there are currently a number of weather stations located across the route. The information provided by each weather station assists Transport Scotland's Trunk Road Operating Companies and Traffic Scotland to provide an effective winter maintenance regime and provide information to the public. Each weather station provides air temperature, road temperature, wind speed and precipitation state information. There are a total of seven weather stations between Perth and Inverness on the A9 at Inveralmond, Dunkeld, Calvine, Drumochter, Avielochan, Slochd and Daviot.

Photo 4.14.7 Existing Weather Station on the A9

(i) Police Observation Platforms (POPs)

There are currently two POPs on the A9 between Perth and Inverness (**Table 4.14.3**) which are located on sections of existing dual-carriageway and will likely be unaffected by the scheme.

Police Observation Platform Reference	Location	Chainage	Direction	Other Details
POP 1	Ballinluig to Tummel Crossing	32,600	Southbound	Dual-Carriageway
POP 2	Nairn Crossing to Inverness	168,750	Northbound	Dual-Carriageway; Located just after a small access

Table 4.14.3 Summary of Existing Police Observation Platforms

(j) Street Lighting

The majority of the existing A9 route between Perth and Inverness does not feature any street lighting. A short section of lighting exists in both verges in the vicinity of the Inveralmond Junction. The recently constructed Ballinluig grade separated junction features lighting on the slip roads and the gyratory only.

(k) Safety Cameras

The existing A9 has a varying speed limit between the sections of single carriageway and dual carriageway for cars (60-70mph). As part of the safety improvements of the existing carriageway, there is a speed prevention programme in force on the road. This programme is overseen by the Scottish Safety Camera Partnership and is delivered by Tayside and Northern Safety Camera Partnerships. This programme includes enforcement of speed limits on the carriageway through fixed and mobile safety cameras. Police Scotland are responsible for the enforcement of the speed limit of the road. There are two static cameras on the carriageway between Perth and Inverness location at Dunkeld (Northbound) and Blair Atholl (Southbound). Mobile cameras are also located throughout the route at appropriate locations such as minor accesses and lay-bys.

The locations of safety cameras are chosen where there is evidence (through statistics) that the location has a high accident rate. In addition, other locations are selected where it is viewed that there is an increased accident risk due to driver behaviour or carriageway alignment.

Photo 4.14.8 Existing Speed Camera on the A9

(l) CCTV Cameras

Between Perth and Inverness there are a number of CCTV cameras on the route. These cameras provide the Trunk Road Operating Company and Traffic Scotland with live eye views of the carriageway at particular locations. This can be used to observe traffic flows, congestion due to carriageway incidents and weather conditions. This can assist the two parties enabling necessary management plans to be put in place to ensure effective operation of the carriageway or implement

appropriate diversions. The view from each camera is also available to the public through the Traffic Scotland website. A camera is installed at eight locations across the existing section. These locations are Ballinluig Junction, Aldclune, Drumochter (Northbound and Southbound), Kingussie, Avielochan Northbound and Southbound), Slochd (Northbound and Southbound), Daviot (Northbound and Southbound) and Milton of Leys.

4.14.4 Proposed Infrastructure

(a) Traffic Signs

The provision of traffic signs will generally be required for all new junctions and new sections of carriageway. An assessment of the condition and information presented on traffic signs on existing online sections will be undertaken in relation to suitability for the dualled scheme. Existing signage which is to be retained will have to be consistent with proposed signage across the route.

The signs on the existing single carriageway sections will require to be replaced to meet design standards for dual carriageway and grade separated junctions. Small signage (warning/regulatory) would be required for specific restrictions or hazards on any new section. In addition, there is a commitment to providing bilingual traffic signs on the route and this would require the provision of new signs on offline sections and the replacement of existing signs on online sections.

Traffic Sign design will be undertaken in accordance with the following:

- *TD 22/06 'Layout of Grade Separated Junctions';*
- *Traffic Signs Regulations and General Directions(TSRGD); and*
- *Traffic Sign Manual and the Local Transport Note 1/94 'The Design and use of Directional Informatory Signs'.*

Notwithstanding the governing standards, the design of Tourist Signs on the route should be provided in accordance with Transport Scotland's Trunk Road and Motorway Tourist Signposting Policy and Guidance document.

The provision of passively safe sign posts will also be reviewed which reduces the risk to vehicle occupants during impact of an errant vehicle. This is also likely to reduce/remove the need for RRS to protect errant vehicles from colliding with signage. Passively safe sign posts proposed will be provided in accordance with TD 89/08 'Use of passively safe signposts, lighting columns and traffic signal posts to BS EN 12767:2007'.

Consultation with the stakeholders affected by the scheme will also be undertaken. This will include local authorities, Transport Scotland's Network and Bus Operations, CNPA (visual impact of signage), Visit Scotland (confirmation that Tourist Attractions meet the necessary criteria of Transport Scotland's Policy and Guidance document) and Sustrans (provision of cycle signage). An assessment of the impact on the wider network of a new signage strategy should also be undertaken. This would include a review of the trunk road network and the local road network.

(b) Road Markings and Studs

On online sections to be upgraded from single carriageway to dual carriageway and for all new offline sections the design of the road markings and studs shall be provided in accordance with the current version of the TSRGD and Traffic Sign Manual Chapter 5. The road marking and stud design will be undertaken once the scheme has been defined following the assessment in accordance with TD 9/93 'Highway Link Design' and TD 22/06 'Layout of Grade Separated Junctions'.

An assessment of the condition of existing road markings and studs for existing dual carriageway on online sections will be required. This will be done in accordance with current specifications. The existing marking design will also be reviewed to ensure that they comply with the current versions of the TSRGD and Traffic Sign Manual Chapter 5.

Consultation will also be undertaken with respect to the design of road markings and studs with relevant stakeholders such as local authorities and Transport Scotland Network and Bus Operations.

(c) Bollards and Marker Posts

Bollards are necessary to highlight the presence of traffic islands to users of the route and minor junctions. The junction strategy restricts access to the corridor and provision of left-in/left-out minor junctions will be restricted which will remove existing traffic islands and subsequent bollards. Bollards will need to be provided on any traffic islands located off the mainline at grade separated junctions. Verge marker posts should be provided at locations of hazards and locations of lay-bys. Consideration to distance marker posts across the proposed scheme should also be given to assist users (reference point for contacts emergency/breakdown services and direction to nearest ERT and Trunk Road Maintenance Operator (to locate and fix defects on the carriageway).

(d) Road Restraint Systems

The requirement for the provision of RRS is detailed in DMRB, TD 19/06 'Requirements for Road Restraint Systems'. This design standard features a software based assessment tool known as RRRAP (Road Restraint Risk Assessment Process) which adopts a risk based approach to the hazards that are identified by the user. Following the input of the required information such as road type, road speed and hazard offset, the RRRAP provides an output detailing where RRS must be located and the minimum containment level.

All new sections of carriageway will require to be fully assessed in accordance with TD19; however, existing online sections of dual carriageway will only require to be assessed where the highway cross-section is being altered permanently, existing RRS life has expired, at the introduction of a new hazard or if existing RRS needs to be dismantled. Despite this, it would be advisable to undertake a full assessment of the entire corridor to ensure a consistent level of safety.

The following factors should also be considered in the design of RRS:

- *Consideration should be given to aesthetics and consistency in the type of barrier, for each containment level, along the entire length of the scheme;*
- *All RRS or parapet to be retained should be condition assessed;*

- *Very high containment level parapets must be provided on all structures crossing or adjacent to railways; the outputs from the RRRAP should also be scrutinised to validate the suitability of RRS in the vicinity of railways;*
- *Consideration should be given to the particular type of RRS in terms of the risk to motorcyclists;*
- *RRS must be provided in the central reserve of most dual carriageway roads in accordance with Clause 3.57 of TD19/06 of the DMRB; however, it is only on certain motorway standard roads where higher containment is required. Nonetheless, should a decision be taken to use high containment barriers in the central reserve of the A9, the implications of using solid barriers with respect to the collection of snow drift should be considered; and*
- *The location of maintenance crossing points and the ease in which they can be manually opened will be particularly important to the winter maintenance strategy and to allow traffic to use one carriageway in contraflow, should the other carriageway be closed in a maintenance/emergency situation.*

(e) Emergency Roadside Telephones (ERT)

There is currently limited standards and guidance on the design of ERTs on motorways and all purpose Trunk Roads in Scotland. Presently DRMB, Vol 9, Section 4, TA 73/97 Annex A (England only), “Motorway Emergency Telephones” exists which within the document makes reference to Annex B for Scotland. However there is no evidence available to demonstrate that Annex B is in development or has been published.

On this basis it will be important to consider TA 73/97 Annex A and continue ongoing discussions to create an appropriate strategy for introducing on an all purpose trunk road. As part of the creation of the strategy, it will also be important for the following considerations to be undertaken:

- *Co-location of ERTs on each side of the carriageway to reduce the risk of pedestrians crossing the carriageway. This will include reviewing existing locations which are being retained;*
- *Spacing of ERTs throughout the route;*
- *Facilities at ERT locations to prevent vehicles obstructing the carriageway and ensuring ‘access for all’;*
- *Proximity of ERTs to the location of local villages/communities; and*
- *Availability of mobile network coverage across the route.*

(f) Variable Message Signs

The requirement for Variable Message signs will form part of the ITS strategy for the scheme, which is currently being considered by Traffic Scotland. As part of this strategy, an assessment of the existing condition of Variable Message signs to be retained on online dual carriageway sections will be undertaken. The impact of proposed Variable Message Signs on other roadside features should also be considered (such as the location of Advance Direction Signs and requirement for Road Restraint System provision).

(g) Snow Gates & Snow Poles

The provision of snow gates and snow poles will be reviewed in later stages of the assessment and design process. The infrastructure should be provided at suitable locations and where there is historical weather data to demonstrate that a section of the corridor is susceptible to inclement weather conditions. A suitable location for snow gates is where it is possible to include a crossover area in the central reserve to allow vehicles to perform a u-turn to divert away from the closed section. An example of this has recently been constructed on the A66 in Cumbria. This would avoid vehicles having to stack until the road conditions were suitable to re-open the section. Investigations could also be undertaken to see if the process of opening and closing the gates could be operated remotely. The introduction of snow fences at locations which are prone to snow drifting on the route could also be considered which could contribute to reducing the frequency of snow gate road closures.

(h) Weather Stations

An assessment of the positioning of the existing weather stations should be undertaken to establish whether they can remain at the existing locations with the upgrade from single to dual carriageway. It should be noted that with the exception of the Dunkeld weather station the rest are currently located on proposed online sections of the scheme.

It will be important to consider if additional weather stations are also required to form part of the final scheme. This will required discussions and agreement with Transport Scotland. It is important to ensure that any existing weather stations to be relocated or the addition of new ones do not clash with other roadside features.

(i) Police Observation Platforms

Impacts to the two existing POPs on the route between Perth and Inverness are not anticipated since the platforms are located on sections of existing dual carriageway. However, further consultation with the Police will be required to establish whether these locations are still suitable or additional facilities are required.

(j) Street Lighting

It is intended that the proposed route corridor shall not be illuminated with street lighting; however consideration should be given to the introduction of street lighting at junction locations on the scheme which may be necessary in accordance with the relevant traffic sign legislation.

As part of this consideration for the introduction of street lighting at the locations of junctions, a Lighting Appraisal should be undertaken in accordance with TD 49/07 ‘Appraisal of New and Replacement Lighting on the Strategic Motorway and All Purpose Trunk Road Network’.

The design of street lighting should be undertaken in accordance with TD 34 ‘Design of Road Lighting for the Strategic Motorway and All Purpose Trunk Road Network’ and BS5489 ‘Code of Practice for the Design of Road Lighting’. Consultation will also be required to be undertaken with affected stakeholders such as local authorities.

(k) Safety Cameras

The A9 Safety Group (see Section 2.11) was set up in July 2012 and will be responsible for discussions and consideration of the potential benefits for the provision of safety cameras on the scheme.

Sections on the finalised route where the Group may consider safety cameras necessary to influence driver behaviour are busy junctions with merging and diverging traffic and long straight sections of carriageway - where it may be attractive for users to break the speed limit and increase the risk of an accident occurring.

The A9 Safety Group will consider the introduction of electronic warning signs (solar powered) which can also contribute to reducing vehicle speeds and accident reduction at hazardous areas on the scheme i.e. locations prone to the congregation of deer. An example of such signage implemented on the Trunk Road network at present is on the A82 at Glencoe.

The A9 Safety Group includes the representatives from the Scottish Safety Camera Partnership who will be able to provide support and assistance to assess the benefits of introducing speed cameras at locations on the scheme. These partners shall also be able to provide information on the required associated infrastructure (cameras, signage & road markings) and advice on enforcement policy.

The A9 Safety Group will also review the existing cameras on the route and the existing purpose they serve, as to whether they are a requirement as part of the final scheme.

(l) CCTV Cameras

The provision of CCTV cameras on the upgraded route will need to consider the existing locations and the possibility of relocating or removing to accommodate the increase in carriageway cross section. It is unlikely that it will be beneficial or financially viable to have 100% CCTV camera coverage of the route. Therefore it should be considered to adopt a similar strategy as the present situation and cover key locations on the network (locations adverse to inclement weather) but also provide coverage of major junctions on the finalised route.

4.15 Intelligent Transport Systems

The minimal existing ITS features along the A9 route, discussed within Section 4.14 Roadside Features, include the following: Variable Message Sign (VMS), CCTV cameras, weather stations and traveller communication items such as ERTs. Future plans for A9 ITS improvements are in initial stages of consideration by Transport Scotland. The potential exists for a future commission to develop an ITS Strategy for the corridor to offer safety and operational benefits.

4.16 Public Utilities

4.16.1 Summary

Utility companies have commercial and legal requirements to maintain service through their apparatus at all times. The presence of public utility apparatus can therefore have a significant impact on the constructability, programme and cost of highway schemes such as the A9 Dualling. It is essential that early consultation is

held with public utility companies to understand the location of apparatus allowing proposals to be developed that protect or divert the apparatus where necessary.

This section will explain the process that has been undertaken to establish the presence of apparatus before summarising the key impacts. The key impacts include areas that contain a large quantity of apparatus or particularly significant apparatus.

4.16.2 Information Gathering

Public utility information is currently being collected at the C2 Preliminary Inquiries stage with further utilities information to be gathered as the scheme design advances.

Utility impacts are critical factors in corridor option selection and future alignment development, due to both community and economic risk factors. These impacts will be avoided whenever feasible. However, if unavoidable utility impacts arise, strong consideration will be given to construction methods for either protection or relocation, depending upon which option is most effective in terms of cost and programme.

4.16.3 SSE HV Line

In January 2010, the Scottish Ministers granted consent to install a 400kV overhead electricity transmission line to replace the existing 132kV overhead transmission line between Beauly and Denny. Construction on the replacement pylons commenced in 2012; the consent states that electricity transmission should begin within six years of commencing construction. Discussions between SSE and Transport Scotland are currently ongoing with respect to the A9 Dualling project.

Photo 4.16.1 Existing SSE Overhead Power Line

Following SSE's upgrade to the high voltage Beauly to Denny power line it will run parallel to and in close proximity to the A9 for approximately 22km which will constrain construction on the southern extent of this subsection from Glen Garry to Dalwhinnie. At least two significant pinch points can be expected where road widening will be constrained by the pylons and the railway (approximate chainages 80000 and 80500). At this location, the A9 is constrained by the Highland Main Line railway to the west and steep landform to the east. Widening the existing single carriageway on the east to achieve a D2AP cross section is therefore the recommended design strategy within this area. Consideration should be given to this key constraint location, specifically between Dalnaspidal Lodge and Dalwhinnie where construction conflicts between the carriageway and a pylon may occur.

In contrast to the noted areas of conflict, there is a segment of carriageway that will be relieved of potential HV line conflict following the Beauly to Denny line implementation. Between Dalwhinnie and Etteridge, the existing HV line crosses the carriageway numerous times. However, this portion of the line will be removed prior to dualling construction as the proposed line turns westward to the north of Dalwhinnie.

4.16.4 Other Known Utilities

As part of the initial information gathering the presence of the following utility apparatus has been identified;

- *Water;*
- *Gas;*
- *Electricity; and*
- *Telecommunication – Telephone and Mobile Communication.*

4.16.5 Advanced Schemes

Detailed utility information for the three advanced schemes is being obtained and analysed at the time of this report. A summary of key utility information within these schemes is provided as follows:

- ***Luncarty to Pass of Birnam:*** *National Grid gas main of nationwide significance has been identified near the Bankfoot Junction; other key facilities include water and telecoms in close proximity and parallel to the road, with occasional crossings; power facilties are also present;*
- ***Pass of Birnam to Tay Crossing:*** *Known utilities at Stage 2 include telecom cables and a mobile phone mast adjacent to the corridor, with three cable crossing locations; three high pressure and one low pressure gas main crossings; above and below ground SSE power lines with eight corridor crossings; two Scottish Water crossings and one combined water/sewer crossing; and*
- ***Kincraig to Dalraddy:*** *Potential conflicts with BT telecom, SSE power and Scottish Water facilities; no gas facilities are present.*

4.17 Offline Corridor Overview

The initial sifting assessment identified three offline corridor options to be progressed to Stage 1, in addition to the online widening alternative (Red Option) within the existing A9 corridor. The three offline corridors are distinguished by colour (Black, Pink, and Green Options), as illustrated in the Key Constraint Plans in **Appendix A**. Each of the offline corridors are located within separate subsections of the route and do not overlap at any point. Offline corridors are intended to be used in conjunction with online corridor widening throughout the remaining lengths of the route. They are therefore considered to be alternative options to online widening at certain feasible locations.

The following Sections 4.18 to 4.20 outline the general offline corridor descriptions and summarise the key engineering issues for each option against the same engineering criteria used in the rest of Section 4 for the online corridors. Section 3.6 provides a preliminary cost estimate comparison for all options.

4.18 Offline Corridor 1: Black Option

4.18.1 Corridor Description

The Black Option is an alternative to the online corridor between Tay Crossing and Ballinluig although the Black Option starts on the northern extents of the Birnam to Tay Crossing section. The corridor is offline, diverging westward from the existing A9 from a location south of the existing River Tay crossing. The offline corridor remains west of the river before heading eastward and crossing near Dowally. The corridor then runs parallel to the existing A9 for approximately 3km and rejoins the existing road where the dual carriageway section begins, south of Ballinluig.

There are minor settlements located sporadically within the extents of the offline corridor. Dowally is centrally located within the section approximately 0.5km southeast of the offline corridor at its closest location.

4.18.2 Topography and Land Use

The Black Option is primarily located within a SEPA Flood Risk Zone. The topography of the land is mainly flat with the exception of steep slopes at the southern limit. The Highland Main Line railway is the dominant feature present as well as the River Tay which will also be a constraint to route option development. The corridor is also in close proximity to Tay Forest Park. The main land use of the corridor is agriculture and forestry.

Consideration needs to be given to the Flood Risk Zone which may result in an elevated carriageway at this location. The topography to the southern limit of the corridor may also result in the need for significant cut and embankment slopes.

4.18.3 Geotechnical Considerations

The main geotechnical features within the Black Corridor include superficial geology mainly of alluvium. Glaciofluvial deposits and Glacial Till deposits are found beyond the river valleys. This offline corridor comprises mostly alluvial deposits.

4.18.4 Water Environment, Hydrology and Drainage

The main watercourse present within the Black Corridor is the River Tay, although several other minor watercourses are also present which will require consideration for new bridges and culverts. The Black Corridor is located within a floodplain and consideration will need to be given to the provision of compensatory storage during the DMRB Stage 2 Assessment.

4.18.5 Alignment

The offline section is approximately 9km in length. At present there are no Departures from Standard identified but further consideration is required during the DMRB Stage 2 assessment. All Departures identified at the southern and northern corridor tie-ins to the existing A9 have been discussed within section 4.6. The natural and built environment constraints such as the river, flood plain and sporadic housing would inform the development of the alignment of this section. Consideration will need to be given to the clearances of the river and railway crossings during the DMRB Stage 2 Assessment.

4.18.6 Structures

It is considered at this stage that two major structures would be required. A new crossing of the River Tay would be required further north of the existing crossing location. A railway structure will be required to carry the proposed road over the Highland Main Line railway at the northern section of the offline corridor. A number of other minor structures would also be required to cross watercourses and traverse the flood plain and any NMU crossing points will be considered during the DMRB Stage 2 Assessment.

4.18.7 Junctions and Accesses

At this initial stage, it is assumed that a grade separated junction would be required where the Black Option diverges away from the A9, south of the Tay Crossing, and merges with the A9 south of Ballinluig. Consideration will need to be given to the connection of the existing B898 at Dalguise and the A837 at Ballinluig to the proposed corridor. Both roads are located at the extents of the Black Corridor and were identified as indicative junction locations through the Junction and Access Strategy for the online corridor. There a number of additional direct accesses along this section of the existing A9 that will be bypassed by the offline section and their access to the proposed corridor will need to be considered during the DMRB Stage 2 Assessment.

4.18.8 Non-Motorised User Provision

An NMU route runs parallel to the corridor for a length of approximately 4.5km, this NMU route also comprises of NCN 77. Consideration will need to be given to NMU crossing points during the DMRB Stage 2 Assessment.

4.18.9 Public Utilities

Public utility information is currently being collected at the C2 Preliminary Inquiries stage with further utilities information to be gathered as the scheme design advances.

Utility impacts are critical factors in corridor option selection and future alignment development, due to both community and economic risk factors. These impacts will be avoided whenever feasible. However, if unavoidable utility impacts arise, strong consideration will be given to construction methods for either protection or relocation, depending upon which option is most effective in terms of cost and programme.

4.18.10 Key Constraints

The key constraints for the Black offline corridor are outlined below:

- *Highland Main Line railway runs to the east of the corridor for approximately 8km;*
- *Corridor crosses the railway at the northern extent;*
- *Corridor crosses and potentially encroaches upon approximately 1.5km of the River Tay, northwest of Dowally;*
- *Potential impacts to two listed buildings;*
- *Approximately 30% of corridor passes through SACs;*
- *Approximately 30% of corridor passes through Ancient or Semi-Natural Ancient Woodlands; and*
- *The entire corridor length encroaches upon a SEPA Flood Risk Zone.*

4.19 Offline Corridor 2: Pink Option

4.19.1 Corridor Description

The Pink Option is an alternative to the fully online corridor between Pitlochry and Blair Atholl. The corridor encompass three A9 subsections: Pitlochry to Killiecrankie,

Pass of Killiecrankie and Killiecrankie to Glen Garry; note only part of the Killiecrankie to Glen Garry section is covered by this offline corridor i.e. until the section reaches Blair Atholl. The offline corridor departs the existing A9 westward from the end of the existing dual carriageway section approximately 2.5km south of Pitlochry and stays on the west side of Loch Faskally and River Garry, before merging again in the vicinity of Blair Atholl. Challenging topography and watercourses are encountered by this option. For description and assessment of the online section, refer to Sections 4.2 to 4.16 and the Corridor Summary Tables in **Appendix G**.

Photo 4.19.1 Topography of the Pink Offline corridor

4.19.2 Topography and Land Use

The topography varies between gradual and steep slopes. The land consists of forest between Pitlochry and Killiecrankie, with forest and moorlands lying between Killiecrankie and Blair Atholl.

After the corridor has passed Pitlochry, the topography becomes very challenging, with steep slopes, which may result in the need for significant cutting and embankment slopes. This challenging topography continues as the corridor enters the Pass of Killiecrankie; to the east, the River Garry separates the offline corridor from the Highland Main Line railway and from the existing A9, which runs along a viaduct within the constrained section. Through the Pass of Killiecrankie, the offline corridor is likely to also require the construction of a viaduct.

Populations are centred in Pitlochry, Killiecrankie and Blair Atholl. Several minor settlements are located between these developed areas. The area between Killiecrankie and Blair Atholl includes tourist facilities and lodges accessed from along the existing route.

At two locations the corridor encroaches upon the Flood Risk Zone i.e. for a 0.7km length south of Pitlochry and for a 1km length at Killiecrankie; consideration needs to be given to the effect this may have on the design of a new dual carriageway at these locations, which could result in the requirement for elevated carriageways.

4.19.3 Geotechnical Considerations

Sections of alluvium deposits and river terrace deposits have been found which indicate the river has previously been located in this area. Therefore, it would be expected that soil characteristics will be weak in this location and potential ground improvement techniques may be required before construction.

4.19.4 Water Environment, Hydrology and Drainage

The River Tummel, Loch Faskally, and River Garry lie east of the Pink Corridor. The proposed corridor passes through a SEPA Flood Risk Zone for a 0.7km length south of Pitlochry and for a 1km length at Killiecrankie; consideration will need to be given to the provision of compensatory storage during the DMRB Stage 2 Assessment.

4.19.5 Alignment

The offline section is approximately 13km in length between Pitlochry and Blair Atholl. There are no identified Departures from Standard located within this corridor but further consideration is required during the DMRB Stage 2 Assessment, all Departures identified at the southern and northern corridor tie-ins to the existing A9 have been discussed within section 4.6. The steep slopes would present challenges to route alignment in this area. The natural and built environment constraints such as the watercourses, flood plain areas, steep slopes and sporadic housing would inform the development of the offline alignment of this section. Clearances at river crossings would require careful consideration.

4.19.6 Structures

As a minimum, two major watercourse crossings would be required to span the River Tummel and the River Garry. The River Tummel crossing would be to the south of Pitlochry at the start of the Pink Corridor and would most likely involve widening of the existing single carriageway crossing of the River Tummel at this location. The River Garry crossing would be located approximately 3km north of Pitlochry and would involve the construction of a new structure.

A number of other minor structures may also be required to cross minor watercourses and traverse flood plain areas.

4.19.7 Junctions and Accesses

As an outcome of the Junction and Assessment Strategy, it appears that a grade separated junction will be required at each end of the corridor i.e. where the Pink Option diverges away from the A9, south of Pitlochry, and where it merges with the A9, immediately south of Blair Atholl. A grade separated junction is already located at the south end, at the locations of the A924 and the B8019. The requirement for a new grade separated junction has been identified at the north end, at the B8079 south of Blair Atholl.

There a number of direct accesses along the section of existing A9 that would be bypassed by the offline section and access to the proposed corridor will need to be considered during the DMRB Stage 2 Assessment.

4.19.8 Non-Motorised User Provision

Three NMU crossing points have been identified to the south of Killiecrankie, which will require to be considered at the DMRB Stage 2 Assessment. To the north of Killiecrankie, an NMU facility runs within the Pink Corridor for a length of approximately 2km, before departing from the corridor for a short distance, and then again running within the Pink Corridor for the remainder of the section length.

4.19.9 Public Utilities

Public utility information is currently being collected at the C2 Preliminary Inquiries stage with further utilities information to be gathered as the scheme design advances.

Utility impacts are critical factors in corridor option selection and future alignment development, due to both community and economic risk factors. These impacts will be avoided whenever feasible. However, if unavoidable utility impacts arise, strong consideration will be given to construction methods for either protection or

relocation, depending upon which option is most effective in terms of cost and programme.

4.19.10 Key Constraints

The key constraints for the Pink offline corridor are outlined below:

- *Steep terrain exists along the majority of the offline route, including the Pass of Killiecrankie;*
- *Highland Main Line railway runs east of the corridor; however, various watercourses, and in some cases the existing A9, separate the offline corridor and railway;*
- *Corridor crosses and potentially encroaches upon approximately 13km of the River Garry as well as bordering Loch Faskally;*
- *Potential impacts to 11 listed buildings;*
- *Approximately 4km of the corridor passes through an area of HGDL;*
- *Approximately 50% of the total corridor length passes through Ancient or Semi-Natural Ancient Woodlands; and*
- *Approximately 50% of the total corridor length encroaches upon a SEPA Flood Risk Zone.*

4.20 Offline Corridor 3: Green Option

4.20.1 Corridor Description

The Green Option is an alternative to the fully online corridor between Killiecrankie and Glen Garry. The offline corridor departs the existing A9 to the south of Bruar for approximately 4km; which would realign a series of sweeping horizontal curves associated with the existing A9. For description and assessment of the online section, refer to Sections 4.2 to 4.16 and the Corridor Summary Tables in **Appendix G**.

4.20.2 Topography and Land Use

The offline corridor traverses gradual slopes that border the River Garry valley, crossing the river at a point southeast of Bruar. The land generally consists of open lowlands used for agriculture with small areas of forest throughout. Lying along the northern edge of the river valley, the Highland Main Line railway is separated from the offline corridor by the existing A9 and River Garry. The proposed offline section rejoins the existing A9 in the vicinity of a railway crossing between Bruar and Calvine

A settlement is concentrated around House of Bruar which lies to the north of the offline corridor. Minor settlements are located sporadically along the corridor. The area is a popular tourist destination.

Consideration will need to be given to the Highland Main Line railway and the River Garry which may restrict the alignment through the Green Option corridor.

4.20.3 Geotechnical Considerations

Sections of alluvium deposits and river terrace deposits have been found which indicate the river has previously been located in this area. Therefore, it would be expected that soil characteristics will be weak in this location and potential ground improvement techniques may be required before construction

4.20.4 Water Environment, Hydrology and Drainage

The main watercourse present within the Green Option corridor is the River Garry, although several other minor watercourses are also present which will require consideration for new bridges and culverts. Sections of the corridor are located within a SEPA Flood Risk Zone and consideration will need to be given to the provision of compensatory storage during the DMRB Stage 2 Assessment.

4.20.5 Alignment

The offline corridor is approximately 4km. There are no identified Departures from Standard located within this corridor but further consideration is required during the DMRB Stage 2 Assessment, all Departures identified at the southern and northern corridor tie-ins to the existing A9 have been discussed within Section 4.6. The River Garry and the SEPA Flood Risk Zone will need to be considered as part of the development of an alignment in this area.

4.20.6 Structures

There is the requirement for a new watercourse crossing at the Glen Garry crossing. A number of other minor structures would also be required to cross watercourses and traverse the flood plain and any NMU crossing points will be considered during the DMRB Stage 2 Assessment.

4.20.7 Junctions and Accesses

At this initial stage, it is assumed that a grade separated junction would be required where the Green Corridor diverges away from the A9, north of Blair Atholl, and merges with the A9 north of Bruar. There are additional accesses that cross the proposed Green corridor that will need to be considered during the DMRB Stage 2 Assessment.

4.20.8 Non-Motorised User Provision

There are five locations where the existing NMU routes cross the Green Corridor of which one is part of NCN 7. In addition NMU routes run parallel with the corridor at the southern extents and also at the mid-section in close proximity to the existing A9. Consideration will need to be given to NMU crossing points during the DMRB Stage 2 Assessment.

4.20.9 Public Utilities

Public utility information is currently being collected at the C2 Preliminary Inquiries stage with further utilities information to be gathered as the scheme design advances.

Utility impacts are critical factors in corridor option selection and future alignment development, due to both community and economic risk factors. These impacts will be avoided whenever feasible. However, if unavoidable utility impacts arise, strong

consideration will be given to construction methods for either protection or relocation, depending upon which option is most effective in terms of cost and programme.

4.20.10 Key Constraints

The key constraints for the Green offline corridor are outlined below:

- *Corridor crosses and potentially encroaches upon approximately 0.5km of the River Garry near Bruar;*
- *Approximately 2.5km of the offline corridor length passes through an area of HGDL;*
- *Approximately 50% of the total corridor length passes through Ancient or Semi-Natural Ancient Woodlands; and*
- *Approximately 30% of the total corridor encroaches upon a SEPA Flood Risk Zone.*

5 ENVIRONMENTAL ASSESSMENT

5.1 Introduction

The A9 passes through areas which are outstanding in wildlife and landscape terms, in particular, the Cairngorms National Park and a number of national and internationally protected sites. A9 Dualling related effects in such areas must be carefully considered through early design phases and sensitively managed through construction phases. A Strategic Environmental Assessment (SEA) has been undertaken in parallel to, but separate from, this DMRB Stage 1 Assessment Report.

5.2 General Principles and Environmental Approach

In Scotland, SEA is legislated through the Environmental Assessment (Scotland) Act 2005, which requires SEA for all public sector plans, programmes and strategies with the potential to present significant effects on the environment. SEA provides for high level environmental protection by bringing the integration of environmental considerations into the very early stages of plan/programme development. This section summarises the key findings of the SEA, including environmental features, key issues and preliminary recommendations. The SEA aims to deliver a route-wide approach which:

- *is similar in scope to a DMRB Stage 1 Environmental Assessment;*
- *provides a link between previous STPR work and later DMRB route alignment and design work;*
- *identifies and collates the range of environmental constraints around the A9 between Perth and Inverness;*
- *presents and assesses significant issues and risks;*
- *considers whether a particular issue would affect where the route goes, in determining significance;*
- *develops effective mitigation and enhancement proposals in terms of:*
    - *recommendations for specific detailed studies;*
    - *opportunities for development and application of consistent strategic environmental principles; and*
    - *guidance for later route alignment studies, detailed design and environmental assessment stages.*
- *consults the public and statutory authorities with environmental responsibilities; and*
- *works alongside the A9 PES commission to clearly identify the most constrained sections of the route and to inform the overarching dualling programme.*

SEA Scoping considered the potential issues relating to the A9 Dualling with a number of topics removed from consideration following consultation and an SEA Scoping Workshop. The A9 SEA topics scoped into the assessment include;

- *Material Assets;*
- *Population and Human Health;*
- *Landscape;*
- *Historic Environment;*
- *Biodiversity, Flora and Fauna;*
- *Soil; and*
- *Water.*

The SEA adopted a Geographical Information System (GIS) mapping approach in order to effectively assess key issues and constraints. The environmental assessment focussed on identifying features within a 200m boundary for each corridor option. The findings of the assessment were presented in six geographical sections; (A) Inveralmond to Tay Crossing, (B) Tay Crossing to Bruar, (C) Bruar to Dalwhinnie, (D) Dalwhinnie to Newtonmore, (E) Newtonmore to Kinveachy and (F) Kinveachy to Inverness.

5.3 Findings

This section provides a summary of the findings of the A9 SEA against the key environmental issues assessed.

5.3.1 Material Assets

An online corridor will minimise material consumption and the associated carbon footprint through retained use of existing infrastructure. The SEA notes that offline corridors would increase consumption and embodied carbon footprint.

Use of local material suppliers would provide benefits to nearby communities and assist minimising the impact of transporting construction materials.

5.3.2 Population and Human Health

The SEA recognises the benefits of the A9 Dualling to population and human health in terms of road safety improvements. Emissions to air are likely to be reduced in the long term due to improved traffic flows however there is potential for localised adverse impacts during the construction stages.

Overall, the SEA also notes there are likely to be no significant, long-term adverse impacts of the A9 Dualling in terms of recreation, access and public transport.

5.3.3 Landscape

With respect to landscape, the SEA considers that an online corridor will minimise adverse effects on National Scenic Areas such as the River Tay (Dunkeld) and Loch Tummel. Offline corridors would present a higher risk in terms of landscape impacts.

Potential impacts on the Landscape (Wildness and Dark Skies) is considered as minor adverse whilst the view from the road is likely to present locally minor benefits or moderate benefits at a route wide scale.

Construction impacts of the A9 Dualling on the landscape are noted as presenting highly visible effects, albeit in the shorter term at a local scale, with consideration to be given to screening and landscaping measures to reduce these potential impacts.

The SEA summarises that a balance needs to be struck between landscape, opportunity views and other factors including safety and biodiversity.

5.3.4 Historic Environment

The SEA considers that the online corridor between Tay Crossing and Bruar presents risks in terms of direct adverse effects given the proximity of some Scheduled Monuments to the existing A9. Direct impacts on these sites would be a major adverse effect but, with avoidance of direct impacts, dualling effects on the site setting will present minimal changes over existing conditions.

The SEA also recognises the potential for locally minor adverse impacts on the setting of sites located outwith the 200m corridor.

The Pink Option would reduce the impact in terms of Historic Environment (Battlefields) but, in the context of other environmental constraints, would present major adverse impacts and therefore the SEA recommends that an online corridor with site level mitigation would be preferable.

The SEA considers that with respect to Historic Environment (Gardens and Designed Landscapes) the online corridor has the potential to present locally adverse impacts. The Green Option has the potential to reduce impacts on Blair Castle but generally the online corridor is preferable. Further consultation with Historic Scotland will be required to advise designs within the boundaries of Gardens and Designed Landscape designations, with Murthly Castle highlighted as requiring detailed consideration.

Detailed environmental assessment and local level consultation will be required to determine suitable site level design mitigation.

5.3.5 Biodiversity, Flora and Fauna

In terms of Biodiversity, Flora and Fauna (Ancient and Semi Natural Ancient Woodland) the online corridor will result in minor losses at a local level, as a result of route widening. A cumulative impact is assessed as presenting a moderate adverse effect at the route-wide scale. Offline corridors would be more likely to present major adverse effects at the local level.

The online corridor would result in local minor adverse secondary impacts on species which could increase to local major adverse impacts where routes affect woodland areas.

The SEA considers that the A9 Dualling has the potential to present major adverse effects on the Drumochter Hills SPA and SAC and the Insh Marshes SAC and minor adverse effects on other designations such as the River Tay SAC, Tulach Hill and Glen Fender Meadows SAC, River Spey SAC and the Insh Marshes SPA and Ramsar site. Each site would need to be examined further through strategic and project level Appropriate Assessments to consider inter-related dualling issues and determine effective mitigation measures.

The SEA considers that in terms of Biodiversity, Flora and Fauna (National Nature Reserves (NNR)) it is likely that the online corridor would result in no significant adverse effects on the Craigellachie NNR site, providing the preferred alignment avoids encroaching on the NNR site. Should the preferred alignment result in landtake from the NNR site, then major adverse effects may result depending on the sensitivity of any affected habitats. This needs to be considered further at DMRB Stage 2 Assessment.

Similarly in terms of Biodiversity, Flora and Fauna (Biological SSSI sites) the online corridor would result in no significant adverse effects on SSSI sites within the 200m corridor, provding the preferred alignment avoids encroaching on designated habitats/ features within the SSSI sites. Any direct landtake within a SSSI would potentially present major adverse effects at the site level. The Green Option is preferable to the online corridor as it avoids encroaching on the Aldclune and Inverack Meadows SSSI. This needs to be considered further at DMRB Stage 2 Assessment.

Given that the Drumochter Hills SSSI has a different boundary than the Drumochter Hills SAC and SPA there is a potentially major adverse effect at a site level at this area. Detailed survey and environmental assessment will be required to inform the online corridor through this site to ensure that impacts are minimised and mitigated. This would likely reduce the risk of residual effects to moderate or minor adverse effects at a site level.

The SEA considers that in terms of Biodiversity, Flora and Fauna (Species) the A9 Dualling would present minor adverse effects at a local level in terms of the potential for woodland edge clearance and associated habitat loss and barrier effects. Dualling could equally provide local minor beneficial effects in terms of enhancing the permeability of the route for mobile species. Local ecology surveys are recommended at later design stages.

5.3.6 Soil

The SEA considers that in terms of Soil (Peat), online widening presents the potential for major adverse effects between Bruar and Newtonmore and from Kinveachy to Inverness. A minor effect is noted between Newtonmore and Kinveachy. Where dualling may impact areas of blanket bog, or other priority habitats, then a major adverse effect at a site level would result.

In terms of Soil (Agricultural Land), the online corridor would result in minor adverse effects on prime quality lands between Perth and Tay Crossing and minor adverse effects on mixed agricultural land along the rest of the corridor other than between Dalwhinnie and Newtonmore where no such land is identified. At a route wide level, loss of agricultural land is considered to have a minor adverse effect.

The SEA considers that in terms of Soil (GCR and Geological SSSI) the online corridor presents potentially mixed effects as the overall scale of losses is expected to be low. Potential enhancement benefits could be realised at some locations, depending on the potential for exposures of equal or better quality. Further surveys are recommended in particular at locations such as the Drumochter Hills SSSI, the Glen Garry SSSI and the Slochd GCR. SNH recommend detailed consideration of the Allt Dubhaig GCR site which lies within the Drumochter Hills SSSI.

5.3.7 Water

The SEA considers that improved road drainage with incorporation of SUDS may present minor local benefits aggregating to a moderate regional benefit with respect to long term improvements to discharge water quality. A similar level of improvement is anticipated in terms of provision of crossing opportunities, habitat connectivity, limiting barrier effects and potential habitat creation. Mixed effects in terms of landscape and visual issues are anticipated with sympathetic design of SUDS features.

In terms of Water (Watercourse Crossings) the online corridor presents potentially minor to moderate adverse effects at a local level. Cumulatively, due to the number of crossings, moderate adverse effects on watercourses are anticipated. Effective design with input from geomorphology and ecology specialists and consultations with statutory bodies could minimise this to a minor effect.

The A9 Dualling could potentially present a major adverse effect in terms of Water (Flood Risk) at the local and route wide level. The SFRA followed by more specific Flood Risk Assessment will ensure that the A9 Dualling programme will not increase flood risk. SEPA have recommended consideration of the cumulative impact of changes to watercourse crossings in terms of potential changes to downstream flow (quantity, quality and rate) associated with culvert widening.

In terms of Water (Wetland Areas) there is the potential for minor to major adverse effects depending on the sensitivity and value of any wetland habitat affected.

5.3.8 Recommendations

The SEA recommends that from a purely environmental perspective, the majority of the offline corridors are not taken forward for further consideration, due to the potential for greater environmental impacts when compared with the relevant online corridor sections, however recognises that they may still be advantageous from an engineering perspective. From a purely environmental perspective, based on the findings of the SEA, the Green Option is the only offline corridor that should be taken forward as a viable alternative to the online corridor in the area south of Bruar.

The SEA recommends that priority should be given to sections that are least environmentally constrained to enable additional time for design, assessment and approval on the more constrained areas.

A number of less constrained sections have been identified in the SEA which have the potential to be developed in a shorter timescale and brought to construction earlier in the programme. Similarly, the most constrained areas are also identified with recommendations for detailed iterative discussions with statutory bodies to determine the most acceptable solutions.

6 TRAFFIC AND ECONOMIC ASSESSMENT

6.1 Introduction

Sections of the A9 between Perth and Inverness carried an Annual Average Daily Traffic (AADT) flow of up to 24,300 during 2012. Traffic levels vary along its length, with the highest volume experienced on approach to the cities at either end of the route (a two-way daily flow of approximately 24,300 vehicles AADT south of Inverness and up to 23,000 vehicles AADT just north of Perth). Between Perth and Pitlochry, two-way traffic levels vary between approximately 23,000 and 13,300 vehicles AADT, with flows generally decreasing with distance north of Perth. Daily two-way traffic levels along the remainder of the route between Pitlochry and Moy, to the south of Inverness, vary between 7,000 and 9,500 vehicles AADT.

The A9 is an important tourist route within Scotland; therefore traffic levels can increase significantly during the summer months. Recent Road Side Interview (RSI) surveys indicate that almost half of all drivers using the A9 are making journeys over 100 miles in length and that nine out of ten people travelling between Perth and Inverness opt to make the journey by car, as opposed to by bus or train, with a typical expected journey time of between 90 and 120 minutes.

Freight movement along the corridor is important to local business and transfer of goods to/from Inverness, the central belt and beyond. HGVs accounted for approximately 7 to 12 percent of the total traffic levels in 2012.

Safety within the corridor was identified as an issue within the STPR. Although the accident rate on the whole is lower than the national average, the proportion of serious and fatal accidents is significantly greater than the national average. There was a noticeable dip in personal injury accidents in 2011; however the level of incidents has remained relatively consistent on the A9 over the last five years. In contrast, the number of accidents across the trunk road network in the same period has been reducing steadily. Likewise, when examining accident severity, levels have also remained similar each year, while they have reduced at a national level, thus increasing the gap between accident severity levels on the A9 and the national average.

Due to the mix of vehicles using the route, including buses, HGVs, caravans and agricultural vehicles, there is a relatively wide range of vehicle speeds. There are various locations along the route (single carriageways) where the speed limit for HGVs (exceeding 7.5 tonnes) is restricted to 40 mph and buses are restricted to 50 mph. Also, some bus stops are located on the main carriageway, further contributing to slow moving vehicles on the main carriageway. Due to the rural nature of the route, agricultural traffic crosses the carriageway and travels along the road, often at low speeds, in order to access land or farms. This mix of vehicles and range of vehicle speeds, coupled with the existing alignment and lack of overtaking opportunities, is believed to cause greater levels of driver frustration, which is considered to be a factor in a number of accidents, as outlined in Section 2.6.1. Driver frustration on the A9 was previously highlighted in STPR in 2008 when the Scottish Government committed to dualling the A9 between Dunblane and Inverness[1].

[1] http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j10194c-21.htm
http://www.transportscotland.gov.uk/files/documents/reports/j10194a/j10194a-a2D14.pdf

Under future conditions, traffic volumes are forecast to increase, which in turn could lead to less overtaking opportunities and higher levels of driver frustration. This may also give rise to an increase in fatal accidents along the route, which already exceeds the national average on over half of the single carriageway sections. In addition, the range of vehicle types and speeds on the single carriageway sections also has an impact on journey time reliability with a wide variation in end-to-end trips. This is outlined in the Bluetooth journey time analysis in Section 6.2.5 where full length trips on a typical week day in February 2012 between the A9 west of Broxden and Longman Roundabout, Inverness took between 97 minutes and up to 232 minutes to complete.

Closures on the route as a result of accidents or other incidents often result in lengthy diversion routes, which may be unsuitable for certain types of vehicle, as outlined in Section 2.5.3. These issues impact on journey time reliability, as does the variation in the volume of traffic throughout the year and lack of overtaking opportunities. These elements will have a detrimental impact on travel time and cost, which in turn could adversely impact the local economy, in terms of business and tourism.

6.2 Base Line Traffic Conditions

6.2.1 A9 AADT Traffic Data

AADT flow along the A9 was determined using Automatic Traffic Counter (ATC) data obtained from Transport Scotland's Scottish Roads Traffic Database (SRTDb). In total there are 32 ATCs along the A9 between Perth and Inverness. For consistency with other sections of the report and ease of analysis the scheme has been broken down into 18 sections plus Inshes to Raigmore. This divides the route into single and dual sections to give a more accurate portrayal of traffic levels:

- *Perth to Luncarty;*
- *Luncarty to Pass of Birnam;*
- *Pass of Birnam;*
- *Pass of Birnam to Tay Crossing;*
- *Tay Crossing to Ballinluig;*
- *Ballinluig to Pitlochry;*
- *Pitlochry to Killiecrankie;*
- *Pass of Killiecrankie;*
- *Killiecrankie to Glen Garry;*
- *Glen Garry Dual Section;*
- *Glen Garry to Crubenmore;*
- *Crubenmore;*
- *Crubenmore to Kincraig;*
- *Kincraig to Dalraddy;*
- *Dalraddy to Slochd;*
- *Slochd to Tomatin;*
- *Tomatin to Moy;*
- *Moy to Inshes.*

In addition to the 18 identified sections, the Inshes to Raigmore section has been included within the traffic analysis. This section is currently dualled and is not within the scheme boundary; however it has been included within this traffic analysis, to assist in the discussion of traffic levels, trends and driver behaviour.

Figure 6.2.1 shows the varying traffic levels along the length of the route. Variations are also illustrated on a location map in **Appendix P**. These figures show that traffic levels are greatest on the approach to the cities at either end of the route, reflecting the level of commuting into the two cities. Two-way traffic levels in the central section, between Pitlochry and Moy, are generally between 7,000 and 9,500 vehicles AADT, thus providing an indication as to the level of end-to-end trips on the route.

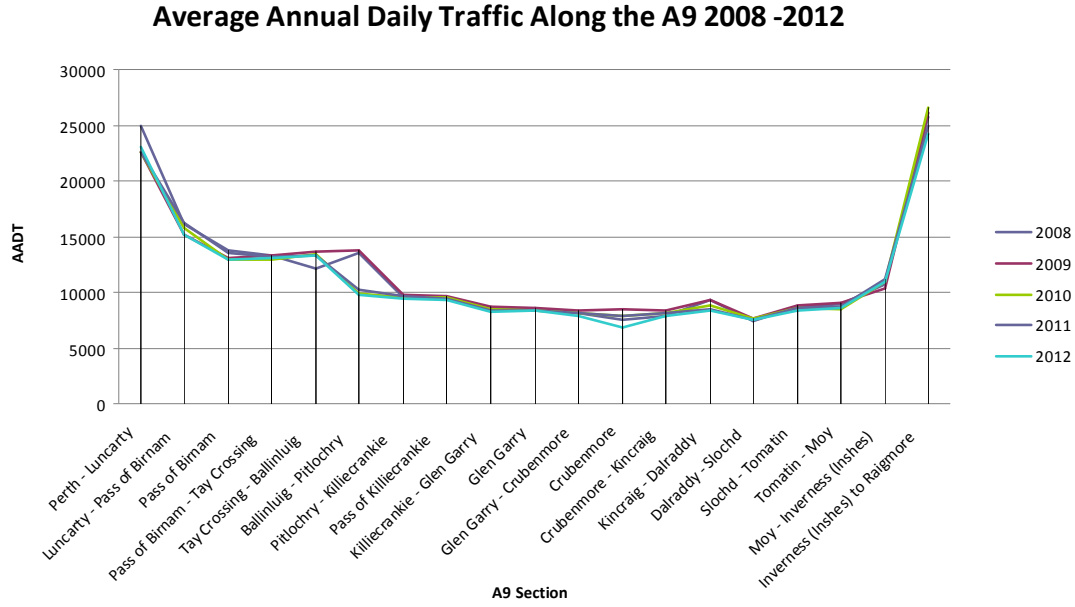


Figure 6.2.1 AADT Traffic along the A9 (Perth to Inverness) 2008-2012

Table 6.2.1 details AADT levels recorded at ATC locations along the A9 between 2008 and 2012. The general trend along the route indicates that at the majority of locations traffic decreased slightly between 2008 and 2012 with the greatest reduction in traffic seen between Perth and Pitlochry and between Inverness (Inshes) and Raigmore.

A9 Section	AADT (Rounded to Nearest 100 Vehicles)					
	2008	2009	2010	2011	2012	Difference (2012 v 2008)
Perth - Luncarty	24,900	22,600	n/a	n/a	23,000	-7.6%
Luncarty - Pass of Birnam	16,100	15,200	15,800	16,200	15,200	-5.6%
Pass of Birnam	13,700	13,100	12,900	13,500	12,900	-5.8%
Pass of Birnam – Tay Crossing	13,300	13,300	12,900	13,200	13,100	-1.5%
Tay Crossing - Ballinluig	12,100	13,700	13,500	13,300	13,200	-9.1%
Ballinluig - Pitlochry	13,500	13,700	13,800	13,600	13,000	-3.7%
Pitlochry - Killiecrankie	9,600	9,700	9,500	9,600	9,400	-2.1%
Pass of Killiecrankie	9,500	9,700	9,500	9,400	9,300	-2.1%
Killiecrankie – Glen Garry	8,500	8,600	8,300	8,400	8,300	-2.4%
Glen Garry	8,400	8,600	8,300	8,400	8,300	-1.2%
Glen Garry - Crubenmore	8,100	8,300	8,100	8,100	7,900	-2.5%
Crubenmore	7,500	8,500	7,900	7,900	6,800	-9.3%
Crubenmore - Kincraig	7,900	8,300	8,200	8,500	7,900	0%
Kincraig - Dalraddy	9,300*	9,300*	8,800*	8,500*	8,300*	-10.8%
Dalraddy - Slochd	7,500	7,700	7,800	7,600	7,600	1.3%
Slochd - Tomatin	8,700*	8,800*	8,600*	8,600*	8,400*	-3.4%
Tomatin - Moy	8,900	9,000	8,500	8,700	8,600	-3.4%
Moy – Inverness (Inshes)	10,700	10,400	11,000	11,200	11,000	+2.8%
Inverness (Inshes) - Raigmore	25,700	26,100	26,600	24,900	24,300	-5.4%

**Estimated flows based on one or more counters or on a counter not in the exact location of the carriageway.*

Table 6.2.1 AADT flows for 2008 to 2012 along the A9

The general trend is considered to be consistent with patterns over recent years on a number of Scotland's Trunk Roads, where traffic has generally remained constant or slightly reduced, likely to be connected to the economic downturn. **Figure 6.2.2** displays the 2012 AADT flows along the route.

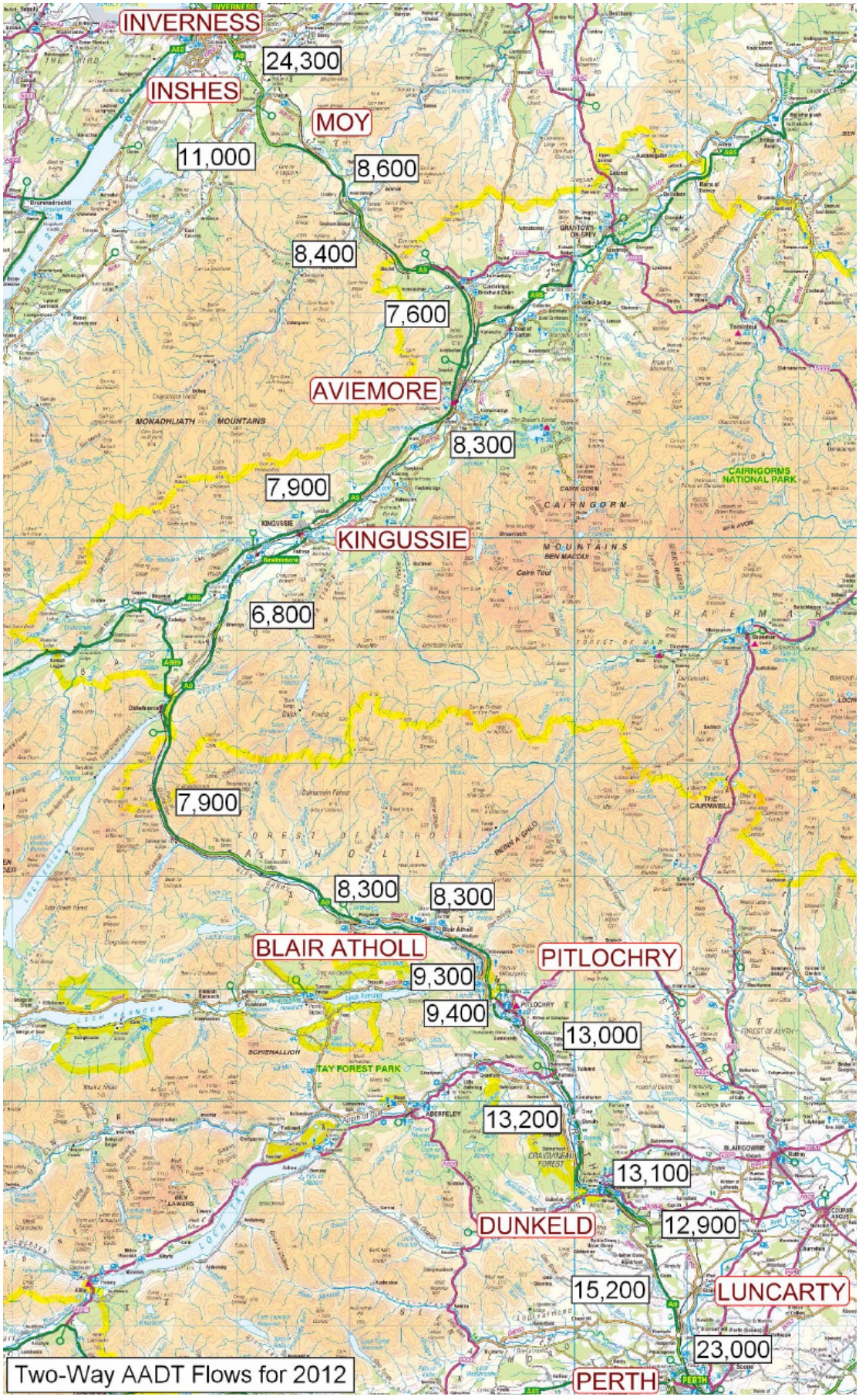


Figure 6.2.2 AADT flows for 2012 along the A9

6.2.2 Traffic Composition

A number of the available ATCs provide classified vehicle levels, which have been used to derive the percentage of Light Goods Vehicles (LGVs)/Rigid HGVs and HGVs on the route in 2012 as shown in **Table 6.2.2**. In 2012 HGVs made up between 7 and 12 percent of traffic on the A9. In addition, LGV/Rigid HGVs range between 11 and 18 percent. Although the percentage of HGVs varies, generally the volume of HGVs is approximately 800 to 900 HGVs per day along the length of route between Ballinluig and Aviemore. HGV levels are lower (approximately 600 per day) at Slochd and Moy. This is due primarily to the significant number of HGVs travelling to Spey Valley and Moray that leave the A9 at the A95 junction north of Aviemore.

A9 Section Equivalent	Location	LGV/Rigid HGV (rounded to nearest 10 vehicles)	HGV (rounded to nearest 10 vehicles)	Total	% LGV/ Rigid HGV
Tay Crossing - Ballinluig	A9 South of Ballinluig	1,780	950	13,200	13%
Ballinluig - Pitlochry	A9 Moulinearn	1,610	890	13,000	12%
Killiecrankie	A9 at Killiecrankie	1,300	900	9,400	14%
Killiecrankie - Glen Garry	A9 South of B847	1,150	870	8,300	14%
	A9 Calvine	1,120	900	8,300	13%
Glen Garry	A9 Glen Garry	1,290	880	8,300	16%
Glen Garry - Crubenmore	A9 Dalnaspidal	1,160	900	8,300	14%
	A9 Calvine to Dalwhinnie	1,230	880	8,300	15%
	A9 Dalwhinnie	1,060	870	7,600	14%
Crubenmore - Kincraig	A9 Ralia	1,100	860	7,500	15%
	A9 Nuide Farm	1,300	860	7,400	18%
	A9 Kingussie	1,090	820	7,400	15%
	A9 Balavail	950	920	8,800	11%
Kincraig to Dalraddy	A9 Kincraig	1,250	880	8,300	15%
Dalraddy - Slochd	A9 Aviemore	1,150	870	7,400	16%
Slochd - Tomatin	A9 Slochd	1,350	630	8,400	16%
Tomatin - Moy	A9 Moy 2+1 South	1,250	640	8,700	15%
Moy – Inverness (Inshes)	A9 Moy 2+1 North	1,250	650	8,800	14%

Table 6.2.2 Traffic composition on the A9 in 2012

6.2.3 Seasonal Variations

Figure 6.2.3 displays the monthly variation of traffic levels at various points along the route in 2012, illustrating the seasonal nature of the route, with peak traffic occurring between May and September and lower traffic from November to February. ATC/JTC data from 2012 on several sections between Perth and Inverness does not contain suitable data to allow a monthly comparison for all 18 sections however 7 sections are included below and these provide a representation of the seasonal average between Luncarty and Inverness along the A9.

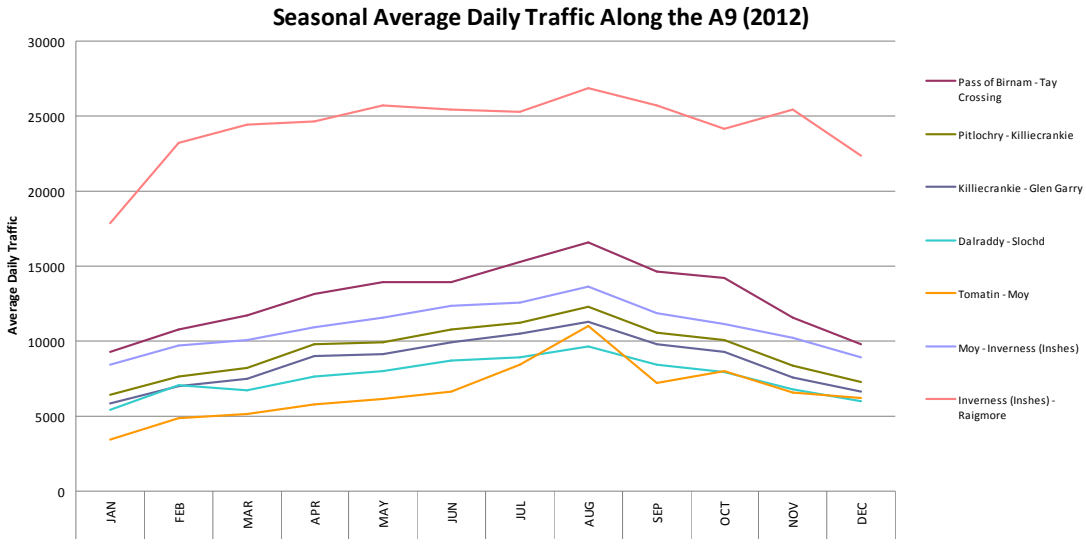


Figure 6.2.3 Monthly Traffic Variations (2012)

6.2.4 Junction Turning Counts

A number of junction turning counts were undertaken on the A9 and the surrounding roads, in November 2012, over 12 hour periods. These have been used to inform the junction strategy (as outlined in Section 4.10.4) and inform the review of baseline conditions. The twelve hour junction turning volumes at key locations along the route are shown in **Appendix N**. The locations of junctions surveyed are included in **Table 6.2.3**:

Junction Number	Location
1	A9 North / A912 / A9 West / Ruthvenfield Road
3	A9 North / Link Road / A9 South
4	A9 North / Link Road / A9 South
5	A9 North / A9 South / B867
6	A9 North / Link Road / A9 South
7	A984 East / Mause Road / A984 West
8	A9 North / A9 South / B867
9	A923 Atholl Street / Boat Road / A923 Dunkfield Bridge
10	A923 / A9 East / A9 West
11	A9 East / A822 Old Military Road / A9 West
12	A9 North / A9 South / B898
46	B9099 North / B9099 South / Ordie View B&B / Unnamed Road
47	B867 North / Unnamed Road East / B867 South / Unnamed Road
48	B9099 Main Road / A9 Slip / B8063
49	B9099 Main Road East / A9 Slip Road / B9099 Main Road West
13a	A827 East /A9 Slip Road /Local Access /A827 West
13b	St. Cedd's Road / A827 East / A827 West
14	A924 North / General Wades Military / A924 South
15	A924 West Moulin Rd /A924 Atholl Rd East / A924 Atholl Rd West
16a	Link Road / A924 East / A924 West
16b	A9 Slip Road / A924 / B8019
17	B8079 North / B8079 / B8019
18	Link Road / A9 East / A9 West
19	B8079 / A9 East / A9 West
20	A9 East / B847 / A9 West
21	A9 North / A9 South / A889
22	Unamed Road / A889 East / A889 West
23	A86 North / A889 / A86 South
24	B9150 / A9 East / A9 West
25	Main Street / Perth Road / Laggen Road
26	A86 High Street East / Link Road / A86 High Street West
26b	Link Road / B9152 East / B9152 West
27	A9 East / Link Road / A9 West
28	A9 North / Link Road / A9 South
29	A95 North / A95 South / Link Road
30	A95 North / A95 South / B9153
31	A95 North / A95 South / A938
32	A938 East / B9153 / A938 West
33	A938 / A9 East / A9 West
34	A9 North / B9154 / A9 South
35	A9 North / A9 South / B851
36	A9 North / B9154 / A9 South
37	B851 / A9 East / A9 West
38a	B9177 North / B9177 South / B9177 West
38b	B9177 / A9 Slip Road / New Development / Unnamed Road West
39	B9006 East / B851 / B9006 West
40	B9006 North / Unnamed Road East / B9006 West / Culloden Road
41	Tower Road / B9006 East / B9006 West

Table 6.2.3 Location of Junction Turning Counts on the A9 in November 2012

6.2.5 Journey Times and Speeds

(a) Source Data

A number of data sources have been collated and reviewed, in order to report journey times and speeds on the A9.

Journey time data has been obtained through Traffic Scotland[2], encompassing travel across the trunk road network, and specifically at a number of locations along the A9. This data has also been used to establish average speeds along each of the relevant sections. In addition, a speed limit review was undertaken in 2012, by Transport Scotland, which provided further speed information at points along the A9.

Bluetooth data has also been obtained from Transport Scotland. This is data collected by receptors located along the A9, detecting bluetooth signals from within vehicles. There are limitations associated with the use of Bluetooth data that should be considered when reviewing the information, such as many vehicles do not have bluetooth devices, and in some cases there may be more than one bluetooth device within a vehicle. No journey time surveys have been undertaken as part of this assessment, however, it is considered that the Bluetooth data provides a suitable sample of information to inform this Stage 1 Assessment. Further limitations of the data are detailed within the analysis section. The Bluetooth data provides both journey time information along the route and also allows average speeds to be calculated. The data also allows analysis of journey time variability and reliability.

(b) Journey Times and Speeds

Table 6.2.4 presents journey time, journey length and average observed speed on sections of the A9 taken from the Traffic Scotland data. At this point no additional journey time surveys have been undertaken; therefore, the difference between peak and inter-peak journey times is not shown. However, it is expected that additional peak hour delays would only be experienced close to Inverness and Perth and not over the other sections of the route during normal operational conditions. The vehicle speeds are based on typical journey time presented in the Traffic Scotland data.

[2] http://m.trafficscotland.org/journeytimes

Origin	Destination	Journey Time (Mins)	Length (miles)	Average Speed (mph)
M90 Broxden	A924 Pitlochry	28	25	58
	A827 Ballinluig	25	21	56
Perth (Inveralmond Roundabout)	A924 Pitlochry	27	22	52
	A889 Dalwhinnie	59	53	58
	A96 Inverness	116	108	58
Dunkeld	A889 Dalwhinnie	46	41	58
	B9152 Aviemore	71	66	58
Pitlochry	M90 Broxden	28	25	54
Blair Atholl	B9152 Aviemore	49	48	59
	A96 Inverness	81	78	58
Kingussie	A924 Pitlochry	45	47	57
	M90 Broxden	74	70	57
Aviemore South	A96 Inverness	32	30	53
A96 Inverness	Aviemore (A95)	29	27	57
	A924 Pitlochry	88	83	57
	Inveralmond	116	108	56

Table 6.2.4 Journey Times along the A9 from Traffic Scotland

The average speeds detailed in **Table 6.2.4** are, in general, close to 60 mph. This suggests, especially on the single carriageway sections, that there is little deviation from the designated speed limit and therefore limited delay on the route. However, this is not the case as this does not recognise day to day fluctuations, or issues that impact reliability, such as time of the year, surface conditions, weather, incident, impact of flow changes and convoys.

The data obtained from Traffic Scotland is considered further in the Bluetooth analysis of journey time variability and reliability.

(c) Speed Limit Review

The A9 was included in Transport Scotland's speed limit review, which was concluded in 2012. No speed limit changes were recommended between Perth and Inverness as a result of this review[3].

Data from the speed limit review indicated that articulated HGV's speeds do not appear to differ between single and dual sections with observed speeds of between 51 and 53mph being maintained, despite the different speed limits allowed by carriageway type. However, this analysis does not include a percentage split

[3] http://www.transportscotland.gov.uk/road/safety/Speed-limit-review/A9-NW-Perth-Thurso

between HGV class types OGV1 and OGV2 (for which different speed limits apply) therefore the full impact of this trend is uncertain. Speed comparisons between cars and articulated HGVs are included in sample sections in **Table 6.2.5**. This indicates that the average speed on single carriageway roads generally varies between 51 mph and 61 mph, for articulated HGV and cars respectively.

Traffic Counter/Location	Carriageway Type	Average Car Speed	Average Articulated HGVs Speed
JTC00567 North of Inveralmond	Dual	63.5	52.8
JTC00306 Moulinearn	Dual	67	53.5
JTC00307 Killiecrankie	Single	55.3	51
JTC00311 Dalwhinnie	Single	57.7	51.2
JTC00355 Kincraig	Single	61	52.8

Table 6.2.5 Car and Articulated HGV Comparison

Table 6.2.5 highlights the difference in speed between cars and articulated HGVs by carriageway type. From the sections analysed above, cars have an average speed of between 55 and 61 mph on single carriageways and between 63 and 67 on dual sections. In contrast, the variation in speeds by carriageway type is less pronounced in articulated HGVs with a more consistent speed of between 51 and 53 mph, irrespective of carriageway type. The relatively high speeds recorded by HGVs would indicate potential speeding by some vehicles. The introduction of Average Speed Cameras, proposed to be installed in 2014, should result in speed limits being adhered to and therefore impact on journey times.

(d) Journey Time Variability and Reliability

Bluetooth journey time data collected over nine days in February 2012, summarised in **Table 6.2.6**, allows for average speeds to be calculated for specific links along the length of the A9. Average, maximum and minimum journey times between Bluetooth receptors are also provided to show the variation between certain links. Although only collected for a short period of time, the data does provide a larger sample size, in comparison to a series of journey time surveys which generally only provide one or two travel times per period per day. The more extensive dataset of Bluetooth data therefore permits analysis of journey time variability and reliability.

There are limitations associated with the use of Bluetooth surveys that should be considered when reviewing the information presented.

A Bluetooth recorder will detect a vehicle travelling north on the A9. The predicted time of arrival of that same vehicle at a second recorder further north can be calculated using a simple speed \ distance \ time calculation. However, it is possible that the vehicle may turn off of the A9 between the survey site locations for a specific purpose (i.e. a comfort stop, travel to shops, visiting friends, travelling to work, etc.) before returning to the A9 and continuing northbound. This can result in a significant amount of time between the vehicle being detected at the first survey point and then detected at the second (sometimes in the order of days) thereby significantly skewing the journey time results obtained from the data.

In order to circumvent this situation, it is pertinent to remove survey records from each survey site that show trips taking significantly longer than expected. In the case of the analysis carried out in support of this report, any trips taking longer than twice the expected journey times between the sites have been excluded from further analysis. This allows for the removal of unreliable data whilst allowing the data set to remain wide enough to be considered valid.

Table 6.2.6 shows that between 5 percent and 15 percent of the AADT flow has been captured and used within the analysis at each site once any outliers have been removed. It should be noted that the Bluetooth data may include vehicles where more than one Bluetooth device is operating and therefore may provide a slight overestimate of the average sample size. Also, although many cars are now factory-fitted with Bluetooth capabilities, the predominant device used to record Bluetooth data is the mobile phone. It has to be noted that mobile Bluetooth signals can be intermittent and a signal picked up at one location may not necessarily be picked up at another location. Furthermore, research suggests that HGVs are more likely to emit a Bluetooth signal than a car. As HGVs are generally slower moving and have to abide by lower speed limits on the route, this may also impact the results extracted.

		Link Flow (Rounded 2012 AADT)****	Average Daily Bluetooth Sample	Sample as a %age of AADT	Typical Journey Time*	Observed Average Journey Time	90% Average Journey Time	110% Average Journey Time	Cutoff**	Observed Max Journey Time (Within Cut Off)	Observed Min Journey Time	% within 10% of average journey time	Av Speed (mph)	Distance (miles)
Link 1 A9 (West Of Broxden) – A9 (Pitlochry South)	**NB**	No Count	608	N/A	00:28	00:30	00:27	00:34	00:56	00:56	00:19	43%	48	25
	SB	4300	404	9%	00:28	00:32	00:29	00:35	00:56	00:55	00:20	38%	46	25
Link 2 A9 (North of Dunkeld) – A9 (Dalwhinnie/ South of A836)	**NB**	6600	680	10%	00:46	00:45	00:41	00:50	01:32	01:32	00:28	47%	54	41
	SB	3400	373	11%	00:46	00:46	00:41	00:50	01:32	01:32	00:27	35%	53	41
Link 3 A9 (Dalwhinnie/ South of A836) – A9 (Aviemore)	**NB**	3400	515	15%	00:27	00:29	00:26	00:32	00:54	00:54	00:16	59%	49	24
	SB	3700	373	11%	00:27	00:29	00:26	00:32	00:54	00:54	00:17	63%	48	24
Link 4 A9 (Aviemore) – A9 (Inverness, Longman Road)	**NB**	3800	184	5%	00:31	00:36	00:33	00:40	00:58	01:02	00:24	37%	49	30
	SB	No Count	182	N/A	00:31	00:35	00:31	00:38	00:58	01:02	00:21	33%	51	30
A9 End to End (West of Broxden – Inverness, Longman Road)* **	**NB**	No Count	319	N/A	01:56	02:31	02:16	02:46	03:52	03:52	01:41	31%	44	110
	SB	No Count	156	N/A	01:56	02:38	02:23	02:54	03:52	03:49	01:37	28%	42	110

Notes: ** Typical Journey Time has been determined using data obtained from Traffic Scotland*

*** Upper and Lower Cut offs have been determined by halving and doubling the typical journey time respectively*

**** End to End Journey Time is for 20th February 2012 only*

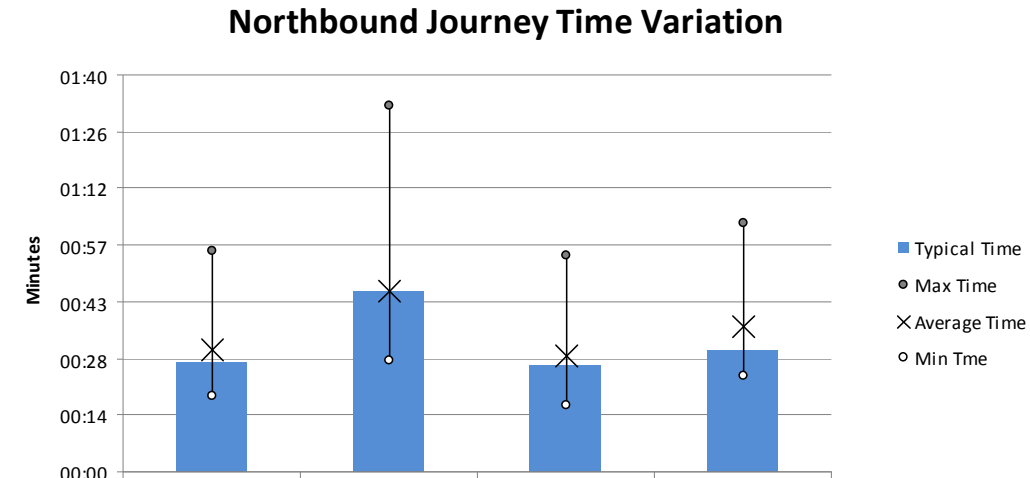
***** Link flows are estimations at recorder locations only*

Table 6.2.6 Bluetooth Journey Times along the A9, West of Broxden to Inverness, from Sky High (February 2012)

Table 6.2.6 shows that the average speed of vehicles on links between A9 West of Broxden and the A9 at Longman Roundabout from the Bluetooth analysis is generally between 46 mph and 54 mph for the days surveyed. For end-to-end trips, for a typical day in February 2012 between West of Broxden and Inverness, the average speed recorded was around 43 mph (44 mph for northbound traffic and 42 mph for southbound trips). Although average end-to-end trips on the A9 between Broxden and Inverness took approximately two and a half hours to complete on the day surveyed, maximum journey times recorded for some vehicles were as high as approximately three hours 52 minutes. This could perhaps be explained by drivers stopping between Perth and Inverness for a rest break or planned detour, thereby increasing the time taken for their journey as a whole. The inclusion of such journeys will also inevitably impact the average speed calculated for this exercise, thereby under-representing the actual average speed calculated between the two end-to-end Bluetooth recorders. Also, the available receptors for the end-to-end journey times were based on data obtained at the A9 just west of Perth and at Longman Roundabout in Inverness, therefore delays at junctions should be expected, particularly for journeys recorded during the AM and PM peak. This will also have an impact on average speeds obtained from the Bluetooth data.

In order to consider the variation in journey times over each of the links, the number of trips arriving within +/-10 percent of the average journey time has been determined. A typical journey time has been derived by only using Bluetooth recorders which are located in close proximity to A9 'Journey Start Points' used by Traffic Scotland to predict typical journey times and delays in real time. Traffic Scotland calculates journey times on the A9 using a combination of historic and live data from numerous sources. This typical time provides an indication of how the route is performing (i.e. how close are the average journey times to what is expected), and also enables outliers to be removed from the dataset.

Trips that do not fall into this group have been assumed to represent trips with variation in excess of typical delay experienced therefore are effectively considered as outliers. For the purposes of this analysis, any journey times that were either double or half of the typical journey time (identified using Traffic Scotland data) have been assumed to be outliers and removed from the analysis. Variation in trip journey times has been summarised in **Figure 6.2.4** to **Figure 6.2.7**.



	Link 1	Link 2	Link 3	Link 4
Typical Time	00:28	00:46	00:27	00:31
Max Time	00:56	01:32	00:54	01:02
Average Time	00:30	00:45	00:29	00:36
Min Tme	00:19	00:28	00:16	00:24

Figure 6.2.4 Northbound Journey Times

Figure 6.2.4 shows that out of the four northbound links, the average journey times through three links (Links 1, 2, and 3) are very close to the typical journey times and that only Link 4 is marginally higher than the typical journey times on the days surveyed. However, there were trips on all links during the surveyed period that were recorded as taking double the expected time to complete a journey between two Bluetooth points. As the selected links range between 24 and 41 miles in length, journey times were recorded as being up to 39 percent less than the typical time on some occasions, which highlights the potential for variation. On the link that shows a higher than average journey time (Link 4, between Aviemore and Inverness) the difference between the average and typical time in the northbound direction is 19 percent. In real terms however, this only amounts to an increased average journey time of 5 minutes over 30 miles in the northbound direction.

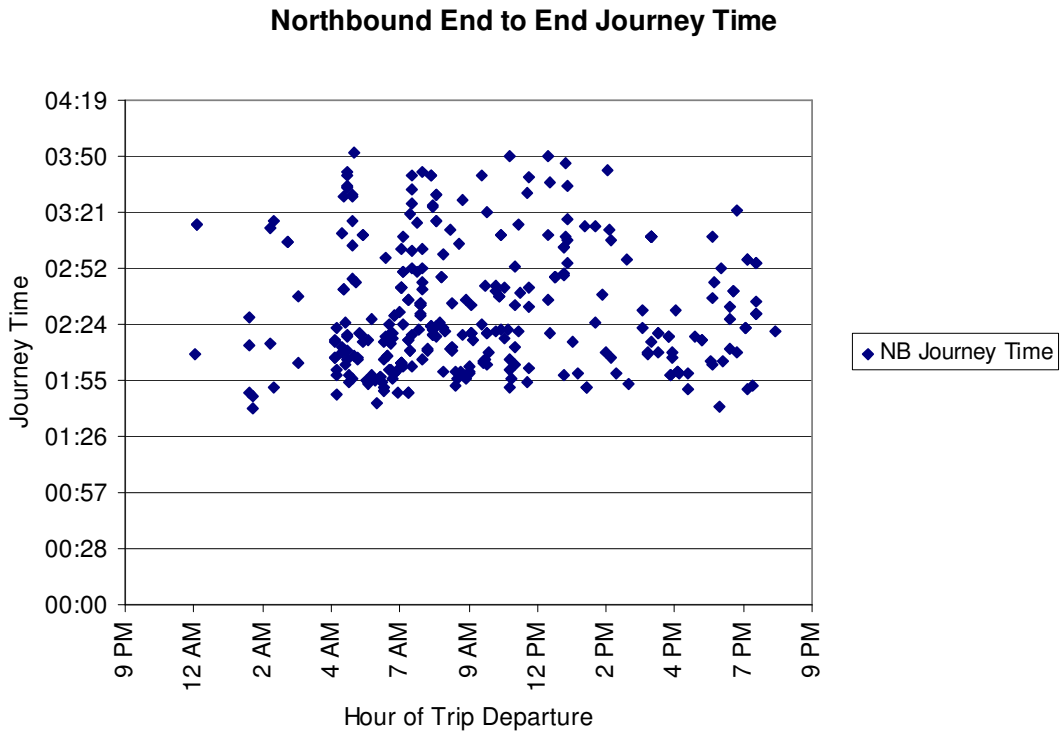
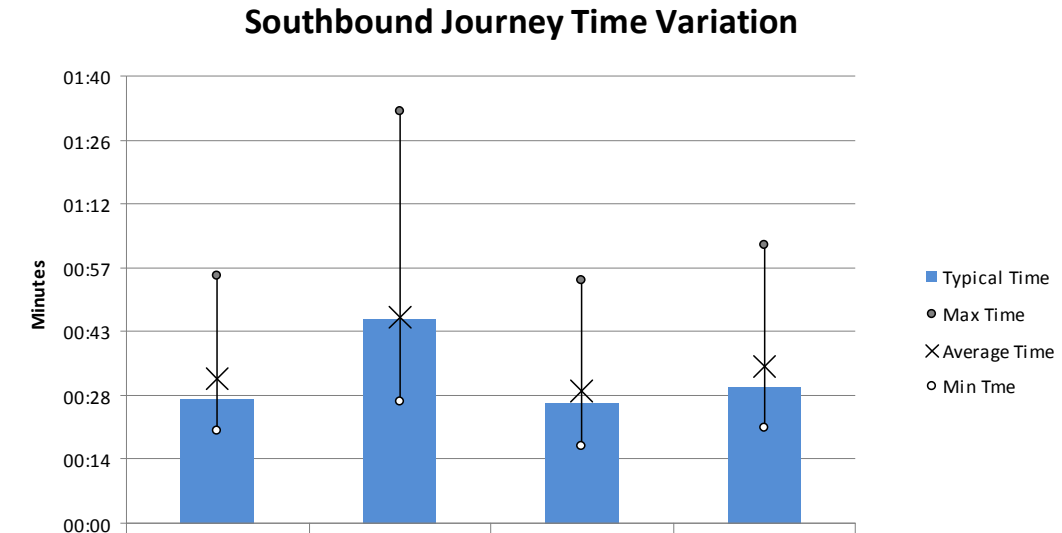


Figure 6.2.5 Northbound Journey Time Variation, 20th February 2012

Figure 6.2.5 shows Bluetooth data collected for end to end trips on the A9 West of Broxden to Inverness, over a 24 hour typical week day in which the level of variation in journey times is easier to see. On the day recorded there appears to be great variation in the northbound direction with the lowest journey times recorded in the morning before 5.00 AM and again in the evening after 5.00 PM. A greater proportion of longer trips seem to occur between 5.00 AM and late afternoon.



	Link 1	Link 2	Link 3	Link 4
Typical Time	00:28	00:46	00:27	00:31
Max Time	00:55	01:32	00:54	01:02
Average Time	00:32	00:46	00:29	00:35
Min Tme	00:20	00:27	00:17	00:21

Figure 6.2.6 Southbound Journey Times

Figure 6.2.6 shows that out of the four southbound links, the average journey times are very close to the typical journey times on two links (Links 2 and 3) and that two links (Links 1 and 4) are marginally higher than the typical journey times. However, as with the northbound journey times, there were trips on all links during the surveyed period that were recorded as taking double the typical time to complete a journey between two Bluetooth detectors. As the selected links range between 24 and 41 miles in length, some journeys were recorded as being up to 40 percent less than the typical time on some occasions, which again highlights the potential for variation in the journey times. On the links that show a higher than average journey time, the difference between the average and typical time in the southbound direction ranges between 14 percent (Link 4, between Aviemore and Inverness) and 17 percent (Link 1, between Broxden and Dunkeld). In real terms however, this only amounts to an increased average journey time of 4 minutes over 24 miles and 25 miles, respectively.

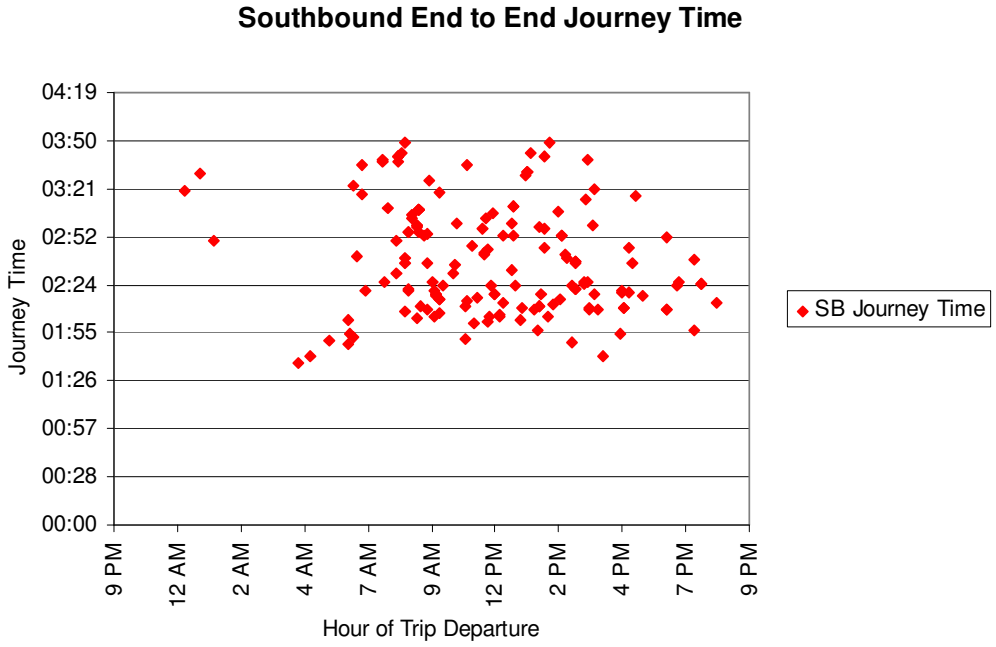


Figure 6.2.7 Southbound Journey Time Variation, 20th February 2012

Figure 6.2.7 shows trip information recorded throughout a typical day in the southbound direction over 24 hours. Similar to northbound trips, there is a variation in journey time in end-to-end trips on the A9 West of Broxden and Inverness, with the lowest recorded journey times occurring prior to 7.00 AM and just after 3.00 PM.

In summary, analysis of journey time data from Traffic Scotland indicates that average speeds are generally approaching 60 mph along the route. This is considered suitable for a road with mixed single and dual carriageway provision.

Articulated HGV's speed data, otained through Transport Scotland's speed limit review, indicated that the average speeds were slightly above 50 mph, irrespective of carriageway provision. The introduction of Average Speed Cameras along the route should impact on the average speeds, with a reduction in the number of vehicles exceeding the speed limit.

Analysis of the available Bluetooth data indicated some significant variation in journey times along the route; however some of the figures are partially attributed to inherent issues in the method of Bluetooth data collection. As expected, the analysis indicated that the variation in journey times appears to increase as the distance between Bluetooth receptors increases, however in general average speeds were approximately 50 mph along the majority of sections, which equates to approximately 85 percent of the majority of sections' speed limit (60 mph).

6.2.6 Accident Data

STATS19 data is collected by the Police and contains information on all incidents which they attend on the trunk road network in which one or more persons is killed or injured. The STATS19 data was obtained from Transport Scotland's Strategic Road Safety team and was analysed to provide an understanding of trends and contributory factors for accidents on the A9. The dataset reviewed for this report covers the period from January 2007 to December 2011. **Figure 6.2.8** contains

details of the number, and severity, of accidents over the full route between 2007 and 2011.

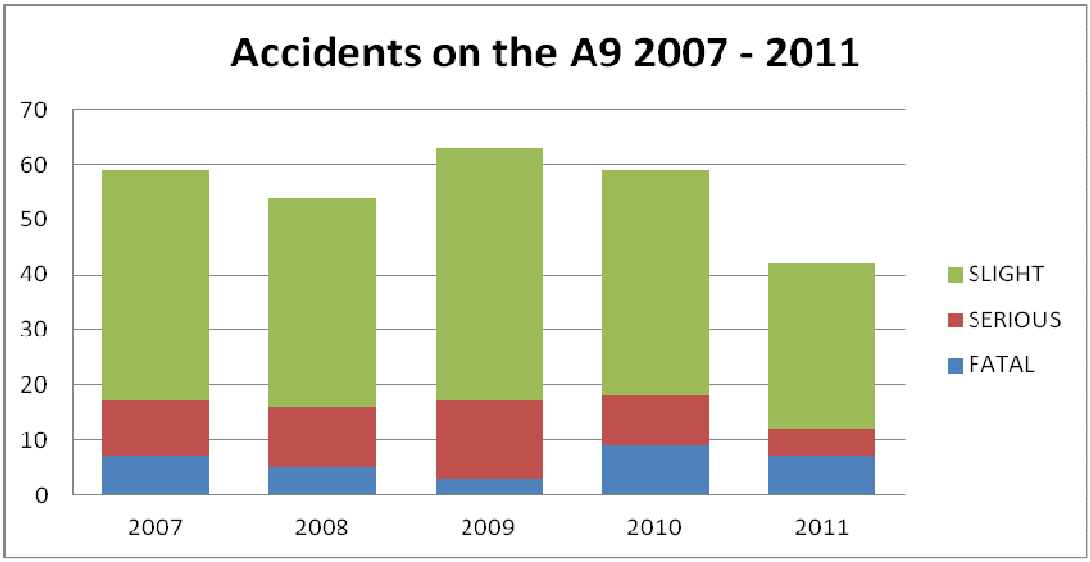


Figure 6.2.8 Accident Numbers and Severity (2007-2011)

Figure 6.2.8 shows the accident numbers and severity of accidents on the A9 over the five year period 2007-2011. The number of accidents per year is generally consistent over the first four year period however there is a noticeable reduction in 2011 with 29% fewer incidents recorded than the year before. Despite this overall reduction, the number of fatal accidents for 2011 remained high. Over half of all fatalities on the A9 over the five year period 2007-2011 took place during the period 2010-2011.

STATS19 data for 2012 data was not available when undertaking this assessment; however initial review of supplementary data provided from Transport Scotland suggests that 40 accidents occurred on the A9 in 2012, including five fatal accidents and eight serious accidents. This is broadly similar to that experienced in 2011, with a slight reduction in the total number of accidents and fatalities.

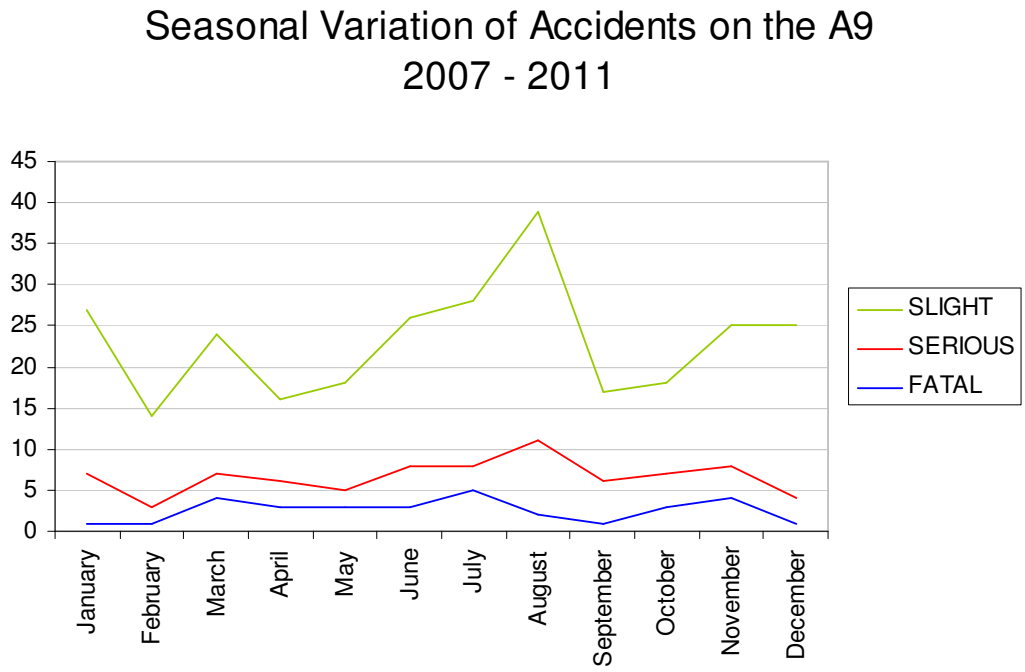


Figure 6.2.9 Seasonal Variation of Accidents on the A9 (2007-2011)

Figure 6.2.9 shows the seasonal variation of accidents on the A9 over the five year period 2007-2011. Accident numbers on the A9 generally peak during the summer months, gradually increasing from June onwards and reaching a high point in August when AADT is also at its highest point of the year, as illustrated by **Figure 6.2.2**. Fatal accidents appear to peak in July/August. Overall, 14% of accidents from 2007-2011 have taken place in the month of August alone and 34% of all accidents have taken place in the main summer months of June, July, and August when the A9 experiences higher traffic volumes. Accident numbers also appear relatively high at the beginning and end of the year during the winter months (January, November and December). Analysis of STATS19 contributory factors highlights a relatively high proportion of accidents being caused by 'slippery road due to weather' (29%).

Accident Severity	A9 5 Year Average 2007 - 2011		A9 2011		National Non-Built up Trunk Roads 2011[4]	
	Number	%	Number	%	Number	%
Fatal	6	11.2%	7	16.7%	37	3.7%
Serious	10	17.7%	5	11.9%	199	20%
Slight	39	71.1%	30	71.4%	758	76.3%

Table 6.2.7 Accident Data on the A9 Compared to National Statistics

Table 6.2.7 compares the number and severity of accidents on the A9 to the Scottish national average. The table shows that the percentage of accidents on the A9 that result in fatalities is significantly higher than the comparative national figure, for both 2011 and the five year average.

The local and national levels can be compared more readily when examining accident rates. The accident rate (per Million Vehicle Kilometres) between 2008 and

[4] Reported Road Casualties Scotland 2011 (Table 5), The Scottish Government

2010 was obtained from Transport Scotland's Route Safety File for the A9[5] and is detailed in **Table 6.2.8** below. The data also highlights that accident rates are higher on single carriageway sections of the road than the dual carriageway sections and that the accident rate for the route within this period was less than the Scottish Trunk Road average[5].

Carriageway Type	Accident Rate (Personal Injury Accidents/Million Vehicle Kilometres(MVK)) 2008 – 2010	
	A9	Scottish Trunk Road Average[5]
Single	11.51	19.3
Dual	6.72	7.7

Table 6.2.8 Accident Rate Comparison of A9 to Scottish Trunk Roads (2008-2010)

Analysis of fatal accidents within the STATS19 data from 2007 to 2011 highlighted that a higher proportion of accidents occurred on single carriageway roads than dual carriageway as shown in **Table 6.2.9**:

Carriageway Type	Accident Severity						
	Fatal	Serious	Slight	Total	% All Accidents	% Fatal Accidents	% Carriageway Type Along Route
Dual Carriageway	5	8	57	70	25%	16%	26%
Single Carriageway	26	41	140	207	75%	84%	74%
Total	**31**	**49**	**197**	**277**	**100%**	**100%**	**100%**

Table 6.2.9 Accident Severity by Carriageway Type (2007-2011)

Table 6.2.11 illustrates the accident rate on sections of the A9 between 2007 and 2011 and shows that in all sections the accident rate is below the 2010 Scottish Trunk Road average for the corresponding road type. The most recent Route Safety File for the A9 only provides this information for 2010; the 2011 figure is as yet unavailable.

[5] National Rates for Dual and Single Carriageways, A9 Route Safety File, 2012, TranServ

A9 Section	Type	Length (km)	Accidents (2007 – 2011)	AADT 2010	2010 Accident Rate (per 100 Million Vehicle Kilometres)		
					A9 Rate	National Rate[5]	Difference
Perth - Luncarty	Dual	4	7	23,500 **	4.08	7.7	-3.62
Luncarty - Pass of Birnam	Single	9	21	15,800	8.09	19.3	-11.21
Pass of Birnam	Dual	2	1	12,900	2.12	7.7	-5.58
Pass of Birnam - Tay Crossing	Single	8	19	12,900	10.09	19.3	-9.21
Tay Crossing - Ballinluig	Single	9	18	13,500	8.12	19.3	-11.18
Ballinluig - Pitlochry	Dual	6	8	13,800	5.29	7.7	-2.41
Pitlochry - Killiecrankie	Single	6	15	9,500	14.42	19.3	-4.88
Pass of Killiecrankie	Dual	2	2	9,500	5.77	7.7	-1.92
Killiecrankie - Glen Garry	Single	21	20	8,300	6.29	19.3	-13.01
Glen Garry	Dual	10	10	8,400	6.52	7.7	-1.18
Glen Garry - Crubenmore	Single	20	31	8,100	10.49	19.3	-8.81
*Crubenmore****	*Dual*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Crubenmore - Kincraig	Single & 2+1	16	22	8,500	8.86	19.3	-10.44
Kincraig - Dalraddy	Single	8	4	8,800*	3.11	19.3	-16.19
Dalraddy - Slochd	Single	25	33	7,800	9.27	19.3	-10.03
Slochd - Tomatin	Dual	5	6	8,600*	7.65	7.7	-0.05
Tomatin - Moy	Single & 2+1	9	15	8,500	10.74	19.3	-8.56
Moy – Inverness (Inshes)	Dual	12	14	11,000	5.81	7.7	-1.89
Total	Single & 2+1	131	198	10,000 ****	8.72	19.3	-10.58
	Dual	41	48	11,700 ****	5.48	7.7	-2.22

**Estimated flows based on one or more counters or on a counter not in the exact location of the carriageway.*
***No flow for 2010 or 2011 so based on average of 2008, 2009 and 2012*
**** All incidents on the Crubenmore dual section took place prior to September 2011 and before the dual carriageway extension was completed and opened for traffic.*
*****Total Flows are as a weighted average*

Table 6.2.10 Accident Rates on the A9 and Nationwide

Table 6.2.10 shows that the section between Pitlochry and Killiecrankie has one of the highest accident rates on the route with 15 accidents in the past five years within a 6km stretch. The Crubenmore section was removed from this analysis as it was upgraded to dual carriageway and opened to traffic in September 2011 which means all of the incidents recorded between 2007 and 2011 took place before this time.

A9 Section	Type	Length (km)	Fatal Accidents (2007 – 2011)	AADT 2010	2010 Accident Rate (per 100 Million Vehicle Kilometres)		
					A9 Fatal Accident Rate	National Fatal Accident Rate[4]	Difference
Perth - Luncarty	Dual	4	0	23,500**	0.00	0.59	-0.59
Luncarty - Pass of Birnam	Single	9	2	15,800	0.77	0.59	0.18
Pass of Birnam	Dual	2	0	12,900	0.00	0.59	-0.59
Pass of Birnam - Tay Crossing	Single	8	4	12,900	2.12	0.59	1.53
Tay Crossing - Ballinluig	Single	9	1	13,500	0.45	0.59	-0.14
Ballinluig - Pitlochry	Dual	6	3	13,800	1.99	0.59	1.4
Pitlochry - Killiecrankie	Single	6	5	9,500	3.85	0.59	3.26
Pass of Killiecrankie	Dual	2	0	9,500	0.00	0.59	-0.59
Killiecrankie - Glen Garry	Single	21	2	8,300	0.63	0.59	0.04
Glen Garry	Dual	10	0	8,400	0.00	0.59	-0.59
Glen Garry - Crubenmore	Single	20	6	8,100	2.03	0.59	1.44
Crubenmore	*Dual*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Crubenmore - Kincraig	Single & 2+1	16	5	8,500	2.01	0.59	1.42
Kincraig - Dalraddy	Single	8	0	8,800*	0.00	0.59	-0.59
Dalraddy -Slochd	Single	25	2	7,800	0.56	0.59	-0.03
Slochd -Tomatin	Dual	5	0	8,600*	0.00	0.59	-0.59
Tomatin - Moy	Single & 2+1	9	0	8,500	0.00	0.59	-0.59
Moy – Inverness (Inshes)	Dual	12	2	11,000	0.83	0.59	0.24
Total	Dual & Single	176	31	10,000***	0.97	0.59	0.38
	Dual	41	5	11,700***	0.57	0.59	-0.02
	Single & 2+1	131	26	9,500***	1.14	0.59	0.55

**Estimated flows based on one or more counters or on a counter not in the exact location of the carriageway.*
***No flow for 2010 or 2011 for Perth to Luncarty so based on average of 2008, 2009 and 2012*
****Total flows are as a weighted average*

Table 6.2.11 Fatal Accident Rates on the A9 and Nationwide

Table 6.2.11 shows the Fatal Accident rate along the A9 compared to the national average for the five year period, 2007-2011. The source data for National Fatal Accident Rates is Reported Road Casualties Scotland 2011, which bases the rate on Non-Built up Trunk A roads, therefore does not distinguish between single and dual carriageways. The figures show that six out of ten single carriageway sections have a fatal accident rate higher than the national average, inclusive of the 2+1 Crubenmore to Kincraig section. The 6km single carriageway section between

Pitlochry and Killiecrankie has the highest fatal accident rate for the five year period. Almost all of the fatalities have occurred on the single carriageway sections, with only 5 fatal accidents recorded on dual carriageway sections from 2007-2011 out of a total of 31. These 5 occurred on the two dual carriageway sections: Ballinluig to Pitlochry (6km) and Moy to Inshes (12km).

Overall, six of the eight dual carriageway sections have a fatal accident rate of zero.

(a) Accident Manoeuvres

STATS19 data records the manoeuvres involved in each of the personal injury accidents between 2007 and 2011. On occasions where there is more than one casualty involved in an accident there may have been multiple manoeuvres involved. For instance, in a collision between two cars one driver may have been 'going ahead' as the other driver was 'slowing or stopping' the vehicle. For this reason, each casualty has been analysed for each accident on the A9 from 2007-2011 to take into account the variety of manoeuvres involved. For all accidents, the most common movements recorded are:

- *Going ahead other (64%)*
- *Overtaking vehicle on offside (7%)*
- *Slowing or stopping (6%)*
- *Going ahead right hand bend (5%)*
- *Going ahead left hand bend (5%)*

"Going ahead other" is the most common description used to describe the manoeuvre being undertaken during, or just prior to, the accident. This is a term used to describe the action of continuous driving without carrying out a complex manoeuvre. As a result it is understandable that the motion of "going ahead other" is the most common manoeuvre being undertaken during, or just prior to, an accident. It is therefore appropriate to consider alternative categories, in order to establish common contributory factors with a view to identifying possible mitigation measures against accidents from such manoeuvres. This shows that "overtaking", "going ahead at a left or right hand bend" and "slowing/stopping vehicles" are most frequently involved in accidents on the route.

In addition to the use of STATS19 accident data, Transport Scotland's A9 Safety Group analysed fatal accident reports for the period 2007-2011 and found 'overtaking' to be the most common contributory manoeuvre involved in fatalities (26%). This is followed by 'loss of control' (19%), 'moved out of lane' (16%) and 'pedestrian stepped out' (13%). **Table 6.2.12** highlights the manoeuvre involved in each of the 31 fatalities that occurred on the A9 from 2007-2011.

Vehicle Types Involved	Vehicle Type Responsible	Causation	Route Provision	Date
Motorcycle, Car	Car	conflict at right turn*	dual	26/10/2007
2 Cars	Car	drifted	single	26/07/2008
Car, Minibus	Car	moved out lane	single	11/06/2007
2 Cars	Car	loss of control	single	02/03/2007
2 Cars, 2 Vans	Car	too close	single	24/03/2007
Car, Pedestrian	N/A (pedestrian)	pedestrian	single	01/04/2007
Artic HGV, Pedestrian	N/A (pedestrian)	pedestrian	single	12/10/2007
2 Articulated HGVs, Van	Articulated HGV	too close	dual	18/10/2007
Car, Coach	Car	moved out lane	single	02/05/2007
Articulated HGV	Articulated HGV	overtake*	single	03/07/2008
2 Cars	Car	overtake*	single	04/09/2008
2 Cars	Car	overtake*	single	04/06/2008
Car, Car+Caravan, Van	Car	overtake*	single	19/07/2008
2 Cars	Car	overtake*	single	15/11/2010
Car	Car	loss of control	single	02/01/2009
HGV<7.5T, Pedestrian	HGV	pedestrian	dual	03/11/2009
3 Cars	Car	overtake*	single	26/11/2009
Motorcycle	Motorcycle	loss of control	dual	02/08/2010
Articulated HGV	Articulated HGV	loss of control	single	04/02/2010
Motorcycle	Motorcycle	loss of control	dual	01/08/2010
Car, Motorcycle	Car	overtake*	single	29/08/2010
Car, Motorcycle	Car	conflict at right turn*	single	24/04/2010
4 Cars	Car	overtake*	single	22/10/2010
Artic HGV, Pedestrian	N/A (pedestrian)	pedestrian	single	18/04/2010
2 Artic HGVs, HGV	Articulated HGV	moved out lane	single	23/12/2010
2 Cars, Coach	Car	loss of control	single	04/11/2011
Car, Van	Car	moved out lane	single	04/07/2011
2 Cars	Car	conflict at right turn*	dual	08/05/2011
Car, Bus	Car	moved out lane	single	10/06/2011
4 Cars	Car	drifted	single	10/03/2011
2 HGV>7.5T, Artic HGV	Articulated HGV	too close	single	02/03/2011

** dualling / grade separation of route should reduce/removethe likelihood of this type of accident*

Table 6.2.12 A9 Perth to Inverness Fatal Accident Summary[6]

(b) Contributory Factors

As well as understanding the manoeuvres involved in accidents on the A9, the contributory factors relating to the accidents are recorded in the STATS19 data. The five most common factors involved for all accidents on the A9 between 2007 and 2011 are generally related to errors in driver judgement, and include the following:

- *Slippery Road due to weather (21%)*
- *Failed to look properly (13%)*
- *Poor turn or manoeuvre (7%)*
- *Loss of control (6%)*

- *Following too closely (5%)*

(c) Moving Cursor Programme

The locations of each of the accidents within this time period are shown in Figures 1 to 3 in **Appendix O**. Generally the accidents appear to be spread along the route. Transport Scotland's SERIS Moving Cursor Programme (MCP) continuously monitors accidents and highlights areas where clusters are identified.

For the period 2007-2011 Transport Scotland's SERIS MCP analysis has identified seven key cluster areas on the A9 between Perth and Inverness. These are located at:

- *Bankfoot Junction;*
- *Dunkeld Junction;*
- *Pitlochry Slip Road;*
- *Lynwilg Junction; and*
- *Granish A95 Junction.*

Two of the clusters identified by the MCP analysis – at Raigmore Interchange and Longman Roundabout – are outside of the scheme extents. The remaining five clusters were selected due to having five or more accidents within a 250m radius.

Transport Scotland has already undertaken steps to try and mitigate the impact of accident clusters at Bankfoot and Dunkeld. In August 2009, a new single lane dual and junction improvement scheme was built at Bankfoot and in 2010 the road was resurfaced at Dunkeld and solar studs were installed[7]. Transport Scotland is currently in the process of investigating the clusters at Lynwilg and Granish A95[8], although solar-powered bollards were installed at these junctions in 2007/08.

No action has been taken at the Pitlochry Slip road as the accident analysis undertaken as a part of the MCP identified no treatable common factor.

(d) Identification of Other Sections to Consider

In addition to the clusters identified under the MCP, there are other sections of the A9 from Perth to Inverness that do not share the same common features of the clusters mentioned (i.e. five or more accidents in a 250m radius) but may warrant further analysis. These include:

- *On the A9 north of Luncarty, just north of the dual section, there have been eight accidents, including one fatal, over the five year period 2007-2011.*
- *The area south of and on the dual section at Crubenmore has had nine accidents, including one fatality, in the five year period over a 2km stretch, all of which occurred before the dual carriageway extension was completed and opened for traffic. The dualling of this section is likely to have addressed the safety issues on this section.*

[6] A9 Safety Group, Transport Scotland, DRAFT A9 Fatal Accident Analysis, March 2013
[7] A9 Route Safety File, 2012, TranServ
[8] A9 Perth to Thurso Route Review Draft (Accident Analysis), 2013, TranServ, p.39-58

- *The A9 connection to the A86 at Newtonmore which has experienced five accidents, including one fatality, in five years over a 1km stretch of single carriageway – immediately after a 4km stretch with no recorded incidents in five years at all.*
- *The Pass of Drumochter between Glen Garry and Crubenmore which has had nine accidents at a bend in the road, including two fatalities, in five years.*

From the analysis undertaken there are few commonalities or trends between accidents at these clusters. Poor road conditions due to adverse weather is identified as a contributory factor in many cases, and poor driver judgment, such as 'failing to look properly' or being 'careless/reckless/in a hurry', are also fairly common indicators.

The "road layout" at the Pass of Drumochter cluster was specifically identified as a possible contributory factor for one of the fatalities as the driver manoeuvred around a left hand bend. The other fatality at this section took place as a vehicle tried to "overtake someone on its offside" and failed to look properly.

Also, on the Crubenmore section "driver manoeuvres" seem to vary greatly. A large proportion of incidents (33 percent) at this cluster take place as a driver is "waiting" to either turn left, right or go ahead; 33 percent take place as a driver goes ahead at a bend; 11 percent as a vehicle is slowing or stopping; and 11 percent as a vehicle changes lanes to the left. This area was recently dualled in September 2011 which is expected to have an impact on the number and severity of accidents going forward.

6.3 Public Transport Provision

Existing public transport facilities along the A9 include bus and train services, as discussed in Section 2.8. Citylink buses provide intercity services between Perth, Glasgow and Edinburgh in the south and Inverness in the north, in general these services run approximately once an hour during the summer months and slightly less frequently in the winter. There are coach parks at both Pitlochry and Kingussie and a Park and Ride site at Broxden on the M9 near Perth. There are also local and regional bus routes around both Perth and Inverness that may use the A9.

The Highland Main Line railway between Perth and Inverness runs close to the A9 for much of its route, with eight stations along the corridor. The majority of the route is single tracked, with only 34 percent double tracked. The journey time between Perth and Inverness by rail is between 2 hours 5 minutes and 2 hours 10 minutes.

The following regular passenger services are available on the route:

- *Inverness to Edinburgh, 6 trains per day;*
- *Edinburgh to Inverness, 5 trains per day;*
- *Inverness to Glasgow, 4 trains per day;*
- *Glasgow to Inverness, 5 trains per day;*
- *Inverness to London Kings Cross 1 service in each direction; and*
- *Sleeper train from Inverness to London Euston, 1 service in each direction.*

6.4 Future Conditions

Historic trends, presented in Section 6.2.1, indicate that traffic levels have been generally consistent in the last five years (2008-2012), with decreases within the section between Perth and Pitlochry. However, over the design life of the proposed route (20-40 years), there is likely to be traffic growth on the route, which is reflected within the national transport model.

The expected completion year of the upgrade to dual carriageway on the A9 is 2025; therefore the design year is set at 2040 (opening year plus 15 years). 2040 is however, beyond the traffic forecasting of National Road Traffic Forecasts (NRTF), Scottish Trip End Program (STEP) and Transport Model for Scotland (TMfS).

Current guidelines recommend the use of the STEP, a software application developed by Transport Scotland to enable the derivation of growth factors based on data from National Transport, Demand and Land Use Models. The use of local demand and land use forecasts can provide an understanding of the likely growth within the locality of the scheme. However, as the A9 is a strategic road with traffic flows affected by changes as far afield as Glasgow, Edinburgh and beyond, it is more appropriate to use the TMfS, which takes into consideration traffic demand and land use across Scotland and can inform strategic growth patterns more accurately.

The TMfS:2012 model currently being developed will better reflect the recent changes in traffic levels, on a strategic basis. In the meantime, until this model is available, the TMfS:07 model has been used to reflect anticipated traffic growth on the A9. It should be noted that the TMfS model also takes account of potential changes in travel demand, relating to land-use projections.

For the purpose of this DMRB Stage 1 Assessment, the base year and traffic forecasts from TMfS for 2025 (the proposed opening year for the full dualling between Perth and Inverness) are presented in **Appendix P.** Traffic growth along the route varies, however the estimated growth from 2012 to 2025 is approximately 14%. Following production of the TMfS:2012 model, revised growth factors will be derived.

Initial modelling of the traffic impact of the full dualling of the A9 between Perth and Inverness, has been undertaken through the LATIS Framework. This indicates a potential increase of traffic on the route of approximately ten percent, following completion of the dualling (approximately 2000 vehicles, based on the AADT just north of Perth). The proportional increase in traffic demand can be greater further north on the A9 corridor. Further modelling will be undertaken when the TMfS:12 model becomes available, to determine the potential impact on traffic levels if the route is dualled.

6.5 Effect of Options

At this stage, the scheme options which are being assessed are dualling of the A9 and the associated junction improvements along its route. Closure of a number of minor junctions is proposed and the routes will be diverted to grade separated junctions along the length of the route. Gaps in the central reservation will be closed, thus removing any right turn movements.

6.5.1 Impacts on Safety

The proposed upgrading to dual carriageway should have a positive impact on safety along the A9. Opportunities for safe overtaking will be increased, improving safety for this manoeuvre, identified in the analysis as a common factor in a number of fatal accidents. This should therefore reduce the potential for accidents.

Although additional travel may be required on side roads to access the new grade separated junctions, the potential for conflict between local and strategic traffic will be reduced by removing access via minor junctions and diverting vehicles to larger grade separated junctions. This should result in improved safety on the A9, as the variation of speeds for vehicles entering and exiting the main carriageway should be reduced. Grade separated junctions should also reduce any queuing on the mainline A9 caused by right turning vehicles who are waiting to turn, which should further contribute towards improved safety on the route.

Gaps in the central reservation will be closed and vehicles will no longer be able to make right turns on and off the A9. The A9 Route Safety File[7] highlights that vehicles carrying out these movements are currently involved in a much higher proportion of accidents on the A9 compared to the national average.

Provision of a dual carriageway will result in a reduced impact on vehicle speeds, caused by slower moving HGVs, buses, caravans and agricultural vehicles.

By comparing national rates for dual and single carriageway routes, it is considered that safety will be improved on completion of the dualling. Accident severity and accident rates on the proposed dual carriageway are therefore expected to be lower than the existing local rates. **Table 6.2.9** shows that the accident rate on the dual carriageway sections of the A9 are significantly lower than those of the single carriageway sections. Additionally **Table 6.2.12** shows that the fatal accident rate on the dual carriageways of the A9 are approximately half those of single carriageways of the A9. Of the eight dual carriageways sections along the A9, six have a fatal accident rate of zero, providing an indication of the potential safety benefits the scheme may bring. Also, **Table 6.2.13** highlights the causation of fatal accidents along the route with 'overtaking' involved in 26 percent of fatalities along the route.

6.5.2 Impacts on Journey times and Reliability

Improving the A9 to dual carriageway standard will result in reduced journey times and improved reliability of those journey times. The upgrade to dual carriageway will enable safe overtaking of slower moving traffic along the entire route. Initial modelling undertaken through the LATIS framework, indicated that a saving of up to 20 minutes could be achieved by dualling the full route between Perth and Inverness.

Journey time reliability will also be improved by the increase in overtaking opportunities. The route will be more resistant to the impact of accidents or incidents with a second lane, thereby reducing the likelihood of a closure caused by accidents and the associated journey time impacts. This will also reduce the impact of traffic management during periods of maintenance, as two lanes of traffic should generally be able to be maintained whilst works are ongoing.

Reducing the number of junctions and improving the standard to a grade separated form, will mean that the speeds of vehicles travelling on the A9 will be less impacted

by traffic joining and leaving the A9, compared to current arrangements. Therefore journey times, for A9 traffic, will be reduced and their reliability increased. Some side road traffic will be required to travel further distances to access the rationalised grade separated junctions, due to the closure of access and central reservation gaps. However, this disbenefit will be mitigated to a degree by the implementation of grade separation which will remove any potential delay for traffic joining/leaving the A9 permit compared to the current provision of priority junctions. The potential travel time disbenefits due to this have not been quantified in this assessment, however should be considered in later stages of the assessment process.

6.6 Economics

The A9 dualling programme will provide travel time benefits, due to the increased speeds and subsequent reduced journey times. Further analysis will be undertaken using the TMfS:2012 model, which will provide a more robust forecast of traffic demand on the route, and subsequently the potential for travel time savings following the full dualling. Accident savings on the route are expected; however due to the existing accident rate being lower than the corresponding national rate for this road type, the level of accident savings are uncertain. There is expected to be a significant reduction in accident severity. The proportion of severe accidents is greater than expected on this type of route and this may be improved by dualling and grade separation of the route.

7 KEY FINDINGS AND RECOMMENDATIONS

7.1 Corridor Options Recommended for Further Consideration

7.1.1 Introduction

It is important to note that the recommendations do not preclude consideration of other options which may be appropriate at DMRB Stage 2. The recommendations indicate an option which should, based on the level of assessment undertaken in this report, be considered further in accordance with a DMRB Stage 2 Assessment and which could potentially be developed in more detail to become overall preferred option for each section of the route.

For the online corridor (Red Option), each section has been assessed to determine its proximity to the adjacent constraints. For the seven existing single carriageway sections, which does not include those that are currently being progressed through a DMRB Stage 2 or 3 Assessment, this has provided an indication of whether widening would be feasible. The results of this assessment are contained within Section 4 of the report.

For the three Offline Corridors identified (Black, Pink and Green Corridors), and the eighteen online sections, corridor summary tables have been produced and are contained in **Appendix G**. The overall recommendations from the assessment are set out below.

7.1.2 Perth to Luncarty

This dual carriageway section currently has 1 grade separated junction, 5 at-grade junctions/accesses and several Departures from Standard for a combination in relaxations for horizontal curvature, vertical curvature and SSD. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during any future DMRB Stage 2 Assessment.

7.1.3 Luncarty to Pass of Birnam

This single carriageway section currently has 21 at-grade junctions/accesses and 1 Departure from Standard for the vertical alignment. This section also has a higher accident rate than the national average for fatal accidents on single carriageway roads. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

The Luncarty to Pass of Birnam single carriageway is currently being progressed through a DMRB Stage 3 Assessment.

7.1.4 Pass of Birnam

There are no existing junctions/accesses on this dual carriageway section and 4 Departures from Standard in relation to a combination of relaxations in the vertical / horizontal alignment and SSD.

It is recommended that this section of existing dual carriageway is further reviewed during any future DMRB Stage 2 Assessment. This review will determine the works required to bring the section up to a Category 7A standard of dual carriageway and ensure a consistent standard is adopted over the length of the A9.

7.1.5 Pass of Birnam to Tay Crossing

This single carriageway section currently has 16 at-grade junctions/accesses and 3 Departures from Standard in relation to a combination of relaxations. This section also has a higher accident rate than the national average for fatal accidents on single carriageway roads. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

The Pass of Birnam to Tay Crossing single carriageway is currently being progressed through a DMRB Stage 2 Assessment.

7.1.6 Tay Crossing to Ballinluig

This single carriageway section currently has 17 at-grade junctions and 20 Departures from Standard for vertical alignment and SSD. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

Both an online (Red Option) and offline corridor (Black Option) have been assessed at DMRB Stage 1.

(a) Red Option

The existing A9 is a single carriageway section, 9km in length which crosses the River Tay northwest of Dunkeld; the A9 lies east of Tay Forest Park and passes through Dowally toward the southern extents of Ballinluig.

(b) Black Option

The Highland Main Line railway runs for approximately 8km to the east of the proposed corridor and crosses at the northern extents. No Departures from Standard have been identified within this initial assessment.

Although the Black Option has not been recommended to be taken forward as part of the SEA, this option cannot be ruled out as there are a number of constraints within the online corridor which could be avoided or where impacts could be reduced by adopting the offline corridor. This includes the number of direct accesses to the existing A9 which will potentially have to be closed or realigned, potential geotechnical issues associated with the slopes above the existing road, environmental impacts of widening on the River Tay Special Area of Conservation (SAC) and the constructability issues of widening the existing River Tay Crossing.

It is therefore recommended that both the Red and Black Options are further reviewed during the DMRB Stage 2 Assessment.

7.1.7 Ballinluig to Pitlochry

This dual carriageway section currently has two grade separated junction and 48 Departures from Standard, mainly relating to combinations of Relaxations or Relaxations on approach to junctions.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during the future DMRB Stage 2 Assessment.

7.1.8 Pitlochry to Glen Garry

This combined section is single carriageway between Pitlochry and Killiecrankie, dual carriageway at Pass of Killiecrankie, and single carriageway between Killiecrankie and Glen Garry. Both an online widening corridor and two offline dualling corridors (Pink Option and Green Option) have been identified in the Sifting Assessment as being suitable for review at DMRB Stage 1.

This section currently has 1 grade separated junction and 39 at-grade junctions/accesses. This section is considerably below standard and includes 56 Departures from Standard, relating to relaxations in horizontal, vertical and SSD and on approaches to junctions. The section between Pitlochry and Killiecrankie has the worst fatality accident rate along the A9 and is above the average for a single carriageway road. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

(a) Red Option

Pitlochry to Killiecrankie and Killiecrankie to Glen Garry are 6.2km and 21.8km single carriageway sections respectively which are split by the 1.7km dual carriageway Pass of Killiecrankie section.

Immediately north of the Pitlochry South Junction, the road crosses the River Tummel and follows along the west edge of the river until crossing Loch Faskally. The River Tummel separates the A9 from Pitlochry and the Highland Main Line railway which lie to the east. North of Pitlochry, the road lies east of the River Garry with the railway crossing from east to west of the A9. The existing Killiecrankie Viaduct is not fully compliant with D2AP requirements but major modifications are not anticipated. The single carriageway section of the north of the Pass of Killiecrankie lies along gradual slopes passing forests and the settlements of Killiecrankie, Blair Atholl, Bruar and Calvine. It is the southernmost A9 subsection located within the boundary of the Cairngorms National Park. The River Garry and the Highland Main Line railway alternate between the north and south of the A9, with the river generally lying between the road and railway.

Several accesses exist along the route; one grade separated and three at-grade junctions lie in proximity to the main population centre of Pitlochry. One at-grade junction is located at the northern extent of the Pass of Killiecrankie subsection. There are three at-grade junctions between Killiecrankie and Glen Garry.

(b) Pink Option

The River Garry runs along approximately 13km of the Pink Option corridor and over half of the corridor is within the SEPA Flood Risk Zone. This section travels through Ancient and Semi-Natural Ancient Woodland and 3.5km is within Historic Gardens and Designated Landscapes (HGDL).

Although the offline route would remove traffic from the existing A9, with a beneficial effect in terms of traffic related impacts for properties along the road and reduce the impact on the Killiecrankie Battlefield, the Pink Option has not been recommended to be taken forward as part of the SEA due significant environmental impacts. However, this option cannot be ruled out as there are a number of constraints within the online corridor which could be avoided or where impacts could be reduced by adopting the offline corridor. This includes the number of direct accesses to the A9 which will potentially have to be closed or realigned, standard of the existing road geometry, reducing the River Tummel crossing and Killiecrankie Battlefield.

(c) Green Option

The River Garry also runs along approximately 0.5km of the Green Option Corridor before the corridor crosses it. Parts of the section travel through a SEPA Flood Risk Zone and over half of the corridor encroach Ancient or Semi-Natural Ancient Woodland. There are a number of constraints within the online corridor which could be avoided or where impacts could be reduced by adopting the offline corridor. This includes the standard of the existing road geometry and encroachment on a SSSI.

It is therefore recommended that the Red, Pink and Green Options are further reviewed during the future DMRB Stage 2 Assessment.

7.1.9 Glen Garry

This dual carriageway section has split level carriageways and currently has 12 Departures from Standard for vertical curvature and SSD; the majority of these are as a result of a combination of Relaxations.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during the future DMRB Stage 2 Assessment.

7.1.10 Glen Garry to Crubenmore

This single carriageway section currently has 24 at-grade junction/accesses. This section also has a higher accident rate than the national average for fatal accidents on single carriageway roads. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings.

It is recommended that this section of single carriageway is further reviewed during the future DMRB Stage 2 Assessment.

7.1.11 Crubenmore

This dual carriageway section currently has 3 at-grade junctions/accesses and 5 Departures from Standard in relation to relaxations to the SSD and in particular locations around the existing junction locations. The upgrading will consider the

closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during the future DMRB Stage 2 Assessment.

7.1.12 Crubenmore to Kincraig

This single carriageway section currently has 2 grade separated junction and 26 at-grade junction/accesses. 18 Departures from Standard have been identified in relation to relaxations to the vertical alignment and SSD. This section also has a higher accident rate than the national average for fatal accidents on single carriageway roads. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

It is recommended that this section of single carriageway is further reviewed during any future DMRB Stage 2 Assessment

7.1.13 Kincraig to Dalraddy

This single carriageway section currently has 19 at-grade junctions/accesses and 2 Departures from Standard have been identified, which are for a combination of relaxations in vertical curvature and SSD. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

The Kincraig to Dalraddy single carriageway is currently being progressed through a DMRB Stage 3 Assessment.

7.1.14 Dalraddy to Slochd

This single carriageway section currently has 36 at-grade junction/accesses and 8 Departures from Standard have been identified, which are for a combination of relaxations. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

It is recommended that this section of single carriageway is further reviewed during any future DMRB Stage 2 Assessment

7.1.15 Slochd to Tomatin

This dual carriageway section has 1 at-grade junction and 5 Departures from Standard, which are for a combination of relaxations. The upgrading will consider the closure of the at-grade junction and removing any right turn manoeuvres by closing the central reserve opening in accordance with a Category 7A road.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during any future DMRB Stage 2 Assessment.

7.1.16 Tomatin to Moy

This single carriageway section currently has 17 at-grade junction/accesses. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

It is recommended that this section of single carriageway is further reviewed during any future DMRB Stage 2 Assessment

7.1.17 Moy to Inverness

This dual carriageway section currently has 1 grade separated junction and 17 at-grade junction/access. 14 Departures from Standard have been identified, which mainly relate to a combination of relaxations. The upgrading will consider the closure of the at-grade junctions and removing all right turn manoeuvres by closing the central reserve openings in accordance with a Category 7A road.

A further review is required to determine the works required to bring the carriageway up to a Category 7A road and ensure a consistent standard is adopted over the length of the A9. It is therefore recommended that this section of existing dual carriageway is further reviewed during any future DMRB Stage 2 Assessment.

7.2 Risks and Uncertainties

7.2.1 Introduction

There are a variety of issues that could impact upon achieving the A9 dualling programme between Perth and Inverness by 2025. Political, procurement and funding risks have not been considered as part of this assessment. This report focuses on deliverability from a technical and legislative perspective only, focussing both on specific risks within each single carriageway subsection and also generic scheme wide risks that may impact both single and dual carriageway subsections.

Risks have been categorised under three headings as follows:

- ***Environmental Constraints*** *– Risk potentially affecting scheme promotion – the sensitivity or significance of environmental constraints or the potential for more significant environmental effects could result in a more complex scheme development and promotion stage, particularly where a public inquiry is required;*

- ***Promotional Issues*** *– Risk potentially affecting scheme promotion – the proximity of the scheme to communities and potential difficulties associated with acquisition of land could result in a more complex scheme development and promotion stage, particularly where a public inquiry is required; and*

- ***Construction Issues*** *– There are various technical issues that could prolong the design and construction of the scheme such as difficult topographical and geotechnical issues, proximity to railways and rivers and implications for structures and major public utilities.*

A summary of the risks identified can be found in the following section.

7.2.2 General Risks

The following generic risks are considered to be key in terms of scheme deliverabilty and will therefore be important factors when considering programme and delivery. The risks are categorised under the three headings outlined above; however, some of the risks will overlap.

Environmental Constraints (General) – There are a broad range of environmental constraints summarised within the SEA Environmental Report such as Ancient Woodlands, SSSI, Ramsar sites, National Nature Reserves, Battlefield sites and the Cairngorms National Park. As a result, a significant level of interest can be expected which could impact on the scheme development and statutory processes. Ensuring continued consultation with interested parties and in particular with statutory bodies such as SNH, CNPA, Historic Scotland and SEPA will assist the process.

Environmental Constraints (Flooding) – The route of the A9 interacts with a number of watercourses and associated floodplains over its length such as the Rivers Tay, Tummel, Garry, Truim and Spey. Encroachment of the road footprint on the floodplain may result in the need for geotechnical design solutions and additional land purchase to provide compensatory storage measures. Furthermore,

watercourse crossings may result in the need for larger culverts or structures to ensure flood risks are mitigated, which may impact the vertical alignment and therefore the footprint of the road. Reference to the A9 SFRA and continued consultation with SEPA will inform design requirements and mitigation.

Environmental Constraints (Drainage) – Surface water treatment and attenutation requirements may result in the need to acquire large areas of land near watercourses for the likes of retention ponds or detention basins. Continued consultation with SEPA to understand and comply with their requirements relating to The Water Environment (CAR) will allow this risk to be better understood.

Promotional Issues (Acquisition of Land) – Widening the A9 may cause disruption during construction, bring the road closer to communities along the route and require the compulsory purchase of private land belonging to businesses and individuals. Early consultation to seek to reduce the impact of the scheme on stakeholders, advising of the statutory process and the working towards agreeing accommodation works will help to reduce the likelihood of delays associated with scheme objections.

Promotional Issues (NMU Routes) - The closure of A9 crossing points or adjacent NMU routes may require the construction of alternative routes and/or structures to avoid severance. This may require significant land purchase or complex structural arrangements in difficult ground / topography.

Construction Issues (Landslides) – The Scottish Road Network Landslides Study: Implementation Report (2008) identified Dunkeld to Drumochter as having a perceived high risk of landslides. Complex geotechnical analysis, design and construction may be required with programme impacts at the design and construction stages.

Construction Issues (Public Utilities) – The A9 runs parallel to the high voltage Beauly to Denny power line for approximately 40km. Following upgrade work which is currently ongoing, 22km of the upgraded power line will remain parallel to the road and will therefore represent a construction constraint with potential impacts on consultation, design and construction. There is also a number of other public utility apparatus along the route such as water, gas, electricity and telecommunication which are also likely to present construction issues.

Construction Issues (Structures) – A large number of structures of varying scale will require to be widened or replaced. This includes eight significant structures over 70m in length that will require significant design and construction periods. In addition, the SEA Environmental Report notes that SNH and CNPA have a preference for underpasses rather than overbridges as they are more likely to minimise visual impacts. This could lead to difficulties in areas with challenging topography or ground conditions.

Construction Issues (Railway Line) – A significant proportion of the A9 runs parallel to the Highland Main Line railway and crosses at a number of locations necessitating various structural works. The close proximity of the railway line represents a significant constraint to the A9 widening, with potential impacts on consultation, design and construction.

Construction Issues (Ground Conditions) – A number of different ground conditions can be expected to be encountered which will introduce a broad range of

challenges. They will include localised peat, made ground associated with the A9, old quarries and pits, rock and potentially contaminated land.

Construction Issues (Junctions / Access) – Construction of grade separated junctions require significant land availability. Complex design and construction can therefore be expected in constrained areas of the route, plus challenges associated with land acquisition. The Junction and Access Strategy detailed in Section 4.10 will also require the closure of many junctions and accesses which, at some locations, will result in the construction of alternative routes and/or structures to avoid severance. This may require significant land purchase or complex underpass construction in difficult ground.

Construction Issues (Buildability) – Online construction and extensive temporary traffic management will be required to ensure traffic impacts are minimised during construction. In general, online construction durations are longer than those for offline routes.

7.2.3 Specific Risks

Specific risks have been considered for each single carriageway subsection as it is these subsections that are likely to have greatest impact on the overall dualling programme. The Luncarty to Pass of Birnam subsection and the Kincraig to Dalraddy subsection have not been considered as they are currently the subject of advanced DMRB Stage 3 Assessments and already have a defined delivery programme.

Birnam to Tay Crossing – This subsection is currently at an advanced DMRB Stage 2 Assessment and reference should therefore be made to the corresponding Stage 2 Report to gain a more accurate understanding of risk. Based on the Stage 1 Assessment undertaken for this report it appears that there could be significant promotional issues given the proximity to the community at Birnam including, but not limited to, the integration with the existing railway provision and station access at Birnam. There will also be environmental and construction challenges involved in widening the 230m, 3-span structure over the River Tay which is designated as a SAC.

Tay Crossing to Ballinluig – The southern extent of this subsection has historical landslide problems including a particular pinch point at approximate Ch. 23000 where a landslide event occurred on the steep hillside opposite the River Tay. The railway and a number of isolated properties are also located in close proximity to various sections of the road and as such the widening options will be restricted throughout. Maintaining access to the properties is likely to increase the scheme footprint.

Pitlochry to Killiecrankie - Widening the 160m span structure over the River Tummel and the 150m span structure over Loch Faskally, both designated as Special Areas of Conservation, will introduce environmental and construction challenges. Construction challenges can also be expected to improve the currently substandard road alignment which affects 68% of this subsection. The proximity to Pitlochry may introduce promotional risks, particularly where construction of the 2 proposed grade separated junctions within this subsection disrupt access to and from the town.

Killiecrankie to Glen Garry – A number of properties, including a primary school at Calvine are located in close proximity to the road, and, as such, the widening

options will be restricted. Furthermore, maintaining access to these properties and other accesses is likely to increase the scheme footprint. The SEA Environmental Report notes that the southern extent of this subsection is one of the most environmentally constrained areas of the A9 corridor. From a construction perspective this southern extent also appears to be the most challenging due to the presence of the three largest structures of the subsection including two over the River Garry which is an SAC site. In contrast the SEA Environmental Report states that the northern extent from Pitagowan to Glen Garry is one of the least environmentally constrained; however, there are extensive lengths of rock outcrops on this section of the route that introduce construction challenges and are designated as both a SSSI and a GCR site. As such, consultation with bodies such as SNH will determine the significance of the risk.

Glen Garry to Crubenmore – Following SSE's upgrade to the high voltage Beauly to Denny power line it will run parallel to and in close proximity to the A9 for approximately 22km which will impact construction on the southern extent of this subsection from Glen Garry to Dalwhinnie. At least two significant pinch points can be expected where road widening will be constrained by the pylons and the railway (approximate chainages 80000 and 80500). The SEA Environmental Report also notes that the southern extent of this subsection is one of the most environmentally constrained areas of the A9 corridor due to various designations (SAC, SSSI, SPA, etc) through the Drumochter Hills. Fewer environmental or construction constraints have been identified in the northern extent of this subsection; however, design and promotion challenges can be expected relating to the severing of access roads and NMU routes. In addition, localised areas of peat may cause environmental or construction risks.

Crubenmore to Kincraig – Widening of the 140m, 7-span structure over the River Spey and general road widening north of the structure will present environmental and construction issues. Consideration will need to be given to the river flood plain and SAC designation and also the adjacent Insh Marshes which is designated as a SAC, SSSI, Ramsar and SPA site. 13 at-grade NMU crossing points have been identified within this sub-section which may result in the need to construct alternative routes and/or structures to avoid severance. This may require significant land purchase or complex structure construction in difficult ground.

Dalraddy to Slochd – The northern extent of the subsection beyond Bogroy Junction is severely constrained by the hard geology, the railway and the need to widen the 3-span 145m Slochd beag Underbridge. The remainder of the subsection is not without construction challenges due to the need to widen the 80m 3 span River Dulnain Underbridge, the presence of peat and the frequency of at grade accesses/junctions. This subsection also contains 21 NMU crossing points which is the highest in the A9 corridor. More significant promotional issues may arise given the proximity of the A9 to Aviemore and private properties. Furthermore the southern extent of the subsection is noted in the SEA Environmental Report as being one of the most constrained of the route from an environmental perspective due to the multiple SAC, SPA, SSSI sites, a Nature Reserve and Ancient Woodland.

Tomatin to Moy – In comparison to the other subsections Tomatin to Moy contains the least significant constraints; however, risks common to the A9 corridor as a whole do exist such as at-grade accesses/junctions and NMU crossing points. Peat may also be encountered.

7.3 Early Implementation Schemes

Consideration has been given to the existing single carriageway sections to identify those subsections of the route that could potentially be progressed more quickly; the Early Implementation Schemes. The Luncarty to Pass of Birnam and Kincraig to Dalraddy subsections have not been included in this assessment as they are at a more advanced DMRB Stage 3 Assessment stage.

The assessment considers the risks identified in Section 7.2 alongside the benefits that construction of each single carriageway subsection of the route would bring. The Early Implementation Scheme Assessment Table provided in **Appendix Q** summarises these findings using a traffic light system and was presented at a workshop on 01 July 2013 attended by representatives from Transport Scotland, the A9 PES team, the A9 SEA team, Perth and Kinross Council, The Highland Council and the consultants responsible for progressing the early implementation schemes. The outcomes of the workshop are contained in this section.

The traffic light system ranks each of the eight single carriageway sections against each heading; Scheme Benefits, Environmental Constraints, Promotional Issues and Construction Issues, with traffic light colours displaying which sections perform best and worst as follows:

- ***Green (performs best)*** *– The subsections ranked first and second;*
- ***Amber (medium performance)*** *– The subsections ranked between third and sixth; and*
- ***Red (performs worst)*** *– The subsections ranked seventh and eighth.*

As can be seen from Table 7.3.1, the best performers are Tay Crossing to Ballinluig and Tomatin to Moy and the worst are Killiecrankie to Glen Garry and Dalraddy to Slochd.

Corridor Subsection	Length	Summary			
		Scheme Benefits (incl. Cost / Economics)	Environmental Constraints	Promotional Issues	Construction Issues
ONLINE OPTIONS					
Birnam to Tay Crossing	8.4km				
Tay Crossing to Ballinluig	7.6km				
Pitlochry to Killiecrankie	6.2km				
Killiecrankie to Glen Garry	21.8km				
Glen Garry to Crubenmore	20.5km				
Crubenmore to Kincraig	15.9km				
Dalraddy to Slochd	24.7km				
Tomatin to Moy	9.3km				

Table 7.3.1 Early Implementation Scheme Assessment Table

The workshop held on 01 July allowed the participants to gain an understanding of the assessment process and consider the most important factors in terms of identifying the Early Implementation Schemes. Ultimately it was agreed that the schemes would be identified based on assessment of overall deliverability criteria. A scheme of approximately 10km was agreed as the optimum scheme length and as such consideration was given to splitting the subsections, assessed throughout this report, into smaller fragments.

An open discussion was subsequently held and the following subsections and fragments of subsections were identified as potential Early Implementation Schemes:

- *Pitagowan to Glen Garry (fragment of the Killiecrankie to Glen Garry subsection);*
- *Dalwhinnie to Crubenmore (fragment of the Glen Garry to Crubenmore subsection);*

- *Granish Junction to Bogroy Junction (fragment of the Dalraddy to Slochd subsection); and*
- *Tomatin to Moy.*

Each of the sections were identified for various reasons and further explanation is therefore provided below based on both the discussions held at the workshop and the findings of the Workshop Report.

It should be noted that although the level of assessment undertaken at this stage is adequate to provide an indication of Early Implementation Schemes, the DMRB Stage 2 Assessment and DMRB Stage 3 Assessment will need to be undertaken before any certainty can be established with regard to programme and delivery. It is therefore advised that findings of this report, in terms of both the Early Implementation Schemes and also the most constrained areas of the route, are used to prioritise the next stages of assessment. This will ensure that the potential Early Implementation Schemes progress to delivery more promptly and that work begins on the sections requiring the longest assessment period. This position was agreed at the workshop.

7.3.1 Pitagowan to Glen Garry

This Scheme is the northern half of the Killiecrankie to Glen Garry subsection which ranks poorly under the Scheme Benefits, Promotional issues and Construction Issues categories. However, the fragment from Pitagowan to Glen Garry performs better when reviewed in isolation and could be considered as an Early Implementation Scheme for the following reasons:

- *It would result in a project length of 10.5km which was identified at the workshop as being an ideal length of scheme. It is long enough to be attractive to tenderers and promote competition and is short enough to allow fast delivery;*
- *The SEA Environmental Report notes that this is one of the least environmentally constrained sections of the route corridor and avoids the Killiecrankie Battlefield, a key constraint which is located within the southern part of the subsection;*
- *The 3 largest structures within the subsection are located to the south, the removal of which would improve the constructability of this scheme;*
- *Similarly, one of the two proposed grade separated junctions is located to the south which can serve Blair Atholl and Killiecrankie. By removing this junction from the scheme it would remove a potential construction risk and also reduce the promotional risk associated with the disruption caused to the residents of the two communities;*
- *This section would link the existing dual carriageway at Glen Garry to a new grade separated junction at Bruar which could be future proofed to ensure there are no abortive works; and*
- *There are no standard diversion routes on this section of the A9 and as such dualling would add resilience to the network in the event of an accident.*

Although there are many reasons as to why Pitagowan to Glen Garry should be regarded as an Early Implementation Scheme at this stage, it is recommended that

further assessment should be undertaken to remove a number of risks which could impact deliverability. In particular:

- *There are extensive lengths of rock outcrops on this section of the route and the road itself is cut into the rock along various lengths. The outcrops are designated as both a SSSI and a GCR Site and as such, consultation with bodies such as SNH will determine deliverability. Further assessment will also be required to better understand how the rock could impact upon the construction methodology and programme;*
- *Further design and assessment will be required in the area around Calvine to understand the impact the road may have on property / land, particularly an adjacent primary school; and*
- *The at-grade junctions and NMU crossing points along the route will require further assessment to understand how severance could be avoided or mitigated.*

7.3.2 Dalwhinnie to Crubenmore

This Scheme is the northern 8.3km of the Glen Garry to Crubenmore subsection. As presented in **Table 7.3.1** Glengarry to Crubenmore performs well in terms of Promotional Issues and poorly in terms of Environmental Constraints. By isolating the section between Dalwhinnie and Crubenmore the following benefits are realised:

- *At 8.3km in length it is long enough to be attractive to tenderers and promote competition and short enough to be delivered quickly;*
- *The SEA Environmental Report notes that this is one of the least environmentally constrained sections of the route corridor avoiding the Drumochter Hills SPA, SSSI and SAC sites to the south of the subsection;*
- *Although the Glen Garry to Crubenmore subsection does not display poor performance under Construction Issues in **Table 7.3.1**, there are at least two potentially significant risks at approximate chainages 80000 and 80500 where the route corridor is constrained by the Highland Main Line railway to the west and a pylon to the east which, when reconstructed as part of the SSE Beauly to Denny upgrade, will support a 400kV transmission line. This particular risk does not impact this section;*
- *The existing pylons between Dalwhinnie and Crubenmore will be removed as part of the SSE Beauly to Denny upgrade;*
- *Road safety will be improved where the fatality rate on this part of the route is over 3 times above the national average; and*
- *This section would extend the short dual carriageway at Crubenmore.*

Although no significant constraints have been identified at this stage impacting delivery, further assessment focussing on the severance of at-grade junctions / NMU crossing points and also the presence of peat is recommended to reduce the associated risks.

7.3.3 Granish Junction to Bogroy Junction

This Scheme is the central section of Dalraddy to Slochd subsection. **Table 7.3.1** suggests that this subsection is unsuitable for an Early Implementation Scheme due to the poor performance associated with the Scheme Benefits, Promotional Issues and Construction Issues. However, the 16.1km central part of the subsection between the existing Granish and Bogroy Junctions does not exhibit many of the constraints which result in the poor performance across the full subsection corridor and could be considered as an Early Implementation Scheme for the following reasons:

- *The high construction risk rating allocated to this subsection was largely due to the challenges that could be expected north of Bogroy Junction where the route is severely constrained by the hard geology, the Highland Main Line railway and the need to widen the three span 145m Slochd beag Underbridge;*

- *Many of the environmental constraints identified within the wider subsection will be avoided within this section. For example, the potential impacts associated with the biological SSSI and Loch Pulladdern are to the south and a GCR site is located to the north;*

- *The poor performance in terms of Promotional Issues of this subsection is associated with the section to the south where the route corridor is in close proximity to Aviemore and in particular to a number of properties;*

- *The local economy of Aviemore is based around winter sports and tourism which relies on people travelling to and from the town. As this section is located to the north of the town, it will only impact upon transport links to and from the north and as such it can be demonstrated that minimising disruption has been carefully considered thereby assisting promotion;*

- *The construction of the proposed grade separated junctions will support the relatively high turning movements at the existing junctions where traffic is currently required to cross the adjacent carriageway when making right turn movements; and*

- *Although this section will not connect to an existing dual carriageway section it does connect two proposed grade separated junctions which could be future proofed to ensure there are no abortive works.*

Although the central section of the Dalraddy to Slochd subsection is less constrained than the northern and southern sections, it is recommended that further assessment is undertaken to remove / reduce a number of risks which could impact deliverability. In particular:

- *There will remain a need to widen the 80m 3 span River Dulnain Underbridge and the 15m single span Baddengorm Underbridge, a significant undertaking;*

- *Peat is likely to be present at the northern extent of the section and should be considered further from an environmental perspective and a construction perspective;*

- *Environmental constraints remain, particularly where the route passes through Ancient Woodland and two SAC sites at the River Dulnain and River Allt nan ceatharnach;*

- *The impact on property / land will require further review, particularly at the River Dulnain Underbridge where widening may impact on nearby gardens; and*

- *The at-grade junction and NMU crossing points along the route will require further assessment to understand how severance will be avoided or mitigated.*

If this section was completed as an early implementation scheme, 5.5km and 7.5km of single carriageway will remain within the Dalraddy to Slochd subsection, which is less than the optimum 10km length identified in the workshop. Further consideration is required to take into consideration the above information before confirming the suitability of the Granish Junction to Bogroy Junction section as an Early Implementation Scheme.

7.3.4 Tomatin to Moy

As presented in **Table 7.3.1** Tomatin to Moy displays low risk for Environmental Constraints, Promotional Issues and Construction Issues and can be regarded as an Early Implementation Scheme:

- *At 9km in length it is long enough to be attractive to tenderers and promote competition and short enough to be delivered quickly;*

- *There are few environmental constraints, promotional issues or construction issues compared to other subsections;*

- *This section would connect the existing dual carriageway sections to the north and south resulting in continuous dual carriageway from Slochd to Inverness;*

- *Although the fatality rate is low, the accident rate is the second highest of the eight single carriageway subsections.*

Although no significant constraints have been identified at this stage impacting delivery, further assessment focussing on road alignment, the severance of at-grade junctions / NMU crossing points and also the presence of peat is recommended to reduce the associated risks.

8 ABBREVIATIONS

AADT	Annual Average Daily Traffic
AOD	Above Ordinance Datum
ARSA	Areas Requiring Special Attention
ATC	Automatic Traffic Counter
AWEA	Advance Wider Economic Appraisal
BGL	Below Ground Level
BGS	British Geological Survey
BS	British Standard
CA	Coal Authority
CAR	Controlled Activity Regulations
CBM	Cement Bound Base
CBR	Californian Bearing Ratio
CCTV	Closed-Circuit Television
CEMP	Construction Environment Management Plan
Ch.	Chainage
CLR	Contaminated Land Report
CNPA	Cairngorms National Park Authority
CPO	Compulsory Purchase Order
CPT	Cone Penetration Testing
CSM	Conceptual Site Model
D2AP	All-Purpose Dual Two Lane Carriageway
DCP	Dynamic Cone Penetrometer
DEFRA	Department for Food, Environment and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DOE	Department of the Environment
EA	Environment Agency
ERT	Emergency Roadside Telephone
FRZ	Flood Risk Zone
FTA	Freight Transport Association
FWD	Falling Weight Deflectometer
GCR	Geological Conservation Review
GI	Ground Investigation
GIR	Ground Investigation Report
GIS	Geographical Information System
GPR	Ground Penetrating Radar
GSJ	Grade Separated Junction
HGDL	Historic Gardens and Designated Landscapes
HGV	Heavy Goods Vehicle
HITRANS	Highlands and Islands Transport Partnership
HS	Historic Scotland
HV	High Voltage
IIP	Infrastructure Investment Plan
ITS	Intelligent Transport System
JTC	Junction Turning Count
LAPPC	Local Authority Pollution, Prevention and Control
LATIS	Land Use and Transportation Integration in Scotland
LGV	Light Goods Vehicle
LiDAR	Light Detection and Ranging
LMA	Land Made Available
mAOD	metres Above Ordnance Datum
MCP	Moving Cursor Programme

MCV	Moisture Content Value
MVK	Million Vehicle Kilometres
NB	Northbound
NCN	National Cycle Network
NGR	National Grid Reference
NMU	Non-Motorised User
NNR	National Nature Reserves
NP	National Park
NRTF	National Road Traffic Forecast
OGV	Other Goods Vehicle
OS	Ordinance Survey
PES	Preliminary Engineering Services
POP	Police Observation Platform
PSD	Particle Size Distribution
PSSR	Preliminary Sources Study Report
RBMP	River Basin Management Plan
RHA	Road Haulage Association
RISS	Route Improvement Strategy Study
RMMS	Routine Maintenance Management System
RQD	Rock Quality Designation
RRRAP	Road Restraint Risk Assessment Procedures
RRS	Road Restraint Systems
RSI	Road Side Interview
SAC	Special Area of Conservation
SB	Southbound
SCOTFLAG	Scottish Freight and Logistics Advisory Group
SCP	Safety Camera Partnership
SCR	Solid Core Recovery
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SERIS	Scottish Executive Roads Information System
SFRA	Strategic Flood Risk Assessment
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPT	Standard Penetration Tests
SRTDb	Scottish Roads Traffic Database
SSD	Stopping Sight Distance
SSE	Scottish and Southern Energy
SSSI	Site of Specific Scientific Interest
STEP	Scottish Trip End Program
STPR	Strategic Transport Projects Review
SUDS	Sustainable Drainage Systems
TACTRANS	Tayside and Central Scotland Transport Partnership
TCR	Total Core Strength
TMfS	Transport Model for Scotland
TSRGD	Traffic Signs Regulations and General Directions
UCS	Unconfined Compressive Strength
UK TAG	UK Technical Advisory Group
VCB	Vertical Concrete Barrier
VMS	Variable Message Sign
VRS	Vehicle Restraint System
WS2+1	Wide Single 2+1 Carriageway

9 REFERENCES

Scott Wilson Kirkpatrick (1995), *A9 (T) Perth to Inverness, Development of a Route Strategy: Phase 2 Interim Report*;

Scott Wilson Kirkpatrick Consulting Engineers (1997), *A9 (T) Perth to Inverness Development of A Route Strategy, Phase 3 Final;*

Transport Scotland (Prepared by Scott Wilson) (2006), *A9 Perth to Blair Atholl Route Improvement Strategy Study*. Retrieved from: http://www.transportscotland.gov.uk/files/A9_RISS_exec_summary_total.pdf;

Transport Scotland (2008), *Strategic Transport Projects Review (STPR) Report 1: Review of Current and Future Network Performance (7.6. Corridor 6: Inverness to Perth)*. Retrieved from: http://www.transportscotland.gov.uk/files/documents/reports/j9853a/j9853a-15.pdf;

Scottish Government (2000), National Parks (Scotland) Act;

Scottish Government (2003), Land Reform (Scotland) Act;

Transport Scotland (Prepared by Halcrow – CH2M Hill) (2013), *Strategic Environmental Assessment (SEA): Draft Environmental Report*. Document: TSSEA9/ER/01. Retrieved from: http://www.transportscotland.gov.uk/files/TSSEA9_Dualling_SEA_Environmental_Report_June2013__low_res__0.pdf;

Transport Scotland's Scottish Executive Roads Information System (SERIS);

Highways Agency (1993), Design Manual for Roads and Bridges (DMRB):

Volume 5, Section 1, Part 2: TD37/93 Scheme Assessment Reporting;
Volume 6, Section 1, Part 1: TD9/93 Highway Link Design;
Volume 6, Section 1, Part 2: TD27/05 Cross Sections and Headrooms;
Volume 6, Section 2, Part 1: TD 22/06 Layout of Grade Separated Junctions;
Volume 6, Section 3, Part 3: TD 69/07 The Location and Layout of Lay-bys and Rest Areas; and
Volume 2, Section 2, Part 8: TD 19/06 Requirements for Road Restraint Systems.

Communities Scotland (2005), *National Standards for Community Engagement*. Retrieved from: http://www.scotland.gov.uk/Resource/Doc/94257/0084550.pdf;

A9 Safety Group (2013). Retrieved from: http://www.a9road.info;

Scottish Government (1984), *Roads (Scotland) Act*;

Scottish Environmental Protection Agency (SEPA) (2013), *Indicative River and Coastal Flood Map*. Retrieved from:
http://www.sepa.org.uk/flooding/flood_extent_maps/view_the_map.aspx;

The Scottish Executive (2005), *Scottish Road Network Landslides Study*. Retrieved from:
http://www.scotland.gov.uk/Resource/Doc/55971/0015351.pdf;

Transport Scotland (2008), *Scottish Road Network Landslides Study - Implementation*. Retrieved from:
http://www.transportscotland.gov.uk/files/documents/reports/j10107/j10107.pdf

Transport Scotland (Prepared by Jacobs) (2013), *Sifting of Indicative Corridor Options*. Retrieved from:
http://www.transportscotland.gov.uk/files/Appendix_E2_-_A9_Sifting_Assessment_Report_240513.pdf;

Scottish Environmental Protection Agency (SEPA) (2013), *River Basin Management Plans*. Retrieved from:
http://www.sepa.org.uk/water/river_basin_planning.aspx;

Met Office (2013), *Historic Data - Rainfall data*. Retrieved from:
http://www.metoffice.gov.uk/climate/uk/stationdata/;

Bluesky (2013), LiDAR survey information;

Transport Scotland (2009), *Roads for All Good Practice Guide for Roads*. Retrieved from:
http://www.transportscotland.gov.uk/files/documents/reports/j11185.pdf;

Scottish Government (2005), *Environmental Assessment (Scotland) Act*;

Transport Scotland (2013), *Scottish Roads Traffic Database (SRTDb)*. Retrieved from:
http://www.transportscotland.gov.uk/road/technology/traffic-count;

Transport Scotland (2012), *Speed Limit Review*. Retrieved from:
http://www.transportscotland.gov.uk/road/safety/Speed-limit-review/A9-NW-Perth-Thurso;

Traffic Scotland (2012), Route Journey Times. Retrieved from:
http://m.trafficscotland.org/journeytimes;

Sky High Traffic Surveys (2012), Bluetooth Journey Times along the A9, West of Broxden to Inverness;

The Scottish Government (Prepared by Transport Scotland) (2012), *Reported Road Casualties Scotland 2011*. Retrieved from:
http://www.transportscotland.gov.uk/files/Reported_Road_Casualties_Scotland_2011_web_version.pdf;

TranServ (2012), *Transport Scotland's Route Safety File for the A9 - National Rates for Dual and Single Carriageways*, A9 Route Safety File;

Transport Scotland (Produced by TranServ Scotland) (2013), *A9 Perth to Thurso, Route Review Accident Analysis*; and

Transport Scotland (2013*), Land Use and Transport Integration in Scotland (LATIS)*. Retrieved from:
http://www.transportscotland.gov.uk/latis.

A9 DUALLING
PERTH TO INVERNESS

TRANSPORT SCOTLAND
The Scottish Government