
Scotland

Route Utilisation Strategy

March 2007





Foreword

This Strategy represents a significant step forward and I am proud to present it as the third final Route Utilisation Strategy (RUS) developed by Network Rail.

The strategy can be considered to be the product of the whole rail industry in Scotland as it has significant input from train and freight operators as well as Transport Scotland.

Scotland's railway is diverse, covering a large geographical area and supports some 2500 daily services providing rapid access along busy commuter routes to our major cities whilst also supporting rural lifeline services. It also supports significant and increasing freight traffic, particularly coal. The mixture of traffic and its needs are challenging.

The Scotland RUS looked at the current and future freight and passenger markets and has assessed the predicted growth in each. It has then sought to accommodate this growth effectively and efficiently.

Scotland is an area of the network where there is intense growth and we have taken particular account of stakeholder aspirations, particularly those of Scottish Ministers as set out in their "Scotland's Railways" document.

This RUS provides a cohesive strategy for Scotland's railways for the next 10 years. The Strategy is designed to support, encourage and facilitate the growth and development of Scotland's railways.

The railway has a key role in supporting Scotland's continual economic and social development. As such this RUS is our

commitment and contribution to supporting the Scottish Executive's "Smart Successful Scotland".

The Strategy consists of a range of measures that have been identified to make effective and efficient use of railway capacity and to develop that capacity in response to demand. It also sets out longer term opportunities to reduce journey times and increase service frequency. This includes additional capacity between Fife and Edinburgh and reduced journey times between the Central Belt and the main cities of the north. In the longer term the Strategy focuses on improving connectivity between Edinburgh and Glasgow.

We look forward to working with all stakeholders on taking this Strategy forward.

John Armit
Chief Executive

Executive summary

The Scotland Route Utilisation Strategy (RUS) has been developed as the third in Network Rail's RUS programme. This document explains the analysis carried out, the responses to the consultation document and the resulting strategy that has been developed for Scotland's railways over the next 10 years.

A range of measures has been identified to make effective and efficient use of existing railway capacity and to develop additional capacity. These measures have been selected on the basis of their value for money across the 10-year period of the strategy and are largely consistent with the National Transport Strategy: "Scotland's Railways" published by Scottish Ministers. The availability of funding is not certain but we do not rule out options from the strategy solely for this reason.

Context

Underlying passenger demand is forecast to grow by up to three percent per annum, and freight demand is expected to grow by 10 percent by 2016.

Passenger demand

The needs of Scotland's railway passengers are particularly diverse. Passenger services include those catering for millions of commuter journeys a year into Glasgow and Edinburgh, inter-urban journeys within Scotland and rural lifeline services which are characterised by considerable seasonal fluctuations in demand. In addition there are cross-border services to various parts of England.

Freight demand

Freight within Scotland is predominantly focussed around coal and intermodal traffic, both domestic and Anglo-Scottish. A number of

sensitivity tests were undertaken in the Freight Route Utilisation Strategy¹ regarding growth predictions which have been incorporated into this RUS.

Gaps

Analysis of the gaps between the Scottish railway system's current outputs and the demand over the next 10 years identified the following principal issues:

- overcrowding is an issue on some suburban routes into Glasgow and Edinburgh and on the inter-urban route between these two cities. This is expected to worsen on some routes over the period of the RUS
- track capacity is heavily utilised in many key sections of the Scotland RUS area. This constrains the extent to which additional services can be accommodated, and has a significant impact on the performance of the existing services, especially those around the main Central Belt cities
- freight demand is primarily focussed around the flows to/from Glasgow and Ayrshire. This demand is currently adequately accommodated by the existing network, but further growth in certain areas could be constrained and there is a lack of diversionary routes for some flows.

In order to address the gaps a number of options were identified for development and testing. They have been appraised using Scottish Transport Appraisal Guidance (STAG) principles and financially reviewed where appropriate. Some options have been amended following the consultation period to better address the gap. This has resulted

in the following elements being proposed for inclusion in the Strategy:

Short term (Control Period 3: 2007 – 2009)

Route 24: East of Scotland

- longer trains with increased capacity between Dunblane and Glasgow are recommended
- three aspect signalling will be implemented between Larbert and Stirling; and Stirling Middle Jn will be re-modelled
- a timetable recast on the Edinburgh – Fife – Aberdeen corridor including services to Newcraighall is proposed
- a new fuelling and cleaning depot is recommended
- a new DDA compliant footbridge is proposed for Haymarket station
- car park extensions within Central Scotland, where capacity is insufficient.

Route 25: Highlands

No specific short-term measures have been identified for this route but timetable options for the north and west Highlands are being developed.

Route 26: Strathclyde and South West Scotland

- infrastructure works to permit the operation of a half-hourly even interval service, with six-car trains at the peaks to Kilmarnock
- it is proposed to amend the Stranraer service to serve the local population better
- changes to the service between Glasgow and Paisley are being developed to deliver a more even stopping pattern that will improve performance and reduce crowding
- the section between Annan and Gretna will be re-doubled with additional intermediate

block signals between Gretna and Mauchline to increase capacity. Further provision for increased freight capacity would be provided by an extension to Stevenston loop

- an independent electrical feeder supply to Polmadie depot will be provided to facilitate infrastructure maintenance works without disrupting depot operations.

Medium term

(Control Period 4: 2009 – 2014)

Route 24: East of Scotland

- to deal with increased patronage and congestion, improvements to Haymarket station are proposed
- to relieve capacity at Glasgow Queen Street High Level station solutions should be developed including the possible substitution of additional trains on busy routes for lightly used services in conjunction with additional infrastructure where appropriate
- following the short-term timetable recast on the Edinburgh – Fife service, additional benefits can be gained from the implementation of additional signalling to reduce headways between Haymarket and Inverkeithing
- when the area around the Tay Bridge is re-signalled, the renewal will seek to modify the current operating restrictions that prevent any two trains from passing on the high girders
- further north, the provision of a southbound loop at Laurencekirk is recommended

¹Freight Route Utilisation Strategy, to be published by Network Rail during March 2007

- with Newcraighall services running to Fife, a more strategic solution is proposed to re-double Portobello Junction and the single line through Brunstane to Niddrie to improve the robustness of the timetable and the operation of the Scottish Borders Railway towards Tweedbank
- in order to encourage access to stations by sustainable means, consideration should be given to car park provision/expansion and management (including, where appropriate, charges) alongside potential improvements to other access modes
- in line with Scottish Ministers' aspirations, the Airdrie to Bathgate Railway, Edinburgh Airport Rail Link and the Scottish Borders Railway will be progressed.

Route 25: Highlands

- to meet the requirement of a faster and more frequent service between Inverness and Perth additional infrastructure is recommended, combined with rolling stock with enhanced performance
- between Aberdeen and Inverness platform extensions are recommended at Insh and Elgin to provide increased capacity by permitting the operation of six-car services at peak times combined with an enhanced service.

Route 26: Strathclyde and South West Scotland

- electrification of the Whifflet line and diversion of these services via Glasgow Central Low Level would release platform space at Central High Level, but re-allocation of trains over the critical Muirhouse Jn section would also be required
- a review of all services between Glasgow and Edinburgh (via Falkirk, Shotts, Carstairs and Airdrie/Bathgate) to improve journey times, frequency and capacity between the two major Central Belt cities is recommended

- to the west, the construction of the Glasgow Airport Rail Link is being progressed
- to facilitate the extension of trains beyond the current six-car maximum, platform extensions on the Ayrshire and Inverclyde corridors would be required
- the replacement of the signalling between Mauchline and Ayr would further increase capacity for freight services
- on the western approach to Glasgow, Hyndland East Junction will be re-modelled to provide an improved layout
- the "Efficient Engineering Access" work stream for the West Coast Main Line has identified an option to deliver sufficient access for infrastructure works from 2009.

Long term (Control Period 5: 2014 – 2019)

Route 24: East of Scotland

Reduced journey times and increased capacity, particularly on inter-urban and suburban routes, are aspirations which will need to be addressed in the longer term. In order to relieve crowding on these services, additional capacity will be required in the major conurbations. At Glasgow Queen Street, long-term options will be considered to accommodate the forecast increase in use. These could include a major redevelopment of the site to provide additional rail capacity and enhanced passenger accommodation. The eastern end of the route into Edinburgh could be developed in a number of radically different ways: more work is required to ensure the most appropriate solution is taken forward to meet demand and expectations.

Route 25: Highlands

On the Highland Main Line it is anticipated that a positive business case can be developed for infrastructure works and rolling stock improvements to allow the further acceleration of the service. As technology develops, signalling alternatives will be progressed to replace Radio Electronic Token Block (RETB) to improve capacity and reduce journey time.

Route 26: Strathclyde and South West Scotland

As a major terminal station, Glasgow Central needs strategic consideration to ensure sufficient capacity is available in the long term. The implementation of a semi-fast and stopping service on the East Kilbride line may be required to provide sufficient capacity.

Given the projected growth in freight and passenger traffic, provision of further additional capacity between Glasgow and Ayrshire needs to be considered and developed.

The double-track section between Eglinton Street Jn and Muirhouse Jn is likely to be a significant constraint on system capacity by the end of the RUS period. Land at this location should be reserved so that a third (bi-directional) line with associated crossovers could be constructed if required.

Conclusions

The Strategy proposes a range of measures that make effective and efficient use of the rail capacity and to develop that capacity in accordance with the requirements of those who use and fund the railway. The industry will continue to work with Transport Scotland as the funder and specifier of the railway in Scotland to take this Strategy forward.



Contents

1	Background	10	7	Option analysis	50
1.1	Introduction to Route Utilisation Strategies (RUS)	10	7.1	Introduction	50
1.2	The railway in Scotland	12	7.2	Route 24: East of Scotland	51
1.3	About this document	12	7.3	Route 25: Highland	58
2	Scope	14	7.4	Route 26: Strathclyde and South West Scotland	59
2.1	Purpose	14	8	Strategy	66
2.2	Stakeholders	14	8.1	Introduction	66
2.3	Scotland RUS timeframe	14	8.2	Generic issues	66
2.4	Scotland geography	14	8.3	Developing the strategy	68
2.5	Linkage to other work streams	15	8.4	Conclusions	70
3	Current capacity, demand and delivery	16	8.5	Alternative growth scenarios	76
3.1	Current train operators	16	8.6	Contingent projects	76
3.2	Other operators	17	9	Next steps	78
3.3	Current passenger market profile	17	9.1	Introduction	78
3.4	Current freight market profile	17	9.2	High Level Output Specification (HLOS)	79
3.5	Scotland rail network	18	9.3	Access charge review	79
3.6	Freight optimisation	25	9.4	Network Rail Strategic Business Plan	79
3.7	Power supply	27	9.5	Network Rail Route Plans	79
3.8	Current engineering access	27	9.6	Ongoing access to the network	79
4	Passenger and freight demand forecast	28	9.7	Review	79
4.1	Introduction	28	10	Appendices	80
4.2	Forecast passenger growth	28	A:	Baselining report. Available at www.networkrail.co.uk	
4.3	Forecast freight growth	35	B:	Working Paper: Baseline Demand. Available at www.networkrail.co.uk	
4.4	Summary of forecast gaps	39	C:	Planned major renewals. Available at www.networkrail.co.uk	
5	Planned schemes	42	D:	Base year and predicted (2016) rail demand. Available at www.networkrail.co.uk	
5.1	Scottish Ministers' major rail projects	42	E:	Evaluation of options	81
5.2	Major renewal schemes	43	F:	Glossary of terms	119
5.3	Proposed third party enhancement schemes	44			
5.4	Commonwealth Games	45			
5.5	Room for Growth studies	45			
6	Consultation process and overview	46			
6.1	The RUS Draft for Consultation	46			
6.2	Consultation responses	46			
6.3	Key themes in the consultation responses	46			
6.4	Additional responses	48			

1. Background

1.1 Introduction to Route Utilisation Strategies (RUSs)

Following the Rail Review in 2004 and the Railways Act 2005, the Office of Rail Regulation (ORR) modified Network Rail's network licence in June 2005 to require the establishment of RUSs across the network. Simultaneously, ORR published guidelines on RUSs. A RUS is defined in Condition 7 of the network licence as, in respect of the network or a part of the network¹, a strategy which will promote the route utilisation objective. The route utilisation objective is defined as:

¹The definition of network in Condition 7 of Network Rail's network licence includes, where the licence holder has any estate or interest in or right over a station or light maintenance depot, such station or light maintenance depot.

“the effective and efficient use and development of the capacity available, consistent with funding that is, or is reasonably likely to become, available during the period of the route utilisation strategy and with the licence holder's performance of the duty”.

Extract from ORR Guidelines on Route Utilisation Strategies, June 2005

The “duty” referred to in the objective is Network Rail's general duty under Licence Condition 7 in relation to the operation, maintenance, renewal and development of the network. ORR guidelines also identify two purposes of RUSs, and state that Network Rail should balance the need for predictability with the need to enable innovation. Such strategies should:

“enable Network Rail and persons providing services relating to railways better to plan their businesses, and funders better to plan their activities; and set out feasible options for network capacity, timetable outputs and network capability, and funding implications of those options for persons providing services to railways and funders.”

Extract from ORR Guidelines on Route Utilisation Strategies, June 2005

The guidelines also set out principles for RUS development and explain how Network Rail should consider the position of the railway funding authorities, the likely changes in demand and the potential for changes in supply. Network Rail has developed a RUS manual which consists of a consultation guide and a technical guide. These explain the processes we used to comply with the Licence Condition and ORR guidelines. These and other documents relating to individual RUSs and the overall RUS programme are available on our website at www.networkrail.co.uk.

The process is designed to be inclusive. Joint work is encouraged between industry parties, who share ownership of each RUS through its industry Stakeholder Management Group. There is also extensive informal consultation outside the rail industry by means of a Wider Stakeholder Group.

ORR guidelines require options to be appraised. In Scotland this is initially undertaken using the Scottish Transport Appraisal Guidance (STAG), developed by the Scottish Executive. To support this appraisal work RUSs seek to capture implications for all industry parties and wider societal implications in order to understand which options maximise net industry and societal benefit, rather than that of any individual organisation or affected group.

RUSs occupy a particular place in the planning activity for the rail industry. They utilise available input from processes such as Transport Scotland's Scottish Planning Assessment (SPA). The recommendations of a RUS and the evidence of relationships and dependencies revealed in the work to produce them form an input to decisions made by industry funders and suppliers. These decisions involve issues such as franchise specifications, investment plans or the High Level Output Specification (HLOS).

Network Rail will take account of the recommendations from RUSs when carrying out its activities. In particular, they will be used to help inform the allocation of capacity on the network through application of the normal Network Code processes.

ORR will take account of established RUSs when exercising its functions.

1.2 The railway in Scotland

Under the provisions of the 2005 Railways Act, Scottish Ministers, through Transport Scotland, have responsibility to both specify and fund the railway outputs they wish to be delivered in Scotland. As the major funder of infrastructure and most passenger train operations within Scotland, Transport Scotland on behalf of Scottish Ministers has the ability to make choices on the balance of support for future funding of the rail industry. The funding regime for Network Rail is agreed on a five yearly basis, (referred to as control periods). In respect of the 2009 to 2014 Control Period (Control Period 4), Scottish Ministers will decide the level of public funding allocated to rail and will develop a view on the levels of capacity and reliability it wishes to procure from this budget.

Improved utilisation of the existing rail network and delivering the strategic outcomes outlined in the National Transport Strategy is a central element of Scottish Ministers' plans to achieve the effective delivery of their rail objectives. The Scotland RUS therefore seeks to optimise the use currently made of available route capacity, as well as promoting the development of further capacity where justified, through targeted intervention, consistent with the level of funding that is likely to be available.

Scottish Ministers' required outputs for the Scotland rail network between 2009 and 2014 will be specified in the HLOS for Scotland, due to be published in summer 2007. ORR will use this to determine the income Network Rail needs to fund these outputs and compare these with the public funds that are available. Any identified gap will be closed by iterations of the specified output levels and associated funding requirements and negotiations between the parties.

The RUS Draft for Consultation formed a key input to "Scotland's Railways", the strategy document which was published by Scottish Ministers in December 2006. This strategy promotes sustainable economic growth and sets the context for the development of

sustainable transport solutions for Scotland over the next 20 – 25 years. It promotes connectivity between major towns and cities, supports faster journey times on key routes and aims to improve quality, accessibility and affordability of Scotland's railways. This strategy will be implemented through the Scottish HLOS process.

If Scottish Ministers decide to progress a service change recommended by the RUS, it will be able to use its Franchise Agreement with the provider of internal Scottish rail services to facilitate its implementation. This helps to create a stable partnership between public and private sectors: with Transport Scotland on behalf of Scottish Ministers offering a clear strategic direction with which the industry will then align, in planning future investment and service patterns.

1.3 About this document

This is the third RUS published by Network Rail. Following the publication of a RUS Draft for Consultation in August 2006, this strategy has been developed based on comments from stakeholders, from within and outwith the rail industry, and comprehensive evaluation and analysis work.

The document describes the geographical scope and timeframe covered by the RUS in Section 2. It also describes the linkage to other associated work streams which relate to this RUS.

The current capacity, demand and delivery for the three strategic routes, namely Route 24 (East of Scotland), Route 25 (Highlands) and Route 26 (Strathclyde and South West Scotland) are summarised in Section 3. This leads to the baseline gaps and highlights the critical pinch points which restrict the current operating infrastructure.

In Section 4 demand forecasting for passenger and freight services with growth estimates for future years are presented.

Section 5 considers the aspirations of Scottish Ministers and third parties, who propose

enhancement and development of the rail infrastructure. This section also details significant renewals which are currently in Network Rail's business plan.

The consultation process and responses are summarised in Section 6. This also explains how these responses are taken into account in the final strategy.

Section 7 provides an analysis of the options considered, and highlights the options selected for inclusion in the final strategy.

Section 8 provides a comprehensive strategy, which details the three Strategic Routes covered by the RUS. It sets out a package of interventions to meet current and forecast gaps within Control Periods 3, 4 and 5. Information on potential funding streams and synergies with other schemes are also detailed.

Finally Section 9 outlines the mechanisms for implementing the recommendations in the RUS.

There are a number of appendices which support this document. The appendices contain supporting data, some of which are included in the document, whilst other supporting documents are available at www.networkrail.co.uk.



2. Scope

2.1 Purpose

A Scotland RUS is required for a number of reasons. The primary drivers are to inform:

- the development of the High Level Output Specification (HLOS) for Scotland
- the optimisation of the output specification for items in Network Rail's planned renewals programme.

The Scotland RUS will therefore:

- propose options to achieve more cost efficient and effective use of the existing rail network
- identify cost-effective opportunities to change the network where appropriate
- enable Network Rail to develop a renewals and maintenance programme in line with Scottish Ministers' aspirations and the reasonable requirements of train operators and other key stakeholders

2.2 Stakeholders

The Scotland RUS industry Stakeholder Management Group met on a number of occasions during the development of this RUS. Transport Scotland, First ScotRail, Great North Eastern Railway (GNER), the Freight Operating Companies who operate on the route, the Association of Train Operating Companies (representing non-lead TOCs) and Strathclyde PTE (now replaced by Strathclyde Partnership for Transport), were represented on this group. A representative from ORR attended group meetings in an observing capacity.

A series of wider stakeholder briefings have also been held in Glasgow, Edinburgh, Aberdeen and Glenrothes to explain the context and scope and invite input on relevant issues.

2.3 Scotland RUS timeframe

As with most other RUSs, a 10-year forward projection has been taken. However, any issues arising in the analysis that extend outwith this period have been highlighted where appropriate.

2.4 Scotland geography

Network Rail Scotland Route comprises 1,520 route miles and 2,460 track miles.

The geographic extent of the route is from the Network Rail Scotland Route boundaries at Annan/Gretna and Berwick in the south, to Thurso in the north, a distance of some 400 miles. The Scotland Route is divided into three Strategic Routes, namely Route 24 (East of Scotland), Route 25 (Highlands) and Route 26 (Strathclyde and South West Scotland) together with parts of Route 8 (East Coast Main Line – ECML) and Route 18 (West Coast Main Line – WCML). Route 8 and 18 are included within the separate ECML and WCML strategies highlighted in Section 2.5.

It was agreed at the outset with the industry Stakeholder Management Group that because of the size of the route and in order to carry out the analysis to the level of detail required to inform the Scotland HLOS, it would be necessary to prioritise the sections of the network that need to be addressed in detail within the Scotland RUS. A ranking exercise was therefore carried out to determine which sections of the route should be the focus of the work. For this purpose the Scotland Route was divided into 24 discrete sections which were then assessed against comprehensive criteria. From this exercise the following routes were excluded from the detailed analysis:

- Edinburgh Freight Routes including Leith South & Powderhall Branches
- North Highland Line (Inverness – Wick/Thurso/Kyle)
- Inverness – Perth
- Dundee – Perth/Dunblane
- West Highland Line (Craigendoran – Oban/ Fort William/Mallaig)
- Ayr – Stranraer including Chalmerston Branch

Although these routes were excluded from the detailed analysis, the entire network was considered more generally and options on some of these routes were adopted.

2.5 Linkage to other work streams

To be successful and coherent, the RUS cannot be considered in isolation. The RUS is related to a number of other strategies and policies:

- The Scottish Planning Assessment (SPA)
- East Coast Main Line RUS, the northern extent of its geographical scope is the east end of Edinburgh Waverley station
- West Coast Main Line Strategy, which includes the WCML section from the Scotland Route boundary at Quintinshill to Carstairs
- Freight RUS, which will examine key freight routes within Scotland
- "Scotland's Railways", which was published by Scottish Ministers in December 2006.

3. Current capacity, demand and delivery

3.1 Current train operators

At present, four franchised passenger train operators run services over the lines covered by the RUS. These are:

3.1.1 First ScotRail (2090 services per weekday)

The principal passenger train operator within Scotland is First ScotRail. First ScotRail operates virtually all internal Scottish services and overnight services from Inverness, Aberdeen, Fort William, Edinburgh and Glasgow to London Euston. The current First ScotRail franchise was awarded in October 2004 and runs for a period of seven years to October 2011 with an option for a three year extension.

As part of the franchise agreement, First ScotRail is committed to delivering a £40 million package of improvements. This investment will include the introduction of CCTV and customer information systems at a number of stations, secure cycling facilities at stations, additional car parking facilities and interior improvements to 21 existing trains on the Strathclyde network.

3.1.2 Great North Eastern Railway (GNER) (40 services per weekday)

Great North Eastern Railway (GNER) operates services from London Kings Cross via the East Coast Main Line (ECML) to Edinburgh, Aberdeen, Inverness (via Perth) and Glasgow Central (via Carstairs). The current ECML franchise was awarded in May 2005 for a period of seven years to May 2012. The Department for Transport (DfT) announced in December 2006 that the franchise will now be terminated and re-let in April 2008: a bid and selection process will be held during 2007 to select the new operator.

3.1.3 Virgin West Coast (20 services per weekday)

West Coast Trains Ltd, a member of the Virgin Group, operates services from London Euston to Glasgow Central (nine per day) and to Edinburgh (one per day). The original franchise was awarded for a 15 year period from 1997 to 2012. This was subsequently superseded by a management contract arrangement which was reviewed on an annual basis. In December 2006, the DfT announced that it has reinstated the franchise agreement with Virgin Rail Group to operate services on the West Coast Main Line (WCML). The franchise agreement is effective from December 2006 until March 2012. The current timetable will remain in place until the December 2008 timetable change is introduced when there will be an increase in services operated by Virgin West Coast.

3.1.4 Virgin Cross Country (64 services per weekday)

Cross Country Trains Ltd, a member of the Virgin Group, operates services from the south of England, Birmingham and Manchester to destinations within Scotland. Its original franchise was also awarded for a 15 year period from 1997 to 2012. This was subsequently superseded by a management contract arrangement which is reviewed on an annual basis. This arrangement will be replaced in 2007 by a new franchise currently being tendered by the DfT. At this time services currently being operated by Virgin Cross Country between Manchester and Glasgow/Edinburgh will transfer to the Trans Pennine Express franchise and those between Birmingham and Glasgow/Edinburgh via Crewe to the Virgin West Coast franchise.

3.1.5 Freight Operators (between 150 and 175 services per weekday)

Five freight operators currently operate services within Scotland. The largest freight operator is English Welsh and Scottish Railways (EWS) which operates bulk, intermodal and wagonload traffic to most parts of Scotland. Freightliner Limited operates intermodal traffic from Coatbridge to a number of English destinations, while Freightliner Heavy Haul operates a number of bulk flows including coal and cement traffic. GB Railfreight Limited operates postal services from Shieldmuir to English destinations and bulk traffic to Aberdeen. Direct Rail Services Limited (DRS) operates intermodal services from Grangemouth and transports traffic from Scottish power stations to Sellafield.

3.2 Other operators

There are a number of other operators which operate on Network Rail infrastructure, which include:

3.2.1 West Coast Railway Company (WCR)

WCR has been a licenced Train Operating Company (TOC) since 1998, when it became the first privately owned non franchised company to obtain a licence, allowing the company to co-ordinate and run its own trains without third-party involvement. WCR operates the Jacobite service, which is a steam service between Fort William and Mallaig in seasonal periods. It also operates a number of charter trains including the Royal Scotsman land cruise train.

3.2.2 Vicat Westlink Railways Ltd

Vicat Westlink Railways has taken over the operation of the charter services previously operated by FM Rail.

3.3 Current passenger market profile

The passenger market in Scotland is very diverse, serving a wide variety of needs including inter-urban express services, urban commuter services and lifeline rural services. This diversity creates a range of issues which are explored further in the Scotland rail network section below (Section 3.5).

3.4 Current freight market profile

3.4.1 Background

Within the UK, rail transport has a small share of the total freight market. However, rail's market share is growing year on year (8.5 percent to 11.5 percent of net tonne kilometres in the 10 years since privatisation), and will continue to grow as the Working Time Directive takes effect on the economics of longer distance lorry journeys. Chapter 3 of the Freight RUS has a comprehensive review of GB demand for rail freight over the last five years.

There are currently 33 terminals in Scotland owned or leased by Freight Operating Companies (FOC) and a further 84 privately owned yards directly connected to the Network Rail network that forward or receive traffic.

Full analysis of freight issues across Great Britain is being progressed in the Freight RUS mentioned in Section 2.5.

3.4.2 Commodities

The routes covered by the Scotland RUS carry a range of commodities as follows:

Coal remains a dominant fuel (with gas) for generating electricity throughout the UK. The continuing increase in oil prices and the trend in gas prices means that coal looks set to remain competitive for many years to come. Approximately 75 percent of the overall freight

tonnage lifted in Scotland is coal traffic, a large proportion of which is transported from Scotland's opencast sites and Hunterston Import Terminal to English power stations. There is also a significant internal market of up to seven million tonnes of coal each year to Longannet and Cockenzie power stations.

Intermodal traffic is the next most significant market segment. Much of this historically originated from or arrived at Freightliner's terminal at Coatbridge. However, while this remains a significant traffic generator, Grangemouth and Mossend have now developed into major intermodal locations. Recent growth at Grangemouth in particular has resulted in this location nearing capacity. Smaller facilities exist at Inverness, Aberdeen, Elderslie and Deanside which are serviced from these locations. Much of the associated traffic growth is in the fast moving consumer goods field from distribution centres, which in many cases depart the rail heads at night with an early morning arrival time for distribution onto the supermarket shelves.

Cement traffic is distributed by rail from Oxwellmains (near Dunbar) to Uddingston, Inverness, Aberdeen, Ayr and English destinations.

Significant volumes of **oil products** are moved by rail from Grangemouth to Carlisle, Prestwick, Leuchars, Kilmarnock, Fort William and Lairg.

Other current significant freight flows include:

- steel from Lackenby to Dalzell (near Motherwell)
- alumina from North Blyth to the British Alcan plant at Fort William
- chemicals from Roche plants in England delivered to their plant at Dalry
- china clay from Burngullow to the UPM Kymmene plant at Irvine
- calcium carbonate from Aberdeen to the UPM Kymmene plant at Irvine

- commercial and industrial waste for Edinburgh Council from the Powderhall loading facility to Dunbar
- Royal Mail traffic from Willesden/ Warrington to Shieldmuir Royal Mail Terminal
- automotive traffic from Washwood Heath to Bathgate (STVA)
- timber loaded at Crianlarich, Arrochar and Kinbrace (seasonal lineside loading)
- pipe traffic from Leith and to Georgemas from Hartlepool
- mud oil from Harwich to Aberdeen.

3.5 Scotland rail network

Infrastructure characteristics on the Route are varied, reflecting historic service demands and development. This has resulted in different levels of current route capability as described below.

The following section will review each strategic route against the following criteria:

- capacity
- utilisation
- overcrowding
- performance
- depots.

3.5.1 Route 24: East of Scotland

The East of Scotland strategic route serves two principal passenger markets: fast frequent inter-urban services and commuting.

It connects Scotland's principal cities of Glasgow, Edinburgh, Perth, Dundee and Aberdeen. It also encompasses the significant suburban networks that radiate around Edinburgh, with access to the ECML and WCML.

3.5.1.1 Capacity

The Edinburgh suburban area has the highest level of capacity, due to short signal sections and a combination of three and four aspect signalling. The rail network between Dundee and Aberdeen has the least capacity due to the long signal sections and limited passing loops.

3.5.1.2 Utilisation

The number of trains operating over each section in the busiest hour along with the load factors was measured to assess the network utilisation.

Larbert – Stirling

Analysis indicates that following the completion of the Stirling/Alloa/Kincardine project and the diversion of additional freight services via Stirling, this section of route is likely to be operating at full capacity, with a significant impact on performance.

Haymarket – Inverkeithing

The baseline work identified that this section was heavily utilised throughout the peak periods of the day. With the likely growth in traffic to and from Fife this congestion is likely to worsen.

Newbridge – Bathgate

This single line section of route currently operates at 100 percent of capacity for most of the day. As part of the Airdrie to Bathgate scheme, it is intended the line will be redoubled to provide additional capacity.

3.5.1.3 Overcrowding

The baseline work considered the load factors on a number of key corridors. As a general principle it is assumed that services with over 70 percent load factor in the three hour morning peak are operating at full capacity in the high peak.

Table 1 highlights a number of services on Route 24, which operate at full capacity within the morning peak. These services suffer from overcrowding for at least part of the morning peak period.

Strathclyde Diesel – Stirling Corridor

Modelled load factors for journeys along this route exceed 70 percent on departure from Croy and reach 104 percent on average after leaving the Bishopbriggs sector. The model indicates that overcrowding is more severe on this route than on any other in Scotland and that a substantial number of passengers have to stand for around 15 to 20 minutes. Train formations are limited by platform lengths, most significantly at Bishopbriggs.

Table 1: Morning peak load factors 2004/05

Service group	Load factor
Strathclyde Diesel – Stirling Corridor	104%
Edinburgh – Glasgow via Falkirk	88%
Fife Circle	84%
Dunblane – Edinburgh	78%
Fife Inter – Urban	77%

Source: Arup RUS SDM; Network Rail Analysis

Edinburgh – Glasgow via Falkirk

On this route, average weekday load factors exceed the 70 percent level by the time the trains leave Falkirk or, for those that stop there, at Croy station. The average load factor is modelled to be 69 percent on departure from Edinburgh suggesting that on some trains passengers have to stand for the entire journey, which takes around 50 minutes, given variations in train loadings over the year.

Fife Circle

Modelled load factors for journeys along this route surpass 80 percent on departure from Dunfermline in an anti-clockwise direction and Inverkeithing in a clockwise direction. Passenger numbers are set to grow with additional growth forecast for this corridor.

Dunblane – Edinburgh

Modelled load factors for journeys along this route surpass 70 percent on departure from Linlithgow. This means some passengers are standing for 20 minutes.

Fife inter-urban

Modelled load factors for journeys along this route surpass 70 percent on departure from Kirkcaldy and Inverkeithing. This means some passengers are standing for 25 minutes. This corridor suffers from heavily occupied track sections, which limits the number of trains which can pass through the corridor.

3.5.1.4 Performance

Overall First ScotRail performance is operating at 89 percent PPM. Performance on this Route is constrained by approaches to Edinburgh Waverley and Glasgow Queen Street, various single lead junctions and single line sections. The mix of express and stopping passenger services combined with freight on many sections of this route, can create fluctuations in performance.

Dundee – Aberdeen

Performance is constrained between Dundee and Aberdeen due to the single line section south of Montrose.

Perth station

A number of First ScotRail services are stabled in Perth station. This leads to confliction between operational and maintenance access which can create performance problems due to the limited maintenance access availability.

Portobello Jn

The service which operates to/from Newcraighall can have performance problems associated with the junction with the East Coast Main Line at Portobello and the single line to Newcraighall as well as having to interface with services west of Edinburgh.

Table 2: Depot capacity/utilisation (vehicles)

Location	Capacity	Stabled	Utilised	Spare capacity
Aberdeen station	27	19	70.4%	8
Dundee station	11	9	81.8%	2
Eastfield Depot	65	65	100.0%	0
Edinburgh Waverley	41	40	97.6%	1
Haymarket Depot	57	57	100.0%	0
Glasgow Queen St station	24	6	25.0%	18
Perth	48	45	93.8%	3
Stirling station	20	19	95.0%	1
Totals	293	260	88.7%	33

Source: First ScotRail 2006

3.5.1.5 Depots

Table 2 details the First ScotRail stabling capacity and utilisation for the timetable, prior to the commencement of the current works at Edinburgh Waverley.

In addition to the figures in Table 2, 20 vehicles are required to be moved from Edinburgh (Haymarket) to Glasgow (Eastfield) each day to ensure that Haymarket Depot does not exceed 100 percent of its capacity.

3.5.1.6 Overview of gaps

Dundee – Aberdeen capacity

The short section of single line near Montrose limits capacity and can lead to poor performance, and inconsistent headways. There is no consistent stopping pattern and the current mix of services makes poor use of the available capacity.

Edinburgh – Fife signalling headways and stopping patterns

Restrictive signalling headways between Edinburgh and Fife, particularly across the Forth Bridge limit the number of trains that can operate over the corridor and result in increased delays during perturbed running. There are also difficulties in accommodating the current mix of express services and all station stopping services combined with heavy freight trains.

Portobello Jn – Niddrie South Jn

The performance of Edinburgh CrossRail services to the east of Edinburgh Waverley is relatively poor. This is largely due to the intensive occupation of the single line section from Portobello Jn through Niddrie South Jn together with the slow, approach-controlled junction layout at Portobello.

Central Scotland platform lengths

Some services in this area (Glasgow/Edinburgh to Fife/Dunblane/Dundee) are operating at full capacity, with growth expected to continue. Train formations are limited by the available length of platforms, and options to address this issue are required.

Larbert – Stirling capacity

Analysis of the capacity between Larbert and Stirling indicates that once the Stirling/Alloa/Kinross project is completed and the Hunterston/Longannet (and other freight) services are diverted via Stirling, this section of route will be at or very close to capacity with the likelihood of a significant impact on performance.

3.5.2 Route 25: Highlands

The Highlands Route serves a large number of rural communities across the North of Scotland and provides access to Inverness, Wick, Thurso, Oban and Fort William.

3.5.2.1 Capacity

This Route has low levels of capacity, which is particularly restricted by the Radio Electronic Token Block (RETB) signalling system on the Far North line. A number of long single line sections across the Route contribute to the low track capacity.

3.5.2.2 Utilisation

Utilisation is predominately low on this corridor, as a result of the infrequent service. There are currently no services on this Route which have high load factors and journey times across much of the route are relatively slow.

3.5.2.3 Overcrowding

Overcrowding has not been identified on any services which operate within Route 25.

3.5.2.4 Performance

Overall First ScotRail performance is operating at 89 percent PPM. Performance on this corridor is restricted by single line sections across the Route but particularly on the busier Perth to Inverness and Aberdeen to Inverness lines.

3.5.2.5 Depots

Table 3 details the stabling capacity and utilisation for depots in this Route.

3.5.2.6 Overview of gaps

No baseline gaps have been identified in Route 25.

3.5.3 Route 26: Strathclyde and South West Scotland

The Strathclyde and South West Scotland Route comprises the local Glasgow suburban rail network and the South Western lines to Stranraer and Gretna Jn. Long distance passenger traffic from the West Coast Main Line (WCML) via Carlisle and the East Coast Main Line (ECML) via Edinburgh joins the Route at Carstairs.

The Route also serves a number of freight facilities, the most significant of which are at Mossend and Coatbridge. The Kilmarnock to Gretna Jn corridor carries significant volumes of coal traffic from Ayrshire opencast sites and the deep water terminal at Hunterston to English power stations

3.5.3.1 Capacity

Glasgow and the surrounding area has a high level of capacity, with much of the suburban network operating on three minute headways.

3.5.3.2 Utilisation

The number of trains operating over each section in the busiest hour, along with the load factors, was measured to assess the network utilisation.

Muirhouse – Bridge Street Jn

The two track Muirhouse to Bridge Street Jn corridor is the most intensively trafficked approach to Glasgow Central High Level station. Services are timetabled to operate at close to the minimum theoretical headway in the peak and any delays to services can have a significant knock-on effect.

Hyndland – Finnieston

The Hyndland to Finnieston corridor is the most intensively trafficked corridor on the Glasgow North Electric network, thus operating at full capacity for much of the day. Services are timetabled to operate at close to the minimum theoretical headway and any delays to services particularly in the peak can have a significant knock-on effect.

3.5.3.3 Overcrowding

Analysis of the utilisation of services considered the load factors on a number of key routes. As a general principle it is assumed that services with over 70 percent load factor

in the three hour morning peak are operating at full capacity in the high peak.

Table 4 highlights the routes which were identified as having a particularly high load factor.

Strathclyde Diesel – East Kilbride/ Kilmarnock/Barrhead

Analysis in the Baseline Report shows average train loadings build up along the two routes before Busby Jn (where the routes join) and through Pollokshaws West towards Glasgow Central. On leaving the East Kilbride branch (which includes stations to Thornliebank) the average load factor is 87 percent. The average loading of trains travelling via Barrhead reaches 69 percent on leaving Kennishead and the average load factor when the trains arrive at Glasgow Central is 87 percent. This suggests that crowding is more severe on the East Kilbride trains over the three hour peak period although passengers do not have to stand for long except on the very busiest trains.

South West Electrics: Glasgow/Paisley/ Ayrshire capacity

Services on this corridor currently operate at full capacity at peak times between Glasgow

Table 3: Depot capacity/utilisation

Location	Capacity now	Stabled now	Utilised	Spare capacity
Fort William station	6	4	66.6%	2
Inverness	62	25	40.3%	37
Kyle of Lochalsh station	6	2	33.3%	4
Mallaig station	4	2	50.0%	2
Oban	6	2	33.3%	4
Wick station	6	2	33.3%	4
Totals	90	37	41.1%	53

Source: First ScotRail 2006

Table 4: Morning peak load factors 2004/05

Service group	Load factor
Strathclyde Diesel - East Kilbride	94%
South West Electrics	84%
Edinburgh – Glasgow via Shotts	78%
Strathclyde Diesel – Kilmarnock/Barrhead	78%

Source: Arup RUS SDM; Network Rail Analysis

and Paisley and beyond (at least as far as Johnstone). Analysis predicts growth will continue on this corridor and options to address this issue are required.

Edinburgh – Glasgow via Shotts

Although analysis indicates that slight overcrowding occurs on this route, there is only one train in the high peak hour. As this overcrowding only occurs on the western end of the route it could be eased by a review of stopping patterns. This corridor has therefore not been included as a baseline gap.

3.5.3.4 Performance

Overall First ScotRail performance is operating at 89 percent PPM. Performance is restricted by approaches to Glasgow Central High Level and a number of single lead junctions. The mix of express and stopping passenger services combined with freight on some sections of this Route, particularly between Glasgow and Paisley, can create fluctuations in performance.

G&SW route service patterns

The passenger service pattern operated on the Glasgow & South Western route between Kilmarnock, Gretna and Stranraer is irregular

in nature and has not changed for about 15 years. The train service no longer meets passenger demand and does not provide the optimum service for passengers on this corridor. During this time there has been very significant growth in freight tonnage carried on the corridor, predominantly coal from Hunterston and Ayrshire opencast sites to English power stations. Both passenger and freight demand on this route has changed, and customer needs are no longer being adequately addressed.

3.5.3.5 Depots

Table 5 details the stabling capacity and utilisation for First ScotRail rolling stock within Route 26: Strathclyde and South West Scotland.

3.5.3.6 Overview of gaps

Glasgow/Paisley/Ayrshire capacity

Overcrowding occurs on services between Glasgow and Paisley and thereafter to Johnstone. Growth is predicted to grow on the Ayrshire corridor and options to address this are required.

Muirhouse – Bridge Street Jn

The section between Muirhouse and Bridge

Street Jn is heavily congested. Services operate at close to their minimum theoretical headway, which can have a significant impact on performance.

Hyndland – Finnieston

The corridor between Hyndland and Finnieston is the most heavily congested track section on the Glasgow North Electric network. Services operate at close to their minimum theoretical headway, which can have significant impacts on performance.

G&SW route service patterns

Due to the irregular timetable and mix of passenger and freight services on this corridor, customer needs are not being adequately addressed.

3.6 Freight optimisation

3.6.1 Introduction

This section covers a number of generic freight issues which apply across the whole of this RUS.

3.6.2 Working timetable utilisation

A feature of freight traffic is that over a given period the volume of trains operating will be less than those shown in the Working Timetable (WTT). Freight trains require more booked paths in the WTT than are actually used to provide operational flexibility. Utilisation of paths can vary for a wide range of reasons. WTT paths need to be booked months in advance and for some commodities a range of supply scenarios have to be covered. In addition to the market driven fluctuations discussed above, paths for diversionary purposes allowing operational flexibility for the railway also drive low WTT path utilisation.

Map 6 reflects freight train utilisation of key network sections examined by the Freight RUS across all commodities for the busier freight routes. The base year of 2004/05 is selected, as it is this year from which the Freight RUS industry forecasts have been built. Since 2004/05 a number of operators have actively sought to reduce the number of unused paths

they have in the timetable. For example across Great Britain EWS have removed 994 paths from the Working Timetable since the 2004/05 base year, around 15 percent of their total.

3.6.3 Gauge

The WCML is the only route which has the capacity for W10 gauge traffic. The ECML is cleared for W9 gauge traffic and the G&SW, with its large number of overbridges, is cleared for W8 gauge traffic. These restrictions mean that the options for diverting services in times of disruption are limited. When the WCML is closed for any reason, there is no suitable diversionary route for the high gauge container traffic on standard wagons. Consequently the route from England via the ECML and Shotts to Mossend is identified in the Freight RUS as an “additional priority” route for W10 gauge clearance. Across the remainder of Scotland gauge clearance varies between W6 (the most restrictive) and W9 (which permits trains conveying larger containers to operate).

3.6.4 Train length capability

Much of Scotland can accommodate 71 SLU traffic (1428 ft), with longer trains being able to run with individual train dispensation. However, most lines to the north of the Central Belt are constrained by the length of the loops for pathing or refuging purposes. There are very few longer length loops on these routes.

3.6.5 Train weight capability

Due to the natural terrain of many parts of Scotland and the associated severe gradient characteristics, there are a number of routes on which the train weight is limited. Despite the recent introduction of modern traction by most freight operators enhancing their freight train haulage capability, this remains an issue on a number of routes.

3.6.6 Hours of operation

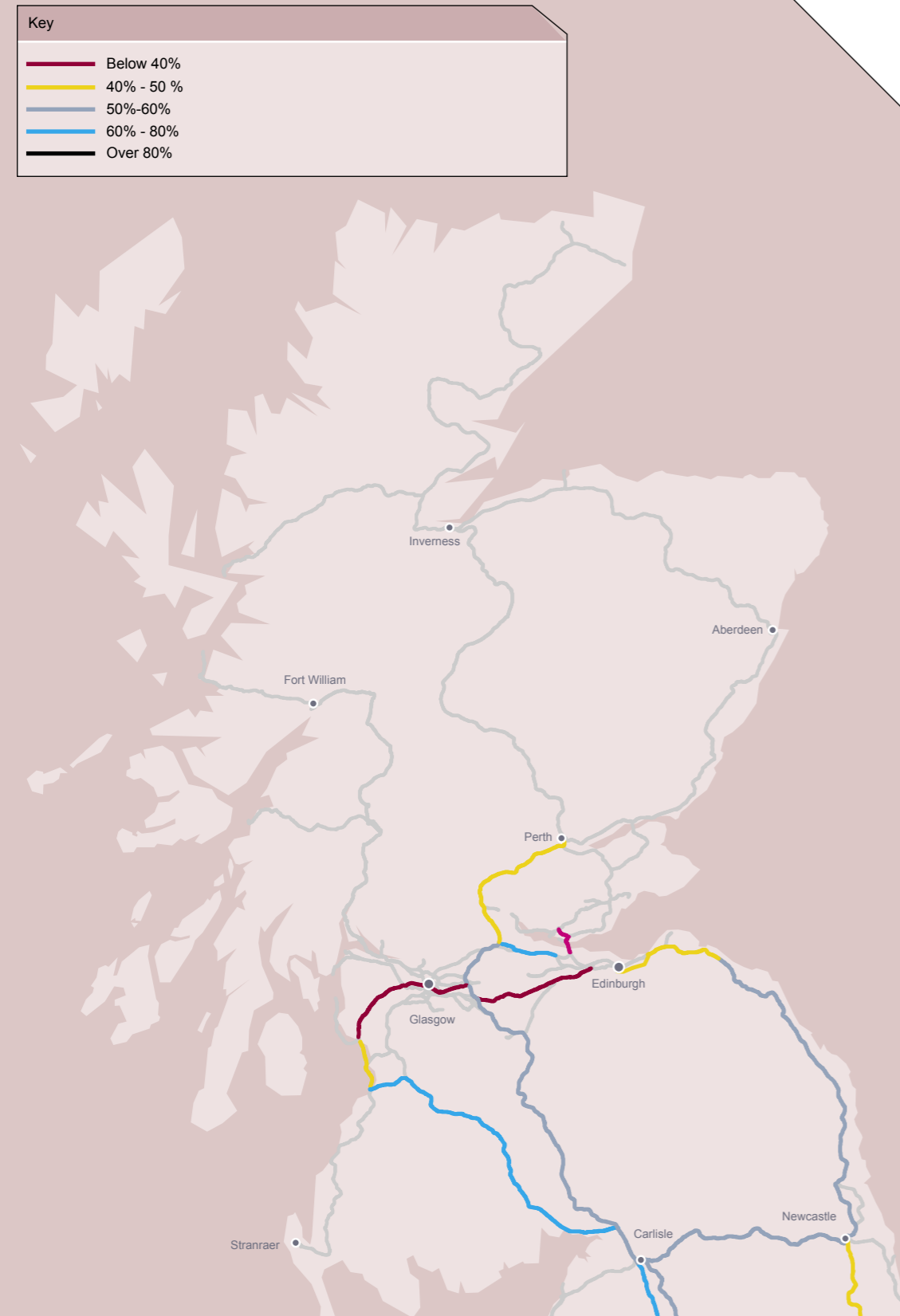
Planning restrictions mean that some of the coal loading sites are restricted to loading between 07:00 and 19:00 Monday to Friday and 07:00 to 13:00 Saturday.

Table 5: Depot capacity/utilisation

Location	Capacity now	Stabled now	Utilised	Spare capacity
Airdrie CS	6	6	100.0%	0
Ayr Townhead CSD	51	28	54.9%	23
Ayr station	12	12	100.0%	0
Corkerhill CSMD	87	81	93.0%	6
Dumfries Yard	4	0	0.0%	4
Glasgow Central	35	24	68.6%	11
Gourock station	12	12	100.0%	0
Helensburgh station	15	15	100.0%	0
Largs station	6	0	0.0%	6
Motherwell	37	37	100.0%	0
Shields TMD (E)	88	34	38.6%	54
Stranraer station	4	2	50.0%	2
Yoker Depot	110	81	73.6%	29
Totals	467	332	71.1%	135

Source: First ScotRail 2006

Map 6: Freight Train Utilisation



3.7 Power supply

Scottish traction power supplies were installed in the early 1960's for the Glasgow suburban areas. They were extended in the early 1970's for the WCML extension to Scotland and for the Ayrshire coast during the 1980's. During the early 1990's Scottish traction power supplies were installed for ECML electrification to Edinburgh. There have been some incremental improvements to the system over the recent years. No current gaps in the capacity of the power supply arrangements have been identified.

3.8 Current engineering access

A cyclical access strategy for key junctions on the network was jointly developed by Railtrack, its maintenance contractors, and its customers five years ago. This strategy identified a programme of regular extended possessions which sought to ensure value for money and minimise overall disruption to train services. This possession strategy was centred on a series of large (geographic coverage and time span), cyclical access opportunities.

The aim of this strategy was to provide the opportunity to undertake all major scheduled maintenance activity for the specific area on a regular, planned basis. This approach reduced the number of short, inefficient, but generally non-disruptive possessions.

This pattern of possessions has been reviewed on an annual basis since then and the concept has gradually been extended to other locations and routes. More recently a programme of extended maintenance opportunities has been introduced on a number of routes in the SPT area combined with the opportunity to operate

late night services on a other nights. A similar programme has been introduced on the main Anglo-Scottish coal routes where additional extended maintenance access opportunities have been provided on a cyclic basis. This allows additional traffic to run on the nights when maintenance access is not required.

While this strategy has resulted in an evolving engineering access regime that matches existing engineering requirements as closely as possible, there are a few locations where there is continued or new pressure on the time available for maintenance and renewal. These are summarised in Section 3.8.1 and options to address them are included in Section 8.

3.8.1 Engineering access gaps

Law – Carstairs

The lack of a robust train plan to facilitate mid-week Single Line Working without incurring performance delays means defective rails etc can only be removed at weekends adding to cost and increasing performance risk.

Rutherglen – Eglinton St

Electric workings at Polmadie depot during the night restrict useful overhead isolations to weekends only, resulting in difficulties in delivering sufficient access for infrastructure maintenance.

Polmont – Haymarket

The combination of the high volume of heavy freight with a frequent passenger service results in the short maintenance periods available being insufficient.

Perth station

Midweek rolling stock stabling and servicing arrangements lead to very restrictive maintenance opportunities.

4. Passenger and freight demand forecast

4.1 Introduction

This section provides a summary of the external factors which we expect to drive changes in demand in future years.

4.2 Forecast passenger growth

4.2.1 Background

Using the RUS Strategic Demand Model (SDM) developed by Arup we have predicted future levels of rail patronage in Scotland in 2011 and 2016. This model was adapted from one originally developed for the Strategic Planning Assessment (SPA) and is calibrated to deliver predictions on a five yearly basis. The methodology used within the model to predict growth in passenger numbers is the rail industry forecasting framework standard.

Within the RUS SDM, overlays have been used to reflect new demand generated from the committed major infrastructure schemes. Growth in passenger demand from Prestwick Airport showing predicted air passenger numbers at the airport was also included by the use of an overlay. Greater detail of the methodology applied is included in Appendix D. The demand information is based on the assumption that Anglo-Scottish service levels are projected to remain at a level similar to the present.

4.2.2 Zoning convention applied

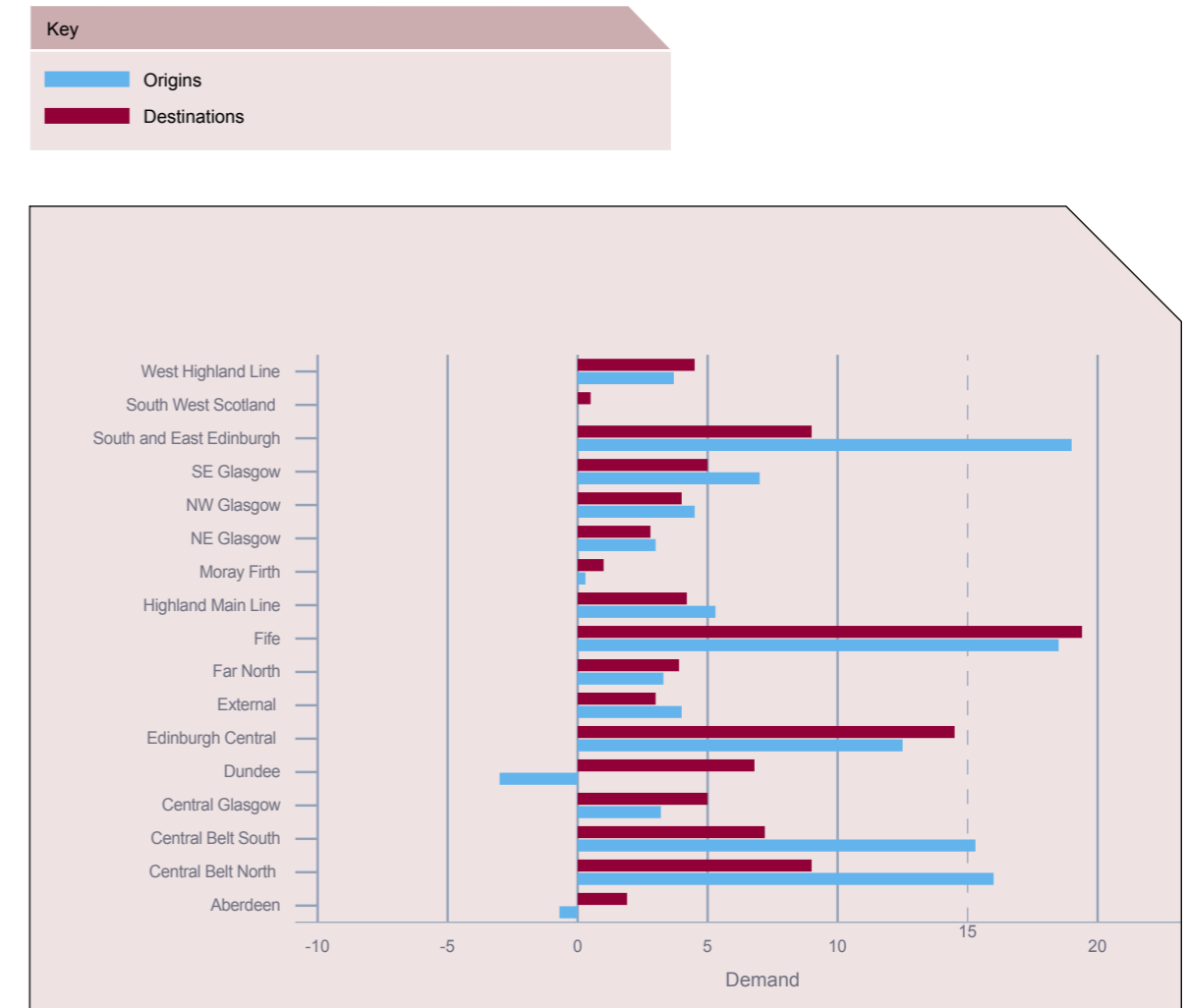
Our predictions of future rail patronage are driven by demographic changes, rates of employment and regional economic growth. We have allocated the predicted growth in passenger journeys from local authority areas to 17 zones. The predicted proportionate changes in the number of trips to and from each zone to 2016 are shown in Figure 7.

The predicted growth of the number of passenger journeys is typically less than has been observed in Scotland over the last few years. The inputs that drive the do-minimum predictions from the model are consistent with those used in the SPA. Several of the inputs are trend based, but analysis suggests local forecasts of demographic and employment changes would not make much difference to the 10 year forecast. This is based on the sensitivity testing undertaken for the SPA. In that work it was found that passenger growth might be one or two percentage points higher in some zones. The exceptions to this are Ayrshire, East Renfrewshire and Fife where local forecasts suggest that unconstrained rail patronage could increase considerably over the next 10 to 20 years.

4.2.3 Route 24: East of Scotland

As previously discussed, Route 24 covers the East of Scotland, which principally serves two markets: fast frequent inter-urban services and commuting. The following section will consider the impact of growth on a number of key corridors.

Figure 7: Predicted changes in am peak passenger journeys by 2016



Note: Origins are Trips Originating and Destinations are Trips Terminating
Source: Arup RUS SDM

Table 8: Predicted am peak load factors on crowded services (Route 24)

Service group	Morning peak load factors			
	Base	2011	2016	2026
Fife – Edinburgh inter-urban	77%	77%	80%	85%
Edinburgh – Glasgow via Falkirk	77%	80%	84%	93%
Dunblane – Edinburgh	78%	85%	92%	100%
Fife Circle – Edinburgh	84%	86%	91%	98%
Glasgow – Edinburgh via Falkirk	88%	88%	93%	99%
Strathclyde Diesel – Stirling corridor including inter-urban	104%	106%	109%	120%

Source: Arup RUS SDM

4.2.3.1 Future overcrowding problems

Table 8 shows the predicted load factors over the RUS period and for comparison with the SPA, the load factors that the model predicts will be reached by 2026. In general passengers have to stand in sometimes uncomfortable crowded conditions on some trains, during the three hour morning peak, when the modelled load factors are greater than 70 percent. In the base year this affected 10 service groups (across the three strategic routes). Peak crowding on trains running into Glasgow and Edinburgh is predicted to become more severe in the do-minimum forecast. This indicates the predicted demand levels if no additional works to drive demand are undertaken. These forecasts are based on the assumptions that rail passengers' preferred arrival time does not change between the base and forecast year, ie. passengers are not crowded out of the peak before 2016.

Fife inter-urban

The model predicts a slight worsening of passenger overcrowding on this route by 2016, with load factors increasing to 80 percent.

Dunblane/Stirling – Edinburgh

The model predicts a slight worsening of passenger overcrowding on this route by 2016, with load factors increasing to 92 percent.

Fife Circle

The model predicts that severe overcrowding will occur in the do-minimum forecast on the Fife Circle route by 2016 particularly on trains serving the route via Dumfermline. Analysis suggests that there will be very severe overcrowding on these services with many passengers having to stand for 30 minutes or more.

Glasgow/Edinburgh via Falkirk

In the westbound direction morning peak overcrowding is predicted to become quite severe as far out as Falkirk where the three hour average load factor is predicted to reach 81 percent by 2016. This indicates some passengers standing for around 25 minutes on this important inter-urban route.

On the reverse journey by 2016 the model predicts that the average am peak load factor will have reached 70 percent on departure from Glasgow. This suggests some passengers will have to stand for the entire journey duration on the busiest trains, a standing time of around 50 minutes.

Stirling Corridor – Glasgow including inter-urban

This corridor is predicted to have the highest load factors within Route 24. The three hour load factor is expected to reach 109 percent by 2016, although the overcrowding will predominately be worst between Bishopbriggs and Glasgow.

4.2.3.2 Station capacity

Predicted growth will result in certain stations becoming more congested. On Route 24 Glasgow Queen St and its constricted approaches will predominately restrict growth. Growth predictions and the development of the tram network in Edinburgh will have an impact on the stations within Edinburgh.

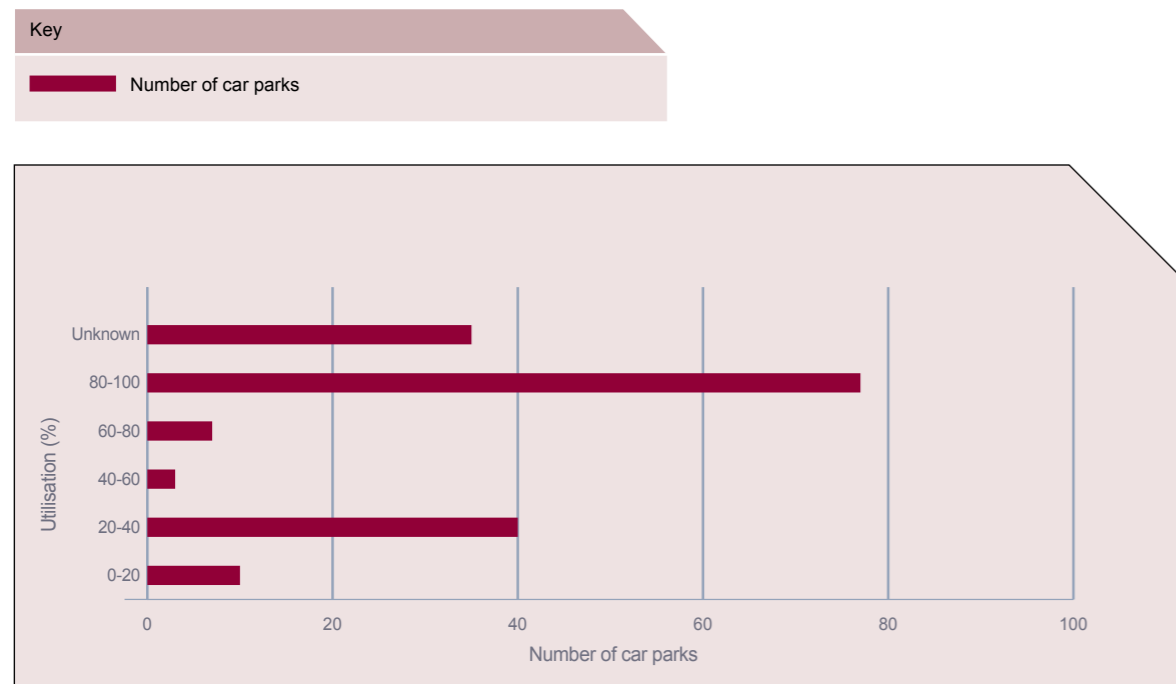
Table 9 highlights the average passenger loadings of a number of key services which operate to and from Glasgow Queen Street High Level. Analysis suggests that the station and its approaches are not being utilised to best advantage for passengers.

Table 9: Train counts from Glasgow Queen Street station

	Arrival			Departures		
	Trains	Passengers	Passengers per train	Trains	Passengers	Passengers per train
Stirling	37	4180	113	36	3468	96
Edinburgh	60	7065	118	60	6935	116
Cumbernauld	36	1083	30	37	1093	30
Anniesland	35	512	15	35	530	15

Source: First ScotRail (2006)

Chart 10: Utilisation of car parks in Central Scotland



Source: First ScotRail data

Car parks

Chart 10 highlights utilisation of car parks within the Central Belt, which currently shows that over 60 percent of car parks are operating at more than 80 percent capacity. Limited capacity of car parks at some locations could impact on the future growth of rail traffic.

4.2.3.3 Forecast gaps

Scottish Ministers have aspirations to increase the rail network in Scotland through the implementation of a number of major projects. These schemes are aimed at delivering economic growth by improving journey times and connections, reducing emissions and improving quality, accessibility and affordability. Over the next few years Scottish Ministers expenditure on public transport is planned to reach £1 billion per year. Much of this funding has been allocated to the major rail projects that Ministers have committed to deliver. On Route 24 these are:

- Edinburgh Airport Rail Link (EARL)
- Airdrie – Bathgate
- Scottish Borders Railway

These projects go a long way to supporting the vision set out above and to realising the broader transport objectives as well as providing a platform for taking forward future developments.

In addition to the new infrastructure proposed by Scottish Ministers, there is also an aspiration to reduce journey time and improve connectivity on the existing network. Within Route 24, this applies particularly to the inter-urban services.

A number of forecast gaps were identified in the analysis, these include:

Edinburgh – Fife – Aberdeen

Journey times on this corridor are uncompetitive with road and the performance of the current Fife Circle service is relatively poor as there is no scope for recovery of any late running incurred on the outward journey due to the circular nature. Passenger demand to Edinburgh is predicted to grow and the current combination of infrastructure and train service will not meet this demand.

Dunblane

Overcrowding on this corridor was identified in the baseline and forecast analysis. Some services in this area (Glasgow/Edinburgh – Dunblane) are operating at full capacity, with predicted growth expected to continue.

Glasgow – Edinburgh via Falkirk

Demand on this corridor is expected to exceed capacity before the end of the RUS timescale.

Stations

Demand in the future is expected to exceed capacity on a number of key corridors before the end of the RUS timescales. This limits capacity on a number of services and exacerbates overcrowding on the station concourse areas. This is likely to occur at the following locations:

- Glasgow Queen Street: Only four of the seven platforms at this location are capable of accommodating six car train formations. With the forecast continued growth in demand on services using the station this will become an increasingly severe constraint.
- Haymarket: This station acts as a key destination and interchange station. Demands on services to Haymarket are forecast to increase.
- Edinburgh Waverley station: This is a key destination and interchange station serving the centre of Scotland’s capital city. The current works taking place at Waverley station are projected to meet forecast demand for the next five to ten years.

Additional demand anticipated within the later years of this RUS is likely to require further capacity on the eastern end of the route.

4.2.4 Route 25: Highlands

As detailed earlier, the Highlands Route serves a large number of rural communities across the North of Scotland and provides access to Inverness, Wick, Thurso, Oban and Fort William.

Scottish Ministers have an aspiration to reduce journey time and improve connectivity. Within Route 25, this applies particularly between Aberdeen – Inverness and on the Highland Main Line, as detailed below.

4.2.4.1 Forecast gaps

Aberdeen – Inverness

Forecast information suggests that as demand continues to grow, the current combination of infrastructure and train service will not meet this demand.

Highland Main Line

Forecast information taken from the Room for Growth study, suggests that as demand continues to grow, the current combination of infrastructure and train service will not meet demand. Scottish Ministers’ have set out in their National Transport Strategy: “Scotland’s Railways”, their aspiration to introduce a faster hourly service between the Central Belt and Inverness.

4.2.5 Route 26: Strathclyde and South West Scotland

4.2.5.1 Future overcrowding problems

The Strathclyde and South West Scotland Route comprises the local Glasgow suburban rail network and the south western lines to Stranraer and Gretna Jn. The Route also serves a number of freight facilities, the most significant of which are at Mossend and Coatbridge.

Tables 11 shows the predicted load factors over the RUS period and, for comparison with the SPA, the load factors that the model predicts will be reached by 2026 where load factors reach at least 70 percent before 2016. In our analysis of base year crowding we saw that load factors of over 70 percent during the three hour peak resulted in modelled loadings of 100 percent during the high-peak hour.

We have modelled the one hour peak load factors on these service groups using the same passenger preferences for time of arrival at their destinations and the same seated capacities as are observed in the base year (2004/05).

There are a number of corridors which will see load factors exceed 70 percent by the year 2016. Of these the following corridors are predicted to have overcrowding.

South East – Lanark/Motherwell

The model predicts that crowding will worsen slightly on this route, although no intervention will be required within the timescales of this RUS.

Edinburgh – Glasgow Central via Shotts

The model predicts that crowding will worsen slightly on this route. Standing is predicted to begin, as modelled in the base year, only in the final stages of the journey.

Kilmarnock/Barrhead/East Kilbride – Glasgow Central

The model predicts a slight worsening of passenger overcrowding on these routes by 2016 with load factors increasing by two to three percent. The load factors on trains originating at East Kilbride are predicted to increase more than those on trains running from Kilmarnock/Barrhead.

Ayrshire – Inverclyde

The model predicts an improvement in load factors between the base year and 2016, although severe overcrowding is still likely to occur and will be further exacerbated by 2026. However we expect that Glasgow Airport Rail Link (GARL) will relieve some overcrowding between Glasgow and Paisley.

4.2.5.2 Stations

Glasgow Central

Increased capacity on routes into Glasgow Central is restricted by the platforms lengths and limited approach tracks. Enhancements to the station are restricted by the station footprint and the approach lines.

Table 12 highlights the average passenger loadings of a number of key services which operate to and from Glasgow Central station. Analysis suggests that the station capacity is not being utilised to best advantage for passengers.

Table 12: Train counts from Glasgow Central station

	Arrival			Departures		
	Trains	Passengers	Passengers per train	Trains	Passengers	Passengers per train
Ayrshire	80	8214	103	76	8590	113
Inverclyde	69	4896	71	68	4818	71
Paisley Canal	34	1415	42	35	1583	45
Whifflet	35	991	28	35	980	28
Kilmarnock/Barrhead	46	2535	55	46	2595	56
East Kilbride	38	3244	85	37	3076	83
South Electrics	117	5839	50	119	6531	55
Shotts	14	874	62	14	1039	74

Source: First ScotRail (2006)

4.2.5.3 Forecast gaps

Scottish Ministers have aspirations to increase the rail network in Scotland through the implementation of a number of major projects. These schemes are aimed at delivering economic growth by improving journey times and connections, reducing emissions and improving quality, accessibility and affordability. Over the next few years Scottish Ministers expenditure on public transport is planned to reach £1 billion per year. Much of this funding has been allocated to the major rail projects that Ministers have committed to deliver. Within Route 26, this includes Glasgow Airport Rail Link (GARL).

These projects go a long way to supporting the vision set out above and to realising the broader transport objectives as well as providing a platform for taking forward future developments.

In addition to the new infrastructure proposed by Scottish Ministers, there is also an

aspiration to reduce journey time and improve connectivity on the existing network.

4.3 Forecast freight growth

4.3.1 Freight traffic

Freight growth has been set out in the Freight RUS, which predicts disaggregated growth levels for the 10 years to 2014/15. These were compiled as a result of close cooperation between rail industry members and stakeholders. The freight predictions for Scotland have been based on two alternative scenarios which were developed within the Freight RUS.

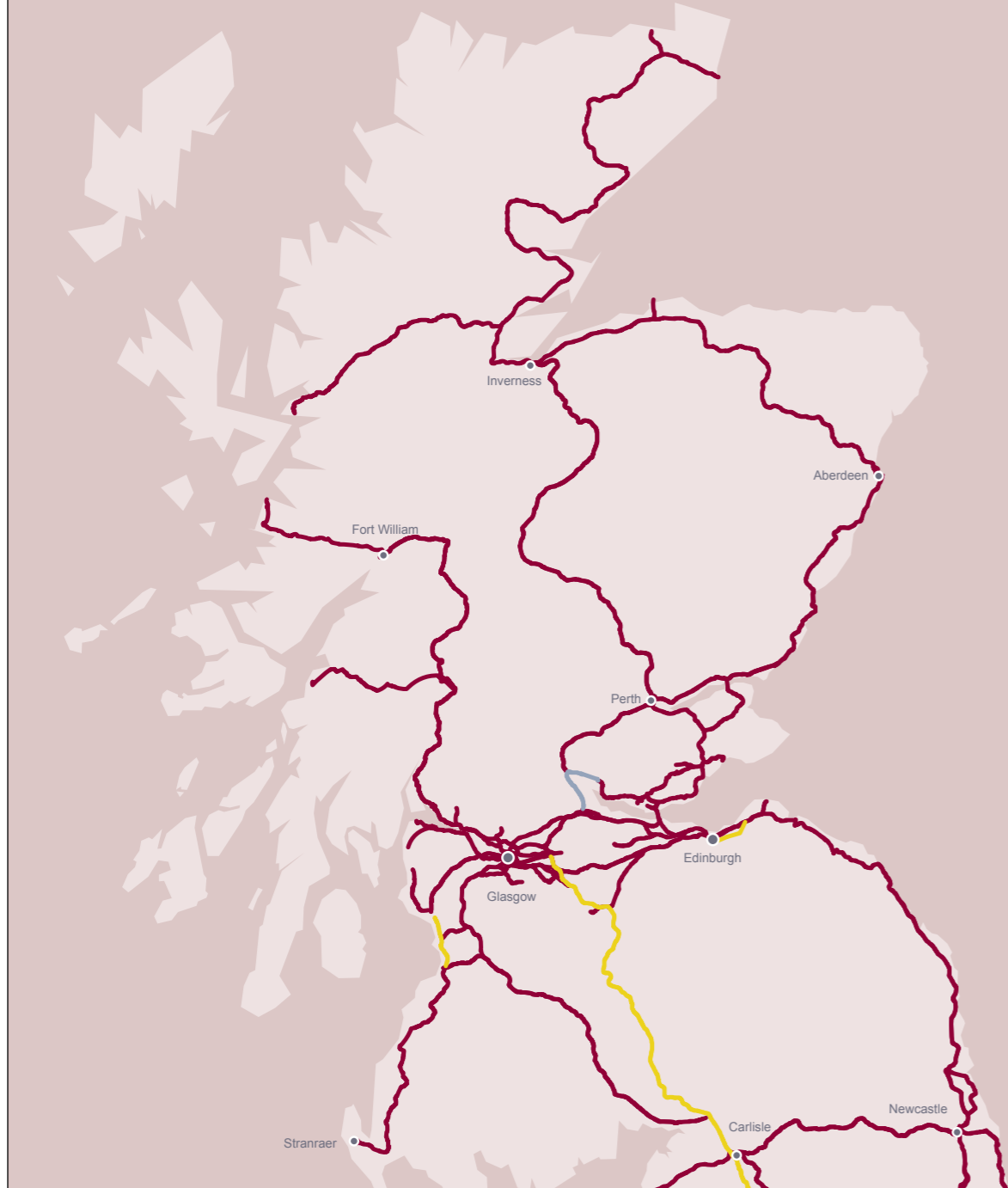
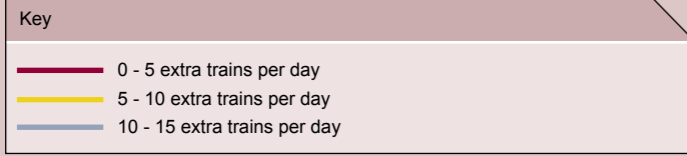
The base case (Map 13) assumes that growth in coal demand from Aire and Trent Valley power stations will be sourced from the English east coast ports whilst Anglo-Scottish coal traffic remains at 2004/05 volumes. The sensitivity case (Sensitivity Test One: Map 14) assumes that this growth is instead sourced from Scottish opencast facilities and Hunterston port.

Table 11: Predicted am peak load factors on crowded services (Route 26)

Service group	Morning peak load factors for trips into Glasgow			
	Base	2011	2016	2026
South East – Lanark/Motherwell	65%	73%	74%	81%
Edinburgh – Glasgow via Shotts	78%	82%	85%	94%
Strathclyde Diesel – Kilmarnock/Barrhead	78%	78%	80%	87%
South West Electrics – Ayrshire/Inverclyde	87%	85%	86%	93%
Strathclyde Diesel – East Kilbride	94%	94%	97%	106%

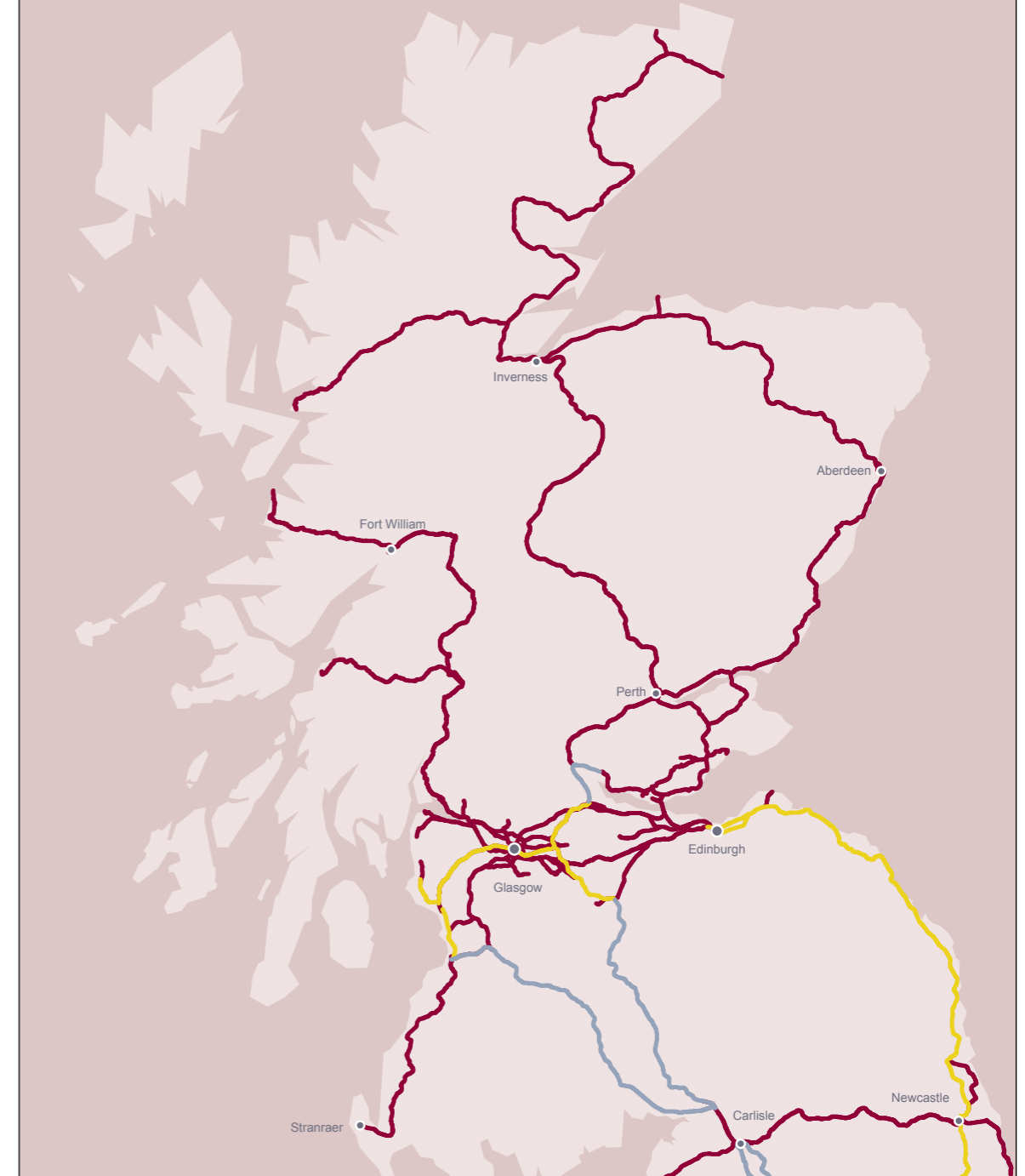
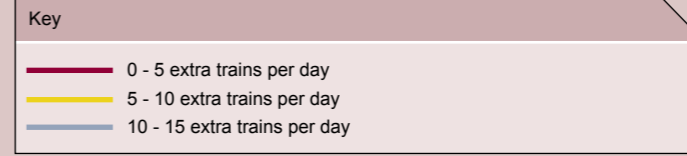
Source: Arup RUS SDM

Map 13: Base case



Source: Freight RUS

Map 14: Sensitivity 1



Source: Freight RUS

4.3.2 Specific anticipated growth areas in Scotland: Coal

The UK Government's Energy Review published in July 2006 sets out the aims for reducing environmental factors associated with energy use. The review indicated that coal-fired generation will continue to play an important role in the UK's energy system for the period of the RUS. It is likely, therefore, that the future level of demand for coal will continue to exceed the potential UK production. This will in turn lead to a continued high level of coal imports.

There are currently two coal fired power stations in Scotland, both of which receive the majority of their supplies by rail. Scottish Power has decided to fit emission reducing equipment at Longannet to guarantee its future beyond 2015 but not at Cockenzie which is likely to close before that date.

4.3.3 Specific anticipated growth areas in Scotland: Intermodal

Continued growth in deep sea intermodal traffic is forecast as a consequence of increased imports from the Far East. This is forecast to result in potentially two or three additional trains per day from Central Scotland to England via the WCML.

Growth is also forecast in domestic intermodal traffic, albeit at a lower level. This is largely as a result of the EU Working Time Directive and environmental concerns which improve rail's competitive position relative to road. Central Scotland to West Midlands flows in particular are forecast to increase, but this might result in longer formations or additional services.

4.3.4 Major strategic initiatives

The above forecasts are based on likely growth in markets where rail freight currently operates. In addition to the above, there are several local strategic initiatives that, if implemented, could generate significant additional rail freight traffic. The Scottish Executive has a strong track record of providing financial support to new rail freight initiatives which may be made available to

support some of these potential new flows in the future.

Clydeport is promoting the development of a new deep sea container terminal at Hunterston to exploit the deep water anchorages available for the latest generation of container vessels during all tidal conditions. This new terminal would absorb some of the predicted growth in container traffic at the south coast ports, therefore most of the throughput is expected to be destined for English markets. Rail would have a strong competitive advantage for these flows due to the poor road links to Hunterston; however significant further work would be required to address the gauge clearance and routeing of these potential new services.

The Scottish Executive's policy objective of achieving a higher re-cycling rate and its associated linked targets has resulted in many local authorities considering establishing joint re-cycling locations. The economies of scale at centralised waste transfer stations would favour rail transport if suitable rail connected sites can be found.

Rail's share of the timber transport market is currently very low due to the high cost of necessary trans-shipment from road to rail and the present low world prices for the commodity. There is, however, an increasing willingness among our industry stakeholders to encourage rail use on environmental grounds. This may result in measures to alter the economic balance which could give rail a higher market share. In addition, there are a number of proposals currently being developed to generate electricity from wood burning (biomass) which, if implemented, would create significant new flows where rail could have a competitive advantage.

These options will continue to be reviewed, and will be reflected in the strategy where appropriate when it is reviewed. Network Rail will continue to work with the developers and promoters of these schemes to provide the necessary information and support.

A number of gaps were identified in the Freight RUS based on capacity restrictions. The following gaps have been adopted by the Scotland RUS, based on the analysis from the Freight RUS. Gaps identified with a letter, are those which have been identified from the analysis in the Freight RUS, but adopted and addressed by this RUS.

G&SW: Falkland Yard – Gretna Jn (gap I)

The driver of the gap includes limited capacity particularly driven by the single line section between Gretna and Annan and the signalling headways Annan and Ayr. This gap is driven by the growth forecast in Freight RUS Sensitivity Test 1 which predicts an additional 12-13 coal trains per day above the 2004/05 volume on this route.

Larbert – Stirling (gap J)

This gap arises as a result of the re-routeing of the existing coal flows to Longannet to operate via Stirling following the reopening of the Stirling/Alloa/Kinross line.

4.4 Summary of forecast gaps

This section details the forecast gaps which were identified following our analysis of the forecast data.

Glasgow Queen Street High Level station: Capacity

A number of platforms at this station are unable to accommodate six-car formations. Growth is predicted to increase, on a number of services which operate from this station. The platform lengths limit the number of trains operating at maximum length on this route.

Central Belt station car parks: Capacity

Many of the station car parks in the Central Belt are now fully utilised throughout the day which constrains their ability to contribute to future growth of the rail network. This also constrains the ability to increase off-peak capacity on a number of key corridors.

Scottish Ministers' aspirations: Edinburgh Airport Rail Link

Passenger numbers at Edinburgh Airport are forecast to increase significantly over

the next 30 years. A fast, frequent transport link is required to Edinburgh city centre and across Scotland.

Scottish Ministers' aspirations: M8 – Airdrie to Bathgate rail link

There are significant passenger flows from West Lothian towards Glasgow and from North Lanarkshire towards Edinburgh that have no direct rail service. The M8 Corridor Study undertaken by the Scottish Executive indicated a growing market within these areas.

Haymarket station: Capacity

Congestion on the station concourse is expected to become increasingly acute in future years. Combined with poor access to and from the platforms and the new interchange traffic which is expected at the station following the completion of the Tram project capacity at the station is predicted to become increasingly constrained.

Edinburgh Waverley station: Capacity

Following the significant works which are being delivered in Edinburgh Waverley station in 2006/07, a number of short platforms which restrict the number of six-car services will still exist. This could restrict long-term growth to and from the capital.

Glasgow – Edinburgh via Falkirk: Capacity

Demand on this corridor is expected to exceed capacity before the end of the RUS timescales.

Scottish Ministers' aspirations: Midlothian and Borders

Significant housing growth is forecast in Midlothian and the Central Borders area. A sustainable transport link to the employment and leisure opportunities in Central Edinburgh is required.

Edinburgh/Fife/Aberdeen: Performance and capacity

Passenger demand to Edinburgh is predicted to grow. The current combination of infrastructure and uncompetitive journey times will not meet demand.

Inverness – Aberdeen: Service

The service pattern is determined by the single line infrastructure on the route which fixes the locations where crossing moves have to take place. This linked with an uncompetitive end to end journey time does not meet demand.

Glasgow Central High Level station: Capacity

Service levels at Glasgow Central High Level station are forecast to increase as a consequence of growth on various routes to/from the station, as well as planned enhancement projects. Because of the constraints of the station site, no additional platforms, other than the new platform planned for Glasgow Airport services on the site of the existing carriageway drive can be added. Additional capacity is required to accommodate these issues.

Scottish Ministers' Aspirations: Glasgow Airport

Passenger numbers at Glasgow Airport are forecast to increase significantly over the next 30 years. A fast, frequent transport link is required to Glasgow city centre.

Kilmarnock Line: Capacity

The single line between Barrhead and Kilmarnock is fully utilised during both peaks. Overcrowding is likely to occur and capacity is forecast to be exhausted towards the end of the RUS period.

East Kilbride Line: Capacity

The additional capacity provided by the recently completed platform lengthening scheme allowed six-car formations to operate during peaks hours. Continuing growth in demand means that this is likely to be exhausted towards the end of the RUS period.

Shotts Line: Capacity and service

Overcrowding is likely to occur and demand will exceed capacity during the peak times. Additional capacity will be required on this route. If planned properly, this could offer some relief to the existing Edinburgh – Glasgow via Falkirk corridor.

G&SW: Falkland Yard – Gretna Jn (gap I from the Freight RUS)

Capacity is limited by the single line section between Gretna and Annan and signalling headways between Annan and Falkland Yard. This particularly impacts on freight traffic and limits future growth.

Larbert – Stirling (gap J from the Freight RUS)

Signalling headways will limit the available capacity following the opening of the Stirling/Alloa/Kinross line. This will limit usage of the new line and constrain future growth.



5. Planned schemes

Section 3 considered the current operation of the network and the operating restrictions which currently limit capacity and impact upon performance. Section 4 then looked to the future and presented a number of restrictions based on predicted growth patterns. Following these sections a number of gaps were identified.

Some of the gaps identified are already being addressed, either by funding from external parties or as enhancement items to Network Rail renewal schemes as follows:

5.1 Scottish Ministers' major rail projects

5.1.1 Introduction

The schemes listed in Section 5.1.2 are currently being funded and delivered by Scottish Ministers and are being implemented. Transport Scotland as a government agency, act on behalf of Scottish Ministers to progress the major schemes and ensure the "National Transport Strategy; Scotland's Railways" is taken forward. The major schemes will address some of the gaps, which are discussed in more detail in Section 8. The schemes listed in Section 5.1.3 are committed by Scottish Ministers and are currently progressing through the development process.

5.1.2 Committed schemes

Stirling/Alloa/Kincardine

Work has commenced on the re-opening of the Stirling/Alloa/Kincardine line, closed to passenger traffic in 1968 and to freight traffic in 1980. The line will be opened to passenger traffic between Stirling and Alloa and to freight traffic throughout. Clackmannanshire Council and Transport Scotland are funding the project which is planned for completion in late 2007.

Edinburgh Waverley re-modelling

Work is underway on the Edinburgh Waverley re-modelling project. Transport Scotland is funding the project which is planned for completion in November 2007. The project will allow the future introduction of additional services at the west end of the station through the provision of a more flexible station throat and additional platforms.

5.1.3 Planned major projects

Airdrie – Bathgate

Network Rail has lodged the Parliamentary Bill seeking powers for the construction works associated with this project on behalf of Transport Scotland, the project funders. The main works comprise the re-opening of the central Drumgelloch to Bathgate section and the re-doubling of the current single line sections together with a new train servicing depot. The line is to be electrified throughout, which requires the installation of new overhead line equipment between Drumgelloch and Haymarket.

Glasgow Airport Rail Link (GARL)

Annual passenger numbers at Glasgow Airport are forecast to increase from the current 8.1 million per year to 15 million by 2030. This projected increase has resulted in pressure to provide a sustainable transport link to the airport from Glasgow city centre.

The selected alignment for this link is to construct a double track branch from Paisley St James, on the Paisley Gilmour St to Gourock line, to a new station at the Airport. A dedicated four trains per hour service is proposed to the Airport from Glasgow Central High Level. This level of additional service drives a requirement to enhance the existing network at Glasgow Central High Level station and between Shields Jn and

Paisley. Strathclyde Partnership for Transport, Transport Scotland and BAA are funding the project which is planned for completion in 2010. In January 2007, this scheme received Royal Assent. This project has been aligned with Network Rail's track and signalling renewal of the Paisley Corridor between Shields Jn and Paisley St James station, to ensure the optimum design is delivered.

Edinburgh Airport Rail Link (EARL)

Annual passenger numbers at Edinburgh Airport are forecast to increase from the current 7.5 million per year to 20 million in 2030. This projected increase has resulted in pressure to provide sustainable transport links to the Airport from Edinburgh city centre and the rest of Scotland. Following a number of studies a heavy rail link has been identified as the optimum way of achieving this and the associated plans are at an advanced stage.

The proposal is to construct a new section of infrastructure for the main Edinburgh to Glasgow route approximately three miles in length that will allow existing Edinburgh to Glasgow and Dunblane services to be diverted via the Airport. Additional chord lines are also to be provided that will connect with this new alignment and allow access to the Airport for services to and from Fife and the north of Scotland. BAA and Transport Scotland are funding the project which is planned for completion in 2011.

Scottish Borders Railway

This project comprises the re-instatement of the former Scottish Borders Railway line from Newcraighall (terminus of the current Edinburgh CrossRail service) to Galashiels and Tweedbank, a distance of some 25 miles. The Private Bill required to permit the construction of the railway has already received Royal Assent. A consortium of City of Edinburgh,

Midlothian and Scottish Borders Councils and Transport Scotland are funding the project.

Construction is planned to commence in 2008 with completion planned for 2011.

These schemes will fill a number of the forecast gaps and will meet Scottish Ministers' aspirations of delivering new infrastructure which will improve journey times, reducing emissions and improving quality, accessibility and affordability.

5.2 Major renewal schemes

Major renewals offer synergies with schemes to strategically enhance the network. Details of renewals over the next three to five years are contained in Network Rail's Route Plans within the 2007 Business Plan, to be published in March 2007. Significant renewals are detailed in Appendix C. Renewals schemes also offer the opportunity to deliver enhancement items, which will meet some of the gaps identified. These are discussed in more detail in Section 8.

A number of major S&C and signalling infrastructure renewal schemes are currently being developed. These renewal schemes offer the opportunity to enhance the network by delivering substantial enhancements, which improve the flexibility and functionality of the infrastructure, in an effective manner.

Network Rail will continue to assess their ongoing S&C, signalling and other renewal proposals to identify and assess any potential enhancement opportunities.

Optimisation of renewals plans has led to the delivery of an enhanced layout at Larbert Jn, improved layout at Grangemouth Jn and the development of reduced headways between Gretna and Annan.

In addition to the major works currently in-progress in the west of Scotland, Stirling is scheduled for re-modelling and renewal in 2008/09. The re-opening of the line between Stirling/Alloa/Kincardine will see an increase in freight services on this corridor. To maximise flexibility and operational output the junction and approaches to Stirling station will be re-modelled to ensure the optimum solution is delivered.

In September 2006, Network Rail announced a £200 million investment in a new control centre at Cowlaers. The investment in a new signalling centre to serve the west of Scotland will consist of renewing the existing 45 year old system and relocating staff to custom-built 21st century facilities. The aim of this proposal is to improve performance and service reliability. The company will also build a new depot for maintenance staff who work around the clock to keep the railway running smoothly.

The new accommodation will replace a range of facilities that Network Rail inherited from maintenance companies when the company brought its maintenance operation in-house two years ago. This scheme will incorporate the new interlocking which is currently underway at Glasgow Central and the enhanced signalling which is currently proposed for Cathcart and Paisley corridor.

5.3 Other proposed third party enhancement schemes

The schemes highlighted in Table 15 are currently under discussion with project promoters.

Details of the implications of each for the RUS and issues that need to be taken account of in their future development are provided.

Network Rail will continue to liaise with the promoters of these projects and any new

Table 15: Other proposed enhancement schemes (continued)

Mossend – Elgin gauge enhancements	North East of Scotland Rail Freight Development Group	Increased capacity utilisation due to anticipated additional freight traffic between Mossend, Aberdeen and Elgin. This will be complete in July 2007.
Glasgow – Kilmarnock service enhancements	SPT (Transferring to Transport Scotland)	Increased capacity utilisation due to associated additional passenger traffic and extent of proposed additional infrastructure. This proposal is included within Section 8.
Tillyflats freight connection	WH Malcolm	Increased capacity utilisation due to anticipated additional freight traffic between Grangemouth, Mossend and English destinations.
Earls Seat freight connection	Hall Construction	Increased capacity utilisation due to anticipated additional freight traffic between Methil, Millerhill and English destinations. These works will be complete in 2007.
Gourock station development	Inverclyde Council	Re-location of the station to provide improved interchange with bus/car/ferry including provision for adequate passenger circulating areas and track and platform capacity to accommodate future requirements.
Tay Estuary Rail Study	Dundee Council	Increased frequency due to new service between Perth and Arbroath.
Bannockburn	Stirling Council	Increased capacity utilisation due to extended journey times between Stirling and Larbert unless balanced by revisions to stopping patterns.

Table 15: Other proposed enhancement schemes

Project	Main promoter	Implication for RUS
Dyce Raiths Farm	Union Square Developments	Increased capacity utilisation due to additional freight traffic between Aberdeen and Dyce as a consequence of the re-location of the freight facilities from Aberdeen to Dyce. Rail works are expected to be complete in July 2007.
Aberdeen Crossrail	Aberdeenshire Council	Increased capacity utilisation due to additional passenger traffic between Stonehaven, Aberdeen and Inverurie.
Laurencekirk New Station	Aberdeenshire Council	Increased capacity utilisation due to extended journey times between Montrose and Aberdeen unless balanced by revisions to stopping patterns.
Glasgow Crossrail	SPT	Release of capacity at Glasgow Central High Level and consequential increased capacity utilisation due to additional passenger traffic through Glasgow Queen St Low Level, which would extend journey times on certain routes.
Perth Station Interchange	Perth & Kinross Council	Removal of redundant facilities with provision of adequate track and platform capacity to accommodate future traffic requirements.
Haymarket Station Development	City of Edinburgh Council	Provision of adequate passenger circulating areas and platform capacity to accommodate future requirements. This is included within the strategy detailed in Section 8.
Hyndland Station/Gartnavel Development	SPT	Linkage with renewal proposals for Hyndland East Jn, included in Section 8.

projects in close consultation with Transport Scotland as appropriate.

5.4 Commonwealth Games

Glasgow is a candidate city for the 2014 Commonwealth Games. Initial discussions have been held with the rail industry but at this stage it is too early to assess exactly what would be required if the Glasgow bid was successful. The current assumption by the bid team is that the Glasgow Airport Rail Link will be completed together with a number of non-rail related schemes. As the bid develops industry partners will continue discussions as appropriate and will consider how rail can best contribute to the transport requirements.

5.5 Room for Growth studies

Two reports have recently been published on options for rail developments in the north of Scotland by Highlands and Islands Enterprise (HIE). The Room for Growth study conducted by Scott Wilson¹ reviews the rail

infrastructure, supported by a Halcrow study² which undertook demand modelling to analyse the future rail traffic growth in the Highlands and Islands.

The demand and analysis sections of the Room for Growth study have been reviewed as part of the RUS. "Scotland's Railways" includes a desire for faster and more frequent services between Inverness and the Central Belt. Findings of the Room for Growth study support these aspirations between Perth and Inverness and have therefore been included in the final strategy detailed in Section 8. Following the publication of the Room for Growth study, HITRANS (Highlands and Islands Transport Partnership) has undertaken a substantial amount of work on a number of tactical timetable options, which will assist in meeting the passenger demands.

¹ <http://hie.co.uk/HIE-Transport-related-documents/Highland-rail-room-for-growth.pdf>

² <http://www.hie.co.uk/HIE-Transport-related-documents/Highland-rail-traffic-growth-2.pdf>

6. Consultation process and overview

6.1 The RUS Draft for Consultation

The Scotland RUS Draft for Consultation was published on 24 August 2006. The document set out the relevant background information on the Scotland RUS area, outlining the issues that are currently faced and those that are predicted in the period 2006 to 2016. The document then outlined the options to be developed within the strategy and the next steps that would be taken.

The RUS Draft for Consultation was distributed to a wide range of stakeholders and was available to download from Network Rail's website. A period of 12 weeks was set aside to allow stakeholders to respond, which ended on 16 November 2006.

During the consultation period, key stakeholders were invited, either collectively or individually to briefing sessions in Glasgow, Edinburgh and Aberdeen at which specific issues were discussed.

6.2 Consultation responses

Stakeholders who responded to the consultation fell into the following broad categories:

- RUS Stakeholder Management Group
- Statutory and voluntary rail user groups
- Local/regional authorities and umbrella groups
- Political, campaigning and charitable organisations
- Companies, organisations and private individuals.

Copies of the various responses can be found at www.networkrail.co.uk, although it should be noted that some responses have been redacted due to confidentiality issues.

6.3 Key themes in the consultation responses

The responses which Network Rail received were considered and, in many cases, comprehensive. As a result, it is difficult to provide an individual précis of each submission. Instead, some of the key and recurring themes are summarised below:

6.3.1 Route 24: East of Scotland

Edinburgh Airport Rail Link (Gap 4)

There was a mixed response to the proposals for Edinburgh Airport Rail Link (EARL). Supporters argued that the proposal was vital to the development of the Scottish Capital, whilst other respondents considered other rail connections more suitable.

Scottish Borders Railway (Gap 4)

There were a number of supporters for the Scottish Borders Railway, however concerns were expressed regarding the proposed journey time of 61 minutes, for a 35 mile journey. Some respondents considered the proposed double junction at Portobello as essential for the success of this project.

Edinburgh Cross Rail (Gap 8)

A number of comments suggested that a double junction was required at Portobello to increase capacity and improve performance from the main line. Comments supported the need for a cross Edinburgh service as a number of passengers travel from Newcraighall to Edinburgh Haymarket or Edinburgh Park, which would require a change of train under the option originally proposed in the RUS.

Stopping pattern in Fife (Gap 12)

A number of concerns were raised regarding the stopping pattern in Fife. Leuchars and Kirkcaldy were identified as key stations on the

corridor, and local residents were concerned about a reduction in services to these locations; although in fact none of the proposals reduced the service at these stations.

Edinburgh – Fife – Aberdeen services (Gap 12)

A number of stakeholders supported the proposal for a fast and semi-fast service to Aberdeen. A number of responses requested that the semi-fast service to Dundee be extended to Arbroath with a revised stopping pattern to serve Carnoustie.

6.3.2 Route 25: Highlands

Services between Inverness and Aberdeen (Gap 17)

A number of stakeholders supported the proposals for faster end to end journey time between Inverness and Aberdeen, and calls were made for re-doubling the track at either end of the corridor, to increase capacity.

Room for Growth study commissioned by Highlands and Islands Enterprise

Several responses called for the Room for Growth recommendations to be included in the final RUS.

Dornoch Rail link

A number of supporters requested that the Dornoch Rail Link should be included in the RUS. This was evaluated and not recommended in the Room for Growth study.

Aberdeen Crossrail

There were a number of supporters for Aberdeen Crossrail, which is being promoted by Aberdeenshire Council. This proposes additional services between Stonehaven, Aberdeen and Inverurie.

6.3.3 Route 26: Strathclyde and South West Scotland

Glasgow Airport Rail Link (Gap 24)

There were a number of responses which supported the development of Glasgow Airport Rail Link (GARL).

Through services from Stranraer (Gap 25)

Some respondents raised concerns regarding the withdrawal of through services from Stranraer to Glasgow. In addition, a smaller number of responses were received regarding through services to Newcastle or Carlisle.

Glasgow CrossRail

There were a number of supporters for Glasgow CrossRail, which could release capacity at Glasgow Central High Level, by diverting some services through Glasgow city centre. This could offer a through service from the west of Scotland to Edinburgh and further destinations, albeit this would have a detrimental effect on journey time to Glasgow city centre. Through journeys to the east and north of Glasgow could have a reduced journey time.

Garrigad Chord

There was support for a new chord between the Springburn line and Cumbernauld line, which would allow electric services to operate directly between Queen Street Low Level and Cumbernauld.

This proposal would release capacity between Glasgow Queen Street High Level and Cowliars. This is one of the options which could be considered to address the gap identified at Glasgow Queen Street.

6.3.4 Freight

A small number of responses were received regarding freight activity in Scotland. Requests were made for increased loading gauge on

diversionary routes. Options to address freight gauge and capacity have been addressed in the Freight RUS, which is being developed simultaneously with this RUS.

6.4 Additional responses

Several responses called for the RUS to consider the construction of new or re-opened stations. Whilst these points are welcome, the scope of the RUS dictates it should only address the case for new stations when such proposals meet a gap identified within the RUS.

A few respondents submitted innovative suggestions for new services, although most were either outside the scope of this RUS, or were unlikely to be fundable. Some examples were:

- extend the Stranraer line to Cairnryan to service the port
- electrify a number of lines.

Responses which propose options which were considered outwith the remit of the RUS detailed in Section 1 will be passed to Transport Scotland for further consideration. A number of these proposals, including electrification have already been addressed and have been included in Scottish Ministers' rail strategy; "Scotland's Railways".



7. Option analysis

7.1 Introduction

Section 3 (Baseline) of this document identified gaps between the capacity and capability that the railway system currently supplies and the demands currently made on it. Section 4 (Forecast) identified similar gaps that it is anticipated will arise during the 10-year period of the RUS. To address each gap, key stakeholders proposed a set of options for testing which were described in the Draft for Consultation.

As a result of feedback from the consultation process and additional analysis, further development of the options has taken place. This section sets out the options from the Draft for Consultation with description of these changes and an indication of which options are included in the Strategy.

It should be noted that several of the options are not mutually exclusive, and might therefore be considered in combination. The summary section for each gap below highlights links and exclusions between options and leads into the development of a single preferred strategy in Section 8. The detail of option assessment is given in Appendix F.

Further discussion on all options proposed for inclusion would be required with the funder of the network.

KEY

Each option has a letter to the right of the text, signifying its status in the Draft for Consultation and its status now. The letters are:

- R** recommended in the Draft for Consultation
- N** not recommended in the Draft for Consultation
- I** included in the final strategy
- A** amended option not included/ recommended in the consultation document, but included in the final strategy
- E** excluded in the final strategy

7.2 Route 24: East of Scotland

7.2.1 Central Scotland including Edinburgh – Glasgow

Gap 1: Glasgow Queen Street High Level station capacity is insufficient to meet demand.

1.1 Extend all platforms to six-car length	R
Only Edinburgh – Glasgow services currently operate in six-car formation. All other peak services currently operate with up to five-car 170/158 formations. This option would remove the current restrictions on the number of six-car formations that can operate in and out of the station. This would provide additional capacity between Glasgow and Stirling/Alloa/Dunblane. An increase from five to six-car formations would provide an additional 74 seats per service. In the short term the extension of a platform at Queen Street, undertaken in conjunction with option 2.1 would relieve some capacity and allow the formation of more six-car services.	
Consultation responses generally supported this option.	I
1.2 Increase passenger circulation space	R
Whether or not the train capacity of the station is increased, forecast demand will require more space for passenger circulation. Expansion of the existing concourse is necessary and should be designed in a manner that also permits option 1.1 to be implemented. As major changes of this type can be made only infrequently, the design for the concourse should seek to accommodate passenger demand for the next 30 years.	
Consultation responses generally supported this option.	I
Gap 1 Summary: For most effective use to be made of the facility, Queen Street High Level station should be capable of accommodating six-car trains in any platform. Options should be progressed to address current and long-term restrictions in the station. In the short term at least one additional six-car platform is required. Options for increasing capacity between Queen Street and Cowliars should also be reviewed.	

Gap 2: Central Scotland platform lengths are mostly standard length.

2.1 Extend all platforms to six-car length	R
There are a number of platforms of inadequate length within Central Scotland. Extension of the platforms at Bishopbriggs alone would permit six-car services to run between Glasgow and Dunblane/Alloa at peak times as well as allowing the station to be served when an all-stations Edinburgh – Glasgow service operates as part of the contingency plan arrangements on this corridor. To obtain maximum benefit, this option should be progressed in conjunction with the interim option recommended for Glasgow Queen Street. This option would include a review of the peak stopping pattern to ensure the capacity is fully utilised.	
Consultation responses generally supported this option.	I
2.2 Introduce selective door opening	N
Selective door opening would allow longer trains to call at Bishopbriggs without lengthening the platforms. It would thus increase capacity at potentially lower cost, but the high risk of extending the station dwell time, while people access/egress through the doors that will fit onto the platform would have an adverse effect on performance.	
There was no support from consultation responses for this option.	E

2.3 Review stopping pattern of busier trains	N
This option proposes that more six-car formations are introduced but do not stop at Bishopbriggs. This would reduce the service operating in the peak times for Bishopbriggs users, but would reduce journey time and improve capacity for passengers who board at other locations on this corridor.	
There was no support from consultation responses for this option.	E
Gap 2 Summary: To accommodate increased capacity, platform extensions at Bishopbriggs and Glasgow Queen Street are required to permit the operation of more six-car services in the peak periods on the corridor.	

Gap 3: Central Scotland car parks have insufficient capacity to meet demand.

3.1 Undertake programme of car park extensions	R
Many of the station car parks in the Central Belt are fully occupied throughout the day. This option proposes that car parks which are fully utilised in the peaks are extended to create additional capacity and encourage greater use of rail in the off-peak. Extension could be by decking where land is scarce.	
Consultation responses generally supported this option.	I
3.2 Review car park charging policy	R
A number of car parks in the Central Belt are fully utilised throughout the day. To encourage access to stations by sustainable means, and therefore creating a positive modal shift, charging will be considered.	
Consultation responses were concerned that this option may price people off the railway.	A
Gap 3 Summary: Charging at some locations is recommended to change user behaviours to travel to the station by more sustainable means and (if varied by time) to maintain capacity for off-peak users. However, the purpose of charging is not to discourage rail use, so there are a number of locations where car park extensions will still be justified.	

Gap 4: Scottish Ministers' aspirations in the Edinburgh – Glasgow corridor.

4.1 Construct Airdrie – Bathgate rail link	R
Scottish Ministers consider that there is significant demand for a direct rail service to cater for markets between West Lothian – Glasgow and North Lanarkshire – Edinburgh. As well as reopening a closed section of line, the option proposes the re-instatement of double track throughout this route. It is forecast that 3 million additional passenger journeys per year will be attracted by the new service.	
Consultation responses generally supported this option.	I
4.2 Construct Edinburgh Airport rail link	R
This option proposes the provision of a new rail link that will allow existing services to be diverted via Edinburgh Airport. This, in turn, drives a requirement for a complete timetable recast for central Scotland. This option proposes a significant amount of additional infrastructure, which includes a new section of route parallel with the existing Glasgow – Edinburgh corridor, in addition to a branch to connect with the Fife line and a new station within the airport terminal.	
Consultation responses presented mixed views on this option.	I
Gap 4 Summary: These options are supported by Scottish Ministers and are currently progressing through the Parliamentary process.	

Gap 5: Haymarket station capacity is insufficient to meet demand.

5.1 Increase passenger circulation space	R
This option proposes providing a larger concourse area, with a longer barrier line, widened footbridge with lifts and escalators. It is proposed that this option would follow works at Edinburgh Waverley.	
Consultation responses generally supported this option.	A

5.2 Construct additional platform	R
As part of the Edinburgh Waverley re-modelling project, an additional temporary turn-back platform has been created at Haymarket station to assist service operation whilst part of Waverley is not available. This option proposes the retention of this additional platform on a permanent basis. No additional works would be required to implement the option.	
Consultation responses generally supported this option.	I
Gap 5 Summary: Due to the aspirations of Edinburgh City Council for the re-development of the Haymarket area, development at Haymarket station would be undertaken in two phases. Initially, to address the congestion gap, a DDA compliant footbridge is required which will provide some additional circulation space. Longer term, the station has been incorporated into local plans for an interchange facility with the tram service and major developments in the vicinity of Haymarket station.	

Gap 6: Edinburgh Waverley station capacity is insufficient to meet demand in the longer term.

6.1 Extend all platforms to six-car length	R
This option proposes the removal of the carriageway ramp and associated vehicle access within the station, and recommends extending platforms 12, 13 and 18 to allow a minimum of six-car formations. This would permit additional capacity on services from the west and north. It would require the construction of a vehicle drop-off point at street level and relocation of the First ScotRail ticket office.	
Consultation responses presented mixed views on this option.	E
6.2 Increase passenger circulation space	R
This option proposes removing the ramp and associated vehicle access into the station, which would remove any conflict risks between passengers and vehicles. It would create additional passenger circulation space to meet projected demand, with vehicle access being provided at street level outside the station.	
Consultation responses generally supported this option.	E
Gap 6 Summary: The current works at Waverley will provide additional capacity to meet medium-term needs. Provision for increased demand into central Edinburgh should be considered holistically with planned developments at Haymarket and proposals for light rail.	

Gap 7: Glasgow – Edinburgh via Falkirk route has insufficient capacity to meet demand.

Within the consultation RUS the following options addressed more than one gap and are related to creating additional capacity between Edinburgh and Glasgow via Falkirk:	R
1.1 Glasgow Queen Street: Extend all platforms to six-car length	I
1.2 Glasgow Queen Street: Increase passenger circulation space	I
2.1 Central Scotland: Extend all platforms to six-car length	I
4.1 Construct Airdrie to Bathgate Link	I
5.1 Edinburgh Haymarket Station: Increase passenger circulation space	I
5.2 Edinburgh Haymarket Station: Construct additional platform	I
6.1 Edinburgh Waverley Station: Extend all platforms to six-car length	E
6.2 Edinburgh Waverley Station: Increase passenger circulation space	E
29.2 Shotts: Additional trains, skip-stopping service	I
Carstairs: Hourly service	A
Gap 7 Summary: The options detailed above address more than one gap. They predominantly increase capacity on the route via Falkirk, although two of the options (4.1 and 29.2) will increase capacity, improve journey time and frequency via Airdrie, Shotts and Carstairs. By increasing frequency and reducing journey time on other corridors, it is expected that passengers will utilise their nearest station so spreading demand for services between the principal cities, rather than drawing demand to the corridor via Falkirk as occurs at present.	

7.2.2 Edinburgh east and south

Gap 8: Portobello Jn – Niddrie South Jn route generates unacceptable performance.

8.1 Timetable recast	R
Edinburgh CrossRail services to and from Bathgate and Dunblane transmit delays occurring in one area to other parts of the network. This option proposes splitting this service at Edinburgh to operate independently, with interchange required at Edinburgh Waverley for through passengers. This would improve performance and reliability of services on this corridor and would limit the reactionary delays on other parts of the network.	
Consultation responses strongly opposed this option. Analysis shows that 40 percent of passengers on these services travel through Edinburgh Waverley with 30 percent terminating their journey at Haymarket and just under 10 percent terminating at Edinburgh Park. The option has therefore been developed to allow services to operate between Newcraighall and Fife, via South Gyle. This would retain some of the performance improvements whilst allowing passengers to continue to travel between Newcraighall and Haymarket/Edinburgh Park. Work with stakeholders has demonstrated wide support for the revised option to operate Newcraighall – Fife via South Gyle.	A
8.2 Reinstate double track	N
This option proposes re-doubling Portobello Jn and the single-line section towards Niddrie, with the provision of a second platform at Brunstane station. This would improve performance and reliability of services on this corridor and would limit the reactionary delays on other parts of the network even if through services across Edinburgh were maintained. It would increase capacity and performance, although slow speed approaches to the junction would still be in place.	
Consultation responses strongly supported this option.	I
Gap 8 Summary: Following feedback from consultation, the option to re-double the junction and single line has been reviewed. Initial development suggests that this option is worth pursuing and if undertaken as part of the Scottish Borders Railway option to extend the railway from Newcraighall to Tweedbank (option 9.1), can offer additional efficiencies. This option will be pursued with the revised option 8.1 timetable recast which has been agreed with stakeholders.	

Gap 9: Scottish Ministers' aspirations in Midlothian and Borders.

9.1 Construct Scottish Borders Railway to Tweedbank	R
This option proposes the extension of the existing Edinburgh – Newcraighall service for 25 miles to Tweedbank, with new intermediate stations at Shawfair, Eskbank, Newtongrange, Gorebridge, Stow and Galashiels. These would be served by extending the existing Edinburgh – Newcraighall services.	
Consultation responses strongly supported this option, although concerns regarding journey time were raised in a number of responses.	I
Gap 9 Summary: This option is supported by Scottish Ministers and has received Parliamentary powers.	

7.2.3 Stirling area

Gap 10: Larbert – Stirling route capacity is insufficient to meet demand. (incorporating Freight RUS gap J)

10.1 Additional signalling to reduce headways	R
This option proposes to close-up the signal spacing and thus improve the operating headways on this corridor, increasing capacity and providing a better degree of performance resilience when delays occur. It would enhance the robustness of both the current timetable and the timetable that is under development for Hunterston – Longannet services on completion of the Stirling/Alloa/Kincardine project. It would also provide the opportunity to operate additional peak services over the corridor in response to projected growth in demand.	
Consultation responses generally supported this option.	I

10.2 Infrastructure changes at Stirling station	R
This option proposes to re-model the track layout at the south end of Stirling station to provide parallel working for services to and from the Alloa branch and an additional freight loop facility. The option would enhance the robustness of the current timetable as well as the timetable that is currently under development for Hunterston – Longannet services on completion of the Stirling/Alloa/Kincardine project.	
Consultation responses generally supported this option.	I
Gap 10 Summary: These options will address current and future demand between Larbert and Stirling.	

Gap 11: Polmont – Winchburgh Jn engineering access is insufficient to meet needs.

11.1 Recast timetable to divert trains via Alloa	R
A timetable recast is being undertaken to divert current freight services onto the new Stirling/Alloa/Kincardine corridor. The diversion might reduce the maintenance requirement on the constrained Polmont – Winchburgh section, and the revised requirement would be assessed against existing and potential engineering access opportunities.	
Consultation responses generally supported this option.	I
Gap 11 Summary: This will be progressed as part of the re-opening of the Stirling/Alloa/Kincardine line, which is currently being implemented.	

7.2.4 Edinburgh/Fife/Aberdeen

Gap 12: Dundee – Aberdeen service pattern does not meet market needs and capacity is insufficient to meet demand.

12.1 Recast timetable	R
The timetable considered in this option includes a faster Edinburgh – Aberdeen service, a new Edinburgh – Dundee semi-fast service, additional Edinburgh – Perth services and alterations to local services in Fife to improve reliability and journey time.	
Consultation responses generally supported this option.	I
12.2 Improved functionality at Montrose	R
There is no southbound loop facility between Aberdeen and Dundee, which limits freight capacity on this corridor. This option proposed a bi-directional loop facility on the northbound side to improve reliability and provide the opportunity for additional freight services, balancing the northbound loop facility already planned for installation in 2007.	
Following development of this option it is apparent that a more flexible option would be to convert the siding at Laurencekirk to provide a southbound loop facility. Combined with the northbound loop being provided at Montrose, this would offer improvements to flexibility and performance, and the capacity for additional freight paths.	A
12.3 Re-double section between Montrose and Usan	N
Following consultation, this option was developed to consider the benefits and capacity which would be created by doubling the single section between Montrose and Usan. Initial estimates concluded that this proposal would cost in excess of £100 million. Discussion with key stakeholders and funders confirmed that there is not sufficient aspiration or demand to justify this cost.	E
Gap 12 Summary: The southbound loop at Laurencekirk and a timetable recast will provide sufficient capacity for both freight and passenger services on this corridor. The timetable recast developed in option 12.1 would have to be combined with option 13.2 to provide a consistent timetable.	

Gap 13: Edinburgh – Fife – Dundee route generates unacceptable performance and capacity is insufficient to meet demand.

13.1 Recast timetable as described in option 12.1	R
Consultation responses generally supported this option.	I
13.2 Recast timetable to separate services	R
This option proposes splitting the Fife Circle to operate as two independent services. The current number of services calling at each station would be maintained under the proposed timetable. The option would improve performance and reliability between Edinburgh and Fife. It would also help to address gap 14.	
Following further development of this option it is apparent that to utilise resources efficiently some services would continue to operate as through services on the Fife Circle.	A
13.3 Additional signalling to reduce headways	R
This option proposes improving the operational headways between Haymarket and Inverkeithing to offer increased capacity for additional trains, particularly during peak periods. At other times it would reduce reactionary delays.	
Consultation responses generally supported this option.	I
13.4 Review Tay Bridge operating restrictions	N
The current signalling restrictions prohibit more than one train over the 'high girders' section of the bridge. This option proposes a review of these restrictions, to improve passenger capacity over the bridge. A timetable recast would be required to make best use of the proposed alteration to capacity.	
Consultation responses generally supported this option. Although this option would not deliver any significant benefits if delivered in isolation, it is proposed that when the bridge is resignalled the renewal will seek to modify the current operating restrictions that prevent any two trains from passing on the high girders.	A
13.5 Increase line speed between Hilton Jn and Ladybank	R
This option proposes to increase the line speed above the current 55 mph, to various speeds in the range 65 – 90mph. The improvement would be delivered in line with a number of phased planned renewals which are currently scheduled to be complete by 2009. The overall reduction in journey time would be about four minutes.	
Consultation responses generally supported this option.	I
Gap 13 Summary: These options should be undertaken as a combined package to deliver the desired outputs.	

Gap 14: Edinburgh – Fife service pattern does not meet market needs and capacity is insufficient to meet demand.

14.1 Recast timetable to separate services as described in option 13.2	R
Consultation responses generally supported this option.	I
14.2 Recast timetable to include additional shoulder-peak trains	R
Although it is not possible to operate additional services in the high peak period without significant investment, an additional service within the wider morning-peak period would help to meet the growing passenger demand between Fife and Edinburgh.	
Consultation responses generally supported this option.	A
Gap 14 Summary: These options should be undertaken with those recommended in gaps 12 and 13 as a combined package to deliver the desired outputs.	

Gap 15: Some lightly-used stations are on capacity constrained corridors.

15.1 Review use of lightly-used stations	R
This option proposes that the renewals plan for low footfall stations, particularly on capacity constrained routes, be reviewed, together with any relevant proposals for housing or other developments, to ascertain the best future strategy for these stations.	
Development of this option has highlighted that no substantial renewals are required at any of the 23 stations identified in the consultation document within the RUS timescales.	I
Gap 15 Summary: This option should continue to be reviewed in line with any proposed developments.	

Gap 16: Perth station area engineering access is insufficient to meet needs.

16.1 Day time maintenance strategy	R
This option proposes the introduction of a new maintenance strategy, which will introduce day and night time infrastructure maintenance. To maximise the opportunities available it is proposed that day time maintenance work is utilised to ensure all areas are covered. This would allow flexibility within the maintenance teams and could integrate into the current day time arrangements.	
16.2 Perth new depot	E
Following consideration of this option with a number of stakeholders, it is apparent that in order to address the gap, taking into consideration the additional rolling stock which will be required for the timetable recast between Edinburgh/Fife/Aberdeen, a new depot facility possibly at Perth is a more efficient option.	A
Gap 16 Summary: A diesel stabling and servicing facility should be delivered to relocate stabling outside the station and to provide sufficient capacity for additional rolling stock required to support the timetable changes considered in options 12, 13 and 14.	

7.3 Route 25: Highlands

7.3.1 Inverness – Aberdeen

Gap 17: Inverness – Aberdeen service pattern does not meet market needs and capacity is insufficient to meet demand.

17.1 Extend platforms and trains to six-car operation	R
Train length on the route is constrained to five cars by the platform lengths at Inch and Elgin. This option considers extending these platforms to enable six-car peak services to operate. This would require platforms at Elgin being extended by 25 metres and at Inch by 17 metres. To operate the two morning-peak services into Aberdeen and the evening-peak return services would require the leasing of two additional vehicles.	
Consultation responses generally supported this option.	I
17.2 Change infrastructure to operate an accelerated hourly service	R
The current positioning of the loops with long single-line sections constrains the timetable. To deliver a more frequent service additional loops are required with line speed improvements. In particular an additional loop between Elgin and Keith, line speed improvements, and relocation of Forres loop and station would permit an hourly service to operate with an end-to-end journey time of approximately two and a quarter hours. Additional rolling stock (two trains) would also be required to deliver this regular hourly service.	
Following a review of passenger numbers, it is evident that the majority of passengers travel between Inverness – Elgin and Aberdeen – Inverurie. The first frequency enhancements should be focussed on these sections.	A
Gap 17 Summary: The development of the line between Inverness – Elgin and Aberdeen – Inverurie to deliver an enhanced service with the platform extensions at Inch and Elgin will provide sufficient capacity for future growth and will meet passenger expectations. With careful specification of the necessary infrastructure enhancements, the option would remain open to connect these more frequent services to create an hourly service throughout the route, but on the basis of quantified appraisal to date, a full multi-modal analysis should be carried out.	

7.4 Route 26: Strathclyde and South West Scotland

7.4.1 Glasgow Low Level lines

Gap 18: Hyndland Jn – Finnieston Jn route generates unacceptable performance and capacity is insufficient to meet demand.

18.1 Re-model Hyndland East Jn	N
This option proposes the re-modelling of Hyndland East Jn to extend the four track section further east. This would provide some limited additional capacity.	
Consultation responses generally opposed this option.	E
18.2 Re-model Hyndland East Jn and reconstruct Hyndland station	R
This option proposes the re-modelling of Hyndland East Jn, concurrently with the renewal of the junction which is planned for 2010, to extend the four track section from Hyndland East Jn to the east of Hyndland station using existing railway owned land. It would be necessary to rebuild Hyndland station as a four platform station, which would allow improved access to the adjacent Gartnavel Hospital. As trains calling at Hyndland station would be on the four track section, junction occupation would be reduced and capacity increased.	
Consultation responses generally supported this option.	E
Additional development is required on the optimum design for Hyndland. In conjunction with the renewal of the junction, it is proposed to re-model it. The final design needs agreement with funders and customers.	A
18.3 Lengthen more trains to six-cars	N
Platform capacity on the Glasgow North Electrics and Argyle lines permits the operation of six-car trains. At present only approximately 20 percent of peak hour trains operate as six cars, the remaining consisting of only three cars. It would be possible to reduce the number of trains operating and retain the existing capacity by operating a reduced number of trains with a higher proportion of six-cars. This would retain the current capacity level with a reduced number of services. The high number of origins, destinations and intermediate stations to be served means that this option would result in an infrequent service on some parts of the network even in the peak period.	
Consultation responses generally opposed this option.	E
18.4 Reduce number of stops	N
At present all services on this corridor call at Partick and Hyndland. This option proposes that trains call at Partick or Hyndland which would reduce the time that trains occupy the congested section by approximately one and a half minutes. Hyndland and Partick are, however, stations with a very high level of usage, both by passengers starting and ending their journeys and by passengers interchanging. As such, this option would reduce interchange and journey opportunities significantly.	
Consultation responses generally opposed this option.	E
Gap 18 Summary: Increased capacity would be generated by the re-modelling of the station and junction. The enhanced layout and station would also improve access to Gartnavel Hospital.	

7.4.2 Glasgow Central High Level and approaches

Gap 19: Bridge Street Jn – Muirhouse Jn route generates unacceptable performance and capacity is insufficient to meet demand.

19.1 Operate fewer, longer trains	R
Platform capacity on the Glasgow South Electrics lines permits the operation of six-car trains. At present only one morning peak-hour train operates as six cars, the remainder consisting of only three cars. It would be possible to reduce the number of trains operating and retain the existing capacity by operating a reduced number of trains with a higher proportion of six cars. This option proposes the operation of fewer services during the peak period on the Cathcart Circle with strengthened services operating from Neilston/Newton. This would provide a performance benefit in the short term and capacity which would be available for additional East Kilbride and/or Kilmarnock trains in the longer term.	
Re-allocation of trains over the critical Muirhouse Jn section would be required.	
Consultation responses on this option provided a mixed view but on balance we believe it is still a viable option. Further discussions on this option is needed with Transport Scotland as funder and specifier of the franchise.	A
19.2 Additional track between Eglinton Street Jn and Muirhouse Jn	N
This option proposes the construction of a third bi-directional line between Muirhouse Jn and Eglinton Street Jn with additional crossovers at Eglinton Street Jn to permit better use of the four lines north of there. Space is available within railway industry ownership for all except about 100 yards of the 1300 yard section for this line. This could be used on a tidal flow basis at peak times. Undertaking this on a stand alone basis would be expensive and disruptive but in conjunction with renewals in the longer term should be considered further.	
It is proposed that the land adjacent to the junction be reserved for potential development in the future, with the land not currently in railway ownership procured should it become available.	
Following consultation this option was supported as a long-term aspiration.	A
Gap 19 Summary: Amending the Cathcart Circle service could address the immediate gap, although land should be preserved for the option to commission an additional track at a later date.	

Gap 20: Glasgow Central High Level station capacity is insufficient to meet demand.

20.1 Electrification and diversion of Whifflet services	R
This option proposes the electrification and upgrade of the line between Rutherglen East Jn and Whifflet to permit the integration of the Glasgow – Whifflet service into the Argyle Line through Glasgow Central Low Level. This would free up two paths per hour in each direction on the approaches to Glasgow Central and the associated platform capacity. Journey times would be extended slightly but passengers would have a wider choice of city centre destinations. The existing diesel rolling stock would require to be replaced by electric rolling stock.	
Consultation responses generally supported this option.	I
20.2 Extend platforms by reducing the concourse	N
This option proposes the extension of platforms 2 – 6 (platforms 3 – 6 are currently very short) into the concourse with a consequential reduction in concourse size. This would permit the operation of longer trains or more trains in these platforms. The passenger capacity of the concourse would, however, be reduced, which is not sustainable given current peak flows.	
Consultation responses included an alternative option to extend platforms 7 and 8 to accommodate 6 x 23m vehicles. Further assessment would be required to assess the viability of this as a longer term option.	E

20.3 Widen Clyde bridge approaches	N
This option proposes the re-instatement of the second bridge over the River Clyde giving improved rail access to the east side of Central station. This would be difficult and expensive to deliver and would not relieve the major bottlenecks of platform capacity and the two track sections.	E
Gap 20 Summary: Electrification and diversion of the Whifflet services would deliver sufficient capacity to meet anticipated demand in the short to medium term. In the longer term further consideration is required to ensure sufficient capacity is available to accommodate ongoing growth.	

Gap 21: Law Jn – Carstairs engineering access is insufficient to meet needs.

21.1 Improved signalling to increase flexibility	R
Several options have been considered, including simplified or full bi-directional signalling. Unfortunately due to the volume of night time traffic, this would not provide any window for maintenance access. This issue will continue to be addressed in line with the Rules of the Route and technological developments. Pending the development of new forms of technology, the performance risk on this issue will continue to be managed under the current regime.	
Following a work stream as part of the “Efficient Engineering Access” development, sufficient access will be delivered following the implementation of the December 2009 timetable.	A
Gap 21 Summary: The outputs from the “Efficient Engineering Access” will deliver sufficient capacity for the works which are required at this location. This work stream will continue to be reviewed involving stakeholders, to ensure the optimum balance between the needs of passengers and freight customers and the need for maintenance access is achieved.	

Gap 22: Rutherglen Jn – Eglinton Street Jn engineering access is insufficient to meet needs.

22.1 Separate power supply feed to Polmadie depot	R
This option proposes the installation of an independent electrical feeder supply to Polmadie depot, to facilitate the operation of the depot during maintenance works on the adjoining main lines.	
Gap 22 Summary: This will be delivered in conjunction with the renewal of the nearby electrical feeder station.	

7.4.3 Glasgow/Paisley/Ayrshire

Gap 23: Glasgow/Paisley/Ayrshire route capacity is insufficient to meet demand.

23.1 Recast stopping pattern	R
Of the current eight off-peak passenger trains per hour on this corridor, six run non-stop between Paisley and Glasgow with the other two calling at the three intermediate stations. It is proposed to revise this to two services (probably to and from Ayr) running non-stop with the other six calling at one of the intermediate stations. This would balance out the differential in timings of passenger and freight services over the corridor, thereby creating a more resilient timetable as well as better spreading the passenger load between Glasgow and Paisley. However discussions on the detailed timetable need to take place with Transport Scotland as funder and specifier of the franchise.	
Consultation responses generally supported this option.	I
23.2 Extend platforms with longer trains	R
Platform capacity on the Ayrshire and Inverclyde lines permits the operation of six-car trains. During the high-peak period all of the Ayrshire services operate in six-car formation and there is no capacity for any further growth. This option proposes the extension of platforms to permit the operation of longer trains to relieve capacity. Platform extensions would be needed at up to 40 stations to permit the operation of these formations.	
Consultation responses generally supported this option.	I

23.3 Extend trains with selective door opening	N
Platform capacity on the Ayrshire and Inverclyde lines permits the operation of six-car trains. During the high-peak period all of the Ayrshire services operate in six-car formation and there is no capacity for any further growth. This option proposes the lengthening of services with the use of selective door opening. There would, however, be a potential journey time penalty as longer dwell times could be required.	
Consultation responses generally opposed this option although it may still be appropriate at a small number of lightly used stations as part of option 23.2.	E
23.4 Additional peak trains between Ayrshire and Glasgow	N
This option considers the possibility of running additional peak trains on the Glasgow/Paisley/Ayrshire corridor. Analysis of the Glasgow/Paisley corridor indicates that at peak times there is no scope for the operation of additional trains without the construction of additional infrastructure (see option 24.2). Further analysis of the proposed Glasgow Airport Rail Link (GARL) is required to ascertain what additional capacity is available beyond that required for the GARL services.	
Consultation responses produced a mixed view on this option but in general there was more support for the GARL option.	E
23.5 Additional peak trains between Paisley and Glasgow	N
This option proposes additional services on the Paisley corridor to aid capacity between Glasgow and Paisley. To deliver this, additional infrastructure consisting of a third bi-directional line between Shields and Paisley would be required. This would not provide relief to stations beyond Paisley and therefore would not address the whole gap. It would, however, provide additional capacity on the busiest part of the route with the option of improved connection into the bus service to Glasgow Airport.	
Consultation responses were generally not in favour of this option.	E
Gap 23 Summary: Additional capacity will be created by recasting the timetable between Glasgow and Paisley and extending the services and a number of platforms to accommodate longer trains. As part of the signalling works renewal work on this corridor, options to create additional capacity are being considered.	

Gap 24: Scottish Ministers' aspiration to improve access to Glasgow Airport.

24.1 Additional trains between Paisley and Glasgow	N
If the infrastructure identified in option 23.5 was built then the additional peak trains could operate all day, connecting with a high frequency road or transit link to Glasgow Airport.	
Consultation responses were generally not in favour of this option.	E
24.2 Construct Glasgow Airport rail link	R
The GARL project developed by SPT on behalf of Transport Scotland comprises the construction of a new double track link from Paisley to the Airport, capacity improvements on the existing Paisley to Glasgow corridor and the lengthening of a platform at Glasgow Central High Level station.	
Consultation responses generally supported this option.	I
Gap 24 Summary: The construction of Glasgow Airport Rail Link will deliver additional capacity between Glasgow and Paisley and the airport link which is a key aspiration of Scottish Ministers; the bill for this has now received Royal Assent.	

7.4.4 Glasgow and South Western line

Gap 25: Kilmarnock – Gretna/Stranraer service pattern does not meet market needs. (Incorporating Freight RUS gap I)

25.1 Recast timetable on Dumfries route	R
Passenger services on the southern section of the G&SW Route between Kilmarnock, Dumfries and Carlisle currently operate on an irregular service pattern. The provision of a clockface pattern for passenger services with standard origins and destinations would also allow the provision of clockface slots for freight services on the line, thereby creating potential additional paths. The proposed service would provide a similar quantum of service on each section of the route with origins and destinations being standardised. Further analysis of the timetable for both this option and for 25.2 indicated that resources are currently very efficiently used. Any change would require to maintain this efficiency.	
Consultation responses provided mixed view on this option with respondents keen to ensure that trains still operated at key times.	A
25.2 Recast timetable on Stranraer route	R
It is anticipated that shipping services from Stranraer to Ireland will be withdrawn in 2008. It is therefore proposed to review the service to better meet the needs of the local population. The existing volume of passenger services to and from Stranraer would still be retained with origins and destinations being standardised.	
Following a review of the timetable proposals and resources, it was considered appropriate that some services will continue to operate as through services between Glasgow and Stranraer. This will ensure passenger needs are addressed and rolling stock resources are efficiently utilised. It is also in line with a number of consultation responses received.	
Consultation responses generated some opposition to a Stranraer – Ayr – Kilmarnock shuttle but were generally in agreement with the need for a recast.	A
25.3 Additional infrastructure to reduce headway between Kilmarnock and Gretna	R
This option proposes the complete or partial re-instatement of double track on the single line section between Annan and Gretna Jn and the provision of additional intermediate block signals between Kilmarnock and Annan. This would provide an improved planning headway of 15 minutes. To deliver the potential growth in coal to English power stations, similar alterations would be needed south of Gretna, which are identified in the Freight RUS.	
Consultation responses supported this option.	I
25.4 Extend freight trains to over 40 wagons	N
The option proposes the operation of longer/heavier freight trains (up to 46 x 100 tonne wagons). This would result in less paths being required, which would have cost savings for freight operating companies, increased maintenance and train capacities. To permit the robust operation of these trains additional extended loops and terminal facilities would be required. No viable option for the general operation of such trains has been identified.	
Freight operators generally support this option, although a viable method of operation needs to be developed. It may be feasible to operate the trains under special arrangements.	E
25.5 Divert some freight trains via West Coast Main Line	N
This option proposes that the WCML acts as a diversionary route for some services currently timetabled for the Glasgow and South West line. The initial assessment indicated that there is insufficient capacity for the G&SW coal trains to be diverted via Paisley and the WCML.	
Freight operators generally support this option, although a viable option needs developed. Some services may be able to operate under special conditions.	E

25.6 Additional functionality at Kilmarnock	N
This option proposes creating a loop facility at Kilmarnock which would allow 23 wagons to be stabled clear of the main line but the maximum length that can be accommodated within railway owned land would only be 21. To create a longer loop additional land would need to be purchased and this option is now being progressed.	
Freight operators generally support this option which now appears to be viable, although to meet future aspirations a length suitable for 27 wagons is proposed.	A
25.7 Extend loop at Stevenston	R
This option proposes the extension of the existing loop to permit standage of longer trains awaiting acceptance to Hunterston. This would deliver a more reliable operation of trains to Hunterston and hence improve the reliability of both the Ayrshire and G&SW lines.	
Consultation responses generally supported this option.	I
25.8 Additional signalling to reduce headway between Ardrossan and Hunterston	N
This option proposes the installation of additional signals between Ardrossan – Hunterston to reduce headway on the bi-directional section of the route. Analysis suggests this would not address the actual constraints on the route.	E
25.9 Improved signalling to reduce headway between Mauchline Jn and Annbank	R
This option proposes the removal of the ground frame and token signalling systems on this route and replacing them with a modern signalling system. This would reduce journey time, increase capacity and improve performance particularly within the Mauchline area.	
Freight operators generally support this option.	I
Gap 25 Summary: Options 25.3, 25.7 and 25.9 together with the amended versions of options 25.1, 25.2 and 25.6 will address the market requirements on this corridor.	

Gap 26: Glasgow – Kilmarnock route has insufficient capacity to meet demand.

26.1 Extend platforms and trains and operate extra trains off-peak	R
Additional capacity can be provided by a programme of platform lengthening works to allow longer trains to operate and the construction of additional infrastructure to extend the existing loop at Lugton. The former (together with additional rolling stock) would deliver additional peak capacity while the latter would permit a more frequent off-peak and contra-peak service.	
Consultation responses generally supported this option.	I
Gap 26 Summary: This option will deliver sufficient capacity and an improved frequency of services between Glasgow and Kilmarnock.	

Gap 27: Ayr – Kilwinning – Hunterston engineering access is insufficient to meet needs.

27.1 Improved signalling to increase flexibility	R
No viable short-term options have been identified. Pending the development of new forms of technology, the performance risk on this issue will continue to be managed under the current regime. This option will continue to be addressed in line with the Rules of the Route and other technological developments. Further consideration should be given to bi-directional signalling at the time of the renewals currently scheduled for 2016/17.	
Gap 27 Summary: This option will be developed as part of the “Efficient Engineering Access” work stream.	

7.4.5 East Kilbride line

Gap 28: Glasgow – East Kilbride capacity is insufficient to meet demand.

28.1 Recast timetable supported by additional infrastructure	R
This option proposes a timetable recast to deliver a mixture of semi-fast and stopping trains on the route. This would require the provision of a new turnback siding at Busby (the extent of the double track section) and the re-instatement of a double junction at Busby Jn.	
Consultation responses generally supported this option, although further analysis suggested it would only be viable if progressed at the same time as renewals on the route.	I
28.2 Extend platforms and trains to eight-car operation	N
This option proposes extending the platforms on the line to accommodate eight-car services. At several of the stations it would be difficult to deliver this and due to the number of short platforms at Glasgow Central (see gap 20) it is unlikely that they could be accommodated there.	
Gap 28 Summary: Option 28.1 would provide the necessary additional capacity as a result of the enhanced service frequency.	

7.4.6 Shotts line

Gap 29: Edinburgh – Glasgow via Shotts route service pattern does not meet market needs and capacity is insufficient to meet demand.

29.1 Additional limited stop trains	N
This option proposes the introduction of an additional limited stop service to allow faster journey times into Edinburgh from key stations such as West Calder and Livingston South. This service would only operate once per hour which is not considered to be frequent enough to provide an attractive service.	E
29.2 Additional trains, skip-stopping pattern	
This option proposes a half-hourly skip-stopping service giving each station between one train every two hours and two trains per hour depending on the volume of business on offer. This would provide a half-hourly faster service from principal stations as well as a more competitive end-to-end journey time.	R
Consultation responses produced a mixed view on this item. On behalf of SPT, SEStran and Transport Scotland, Faber Maunsell has recently appraised a number of options between Glasgow and Edinburgh via Shotts. The option to operate two semi-fast services per hour via Shotts had the highest benefit cost ratio (BCR), but was not the option recommended by the sponsoring group, which preferred a service consisting of one limited stop and one all stations train per hour.	A
Gap 29 Summary: To meet passenger expectations and deliver attractive journey times between Glasgow and Edinburgh, a timetable recast for all routes via Falkirk, Airdrie, Shotts and Carstairs is proposed. It is anticipated that this recast will jointly deliver two limited stop services per hour between Glasgow Central and Edinburgh.	

8. Strategy

8.1 Introduction

Previous sections of this document describe the analysis and tests carried out to inform the development of a strategy. This section sets out the industry's preferred 10-year strategy. It identifies the interventions which are required in the short, medium and longer term and discusses the outputs which could be delivered on each of the key corridors.

8.2 Generic issues

There are a number of generic issues, which will impact on all the RUS recommendations below. The strategy will need to take due cognisance of the issues, but further work is required to ensure these are integrated into the strategy.

8.2.1 Engineering access

In March 2005, ORR initiated a possessions review to assess the impact of implementing concepts developed through the "Efficient Engineering Access" project. Following its initial consultation, ORR recognised that further work was still required to establish whether there is a case for a significant change to the current possessions regime. An industry working group, chaired by ATOC, was set up to develop the way forward.

The overall objective of the work is to identify a framework of modern engineering access regimes that optimise the whole rail industry business case. This should be achieved by establishing a common view of the best way forward based on evidence that is both shared and understood, followed by implementation based on an agreed framework.

In assessing alternative possession strategies, there is a trade-off between moving towards a seven day railway with minimal disruption

to train operators, and the maximum level of efficiency that Network Rail can achieve in carrying out its maintenance and renewal operations. Central to this trade-off is gaining a better understanding of the demand for a seven day railway as this will determine how and when engineering access is taken.

The initial trial on the Western Route indicated that cost savings are likely to come from Network Rail productivity gains. Therefore in addition to assessing the impact of alternative access strategies, attention should be given to making better use of possessions and the existing capability of the network. From July 2007 to October 2007 Network Rail is benchmarking its use of possessions with international railways to identify opportunities for improving the planning and management of engineering access.

Network Rail is also developing a suite of key performance indicators (KPIs) to be agreed with ORR in 2007 to monitor possession planning and management, which will be used as the basis for providing regular reports to the industry. This work is currently under review by the industry.

8.2.2 Rolling stock

Transport Scotland is currently considering the future provision of rolling stock on behalf of Scottish Ministers. This work will address the short-term rolling stock resources required to accommodate some of the timetable recasts detailed in Section 8.4. It will also consider Scotland's longer-term rolling stock requirements, including the possible impact of further electrification.

8.2.3 Depots and stabling

A number of the RUS recommendations will generate a change in rolling stock quantity

and/or type in order to deliver the required outputs. Network Rail, Transport Scotland and the train operating companies are progressing a joint review in 2007. This will identify future rolling stock requirements against the current utilisation of all depots and stabling points in Scotland operated by First ScotRail, GNER and Virgin. In addition, the strategic locations required in the future to ensure the availability of engineering access and TOC/FOC productivity is maximised will also be reviewed, to feed into the Network RUS work stream on depots and rolling stock.

8.2.4 Power supply

Traction power supply is discussed in Section 3.7.

This analysis has concluded that there are currently no known capacity constraints associated with power supply. The major projects supported by Scottish Ministers will deliver sufficient power supply to extend the network. Where appropriate the system feeding arrangements will be designed to be consistent with the principles of major feeding (so that main routes have independent feeds).

Independent feeds to light maintenance depots and stabling points will also be developed at the time of asset renewal where practical.

A power supply strategy group has been set up to develop the strategy and provide a Network Rail focus in strategic discussions with the suppliers. Power supply strategy will continue to be developed to ensure that sufficient power is available to deliver the required capacity detailed in this strategy.

8.2.5 Lightly-used stations

Within the Scotland RUS Draft for Consultation, 23 stations were listed as having fewer than 1,000 passengers per

year. A review of the station renewal plan has highlighted no significant investment or renewal is required at any of these stations within the next few years. Network Rail will continue to liaise with the promoters and developers of housing and other substantial developments to ensure that all considerations are addressed in relation to these lightly used stations.

8.2.6 Car parks

Many of the car parks within the Central Belt are now fully utilised throughout the day, which constrains their ability to contribute to future growth of the rail network. Initial analysis suggests that nearly 80 percent of the car parks within central Scotland are fully utilised. To ensure car park use is optimised and the proposed strategy supports rail capacity developments, the following issues must be addressed.

Managing existing car parks

There are 130 station car parks within the Central Belt, under railway, local authority and private ownership. To ensure the current utilisation is biased towards rail passengers, it is proposed that there will be dedicated peak and off-peak parking facilities at some stations on the key corridors. This will be implemented and monitored via a car park charging regime which will consider the end-to-end journey costs and will investigate inclusion in season tickets. This pricing regime will include penalty charges for individuals who abuse the system. Revenue from this initiative will be reinvested to extend car parks and improve safety, accessibility and maintenance.

In line with the creation of increased capacity, marketing techniques will be used to support increases in train service frequency and reductions in journey time. Passengers will

also be encouraged to use sustainable forms of transport to access the station.

Expansion of car parks

The expansion of car parks will be undertaken:

- where possible
- when supported by rail capacity developments
- when supported by a positive business case
- when supported by local authorities and Regional Transport Partnerships.

Supporting strategies

“Scotland’s Railways” recommends “a rolling programme of car park expansions and including station design to include feeder bus services and opportunities to walk/cycle to stations”¹. This RUS details capacity constraints on key corridors and recommends a number of options which will support passenger growth, of which car parking forms a key part. Regional transport partnerships and train operating companies play an important role in the development of stations and car parks.

The various stakeholders have formed an Implementation Group, which will meet at a working level to ensure a joined-up approach is adopted to the management of current car parks and that extensions are proposed at the most appropriate locations to support passenger and rail growth proposals.

8.2.7 Light rail

As part of the Edinburgh City Council plan, light rail is featured as a key intervention to alleviate transport problems in central Edinburgh. Within “Scotland’s Railways” Scottish Ministers also support considering the conversion of some Glasgow suburban lines to light rail where there is a strong case following feasibility work. Conversion to light rail potentially provides more flexibility for local services, better penetration of the city centre and more effective use of capacity on heavy rail routes.

8.3 Developing the strategy

As set out in the Licence Condition, the route utilisation objective is defined as:

“the effective and efficient use and development of the capacity available, consistent with funding that is, or is reasonably likely to become, available during the period of the Route Utilisation Strategy and with the license holder’s performance of the duty”.

This section is therefore laid out to differentiate between:

- measures which contribute to the objective and which are financially neutral or beneficial (8.3.1)
- measures which contribute to the objective; which have a net financial cost but are value for money when their wider economic effects are considered; and are necessary to meet forecast demand growth (8.3.2)
- measures which contribute to the objective; which have a net financial cost but are value for money when their wider economic effects are considered; and are the specific requirements of railway funders (8.3.3).

Section 8.4 details all the recommendations in a single strategy for implementation during Control Period 3 (2007 – 2009), Control Period 4 (2009 – 2014) and beyond.

8.3.1 Better use of current industry resources

This section summarises RUS recommendations to meet the route utilisation objective which have a neutral or positive financial effect. Each recommendation has been assessed using STAG principles.

Analysis of the operation of the railway in Scotland has revealed a timetable which is generally very efficient and makes good use of the rolling stock. As such there is very little that can be done to deliver enhanced services within the current railway industry resources.

Performance gaps were identified in a range of locations. A few of the options to fill these gaps can be implemented at little or no cost and these are described below:

Overall train performance in Scotland since the introduction of the December 2004 timetable has greatly improved and the industry is continuing to develop options to deliver a higher level of PPM.

- To meet customer expectations and improve performance, timetable recasts on the following corridors should be progressed: Cross Edinburgh services, Paisley Corridor, Kilmarnock – Dumfries – Carlisle and the Stranraer line.
- A revision of the peak timetable and train formations for trains operating on the congested Muirhouse to Glasgow Central corridor could assist with reducing capacity utilisation at key junctions.
- In line with track renewals, it is proposed to increase line speeds, particularly on the Hilton – Ladybank corridor, which will reduce journey time on a key inter-urban route.

8.3.2 Investment to address forecast growth

This section summarises the RUS recommendations to meet the route utilisation objective which are not self-financing but are considered to be consistent with funding that is likely to become available over the period of the RUS. Each recommendation has been assessed using STAG principles.

- As detailed in Section 8.2.2, Transport Scotland are currently developing proposals for future rolling stock, which will include the short and longer term aspirations for electric and diesel stock in Scotland. This will address formations to reduce overcrowding and acceleration targets to reduce journey time.
- Lengthening trains is recommended on the Ayrshire, Glasgow – Edinburgh and

Dunblane services. This measure should be implemented as soon as infrastructure works, funding agreements and rolling stock procurement allow.

- In Section 7, a number of timetable recasts were selected for inclusion in the strategy. To fulfill this requirement, in some cases (eg. Edinburgh/Fife/Aberdeen) additional rolling stock would be required as discussed in Section 8.2.2.
- A number of freight improvements within the Glasgow and South West area which are detailed in section 7.4.4, will relieve main line capacity and accommodate future freight growth which is detailed within the Freight Route Utilisation Strategy to be published in March 2007.
- Following analysis within the Consultation Document, car parks were highlighted as a key issue in the facilitation of future growth. Section 8.2.6 details the various work streams which are ongoing to address this issue.
- A number of the items in the strategy will be delivered as enhancements to planned infrastructure renewals. Minor modification to signalling or track layouts can achieve substantial industry benefits, with minimal additional investment.
- Long-term strategies to provide additional capacity are essential at Glasgow Central High Level, Glasgow Queen Street, Edinburgh Haymarket and Edinburgh Waverley. Although some works are currently being progressed at these locations, additional expansion and modification will be required in the future to support the network.

8.3.3 Investment to deliver funders’ aspirations

This section summarises the RUS recommendations to meet the route utilisation objectives which are not self-financing but are the result of specific requests from railway funders.

¹ Extract from “Scotland’s Railways”, Scottish Executive 2006

'Scotland's Railways', which is part of the National Transport Strategy, was published by the Scottish Executive in December 2006 and sets out Scottish Ministers' vision for rail in Scotland over the next 20 years. This document focuses on the following strategic outcomes:

- improving journey times and connections
- improving quality, accessibility and affordability
- reducing emissions.

Scottish Ministers are committed to meeting a number of transport objectives. These were set out in the 2004 Transport White Paper, and include: promoting economic growth, social inclusion, health, and protection of the environment through a safe, integrated, effective and efficient transport system. They have specified a number of new rail schemes to help deliver these. The most significant of these are Glasgow Airport Rail Link, Edinburgh Airport Rail Link, Airdrie – Bathgate reopening and Scottish Borders Railway.

8.4 Conclusions

The strategy consists of a range of measures that have been identified to make effective and efficient use of railway capacity, as well as developing capacity in accordance with the output requirements of those who fund the railway. These measures have been selected on the basis of their value for money across the 10-year period of the strategy. The availability of funding is not certain, but options have not been ruled out solely for this reason. It will therefore be necessary for the industry to continue working closely with Transport Scotland, as the funder and specifier of the railway in Scotland, to take this strategy forward. The strategy is presented here by strategic route and by control period.

8.4.1 Short term

(Control Period 3: 2007 – 2009)

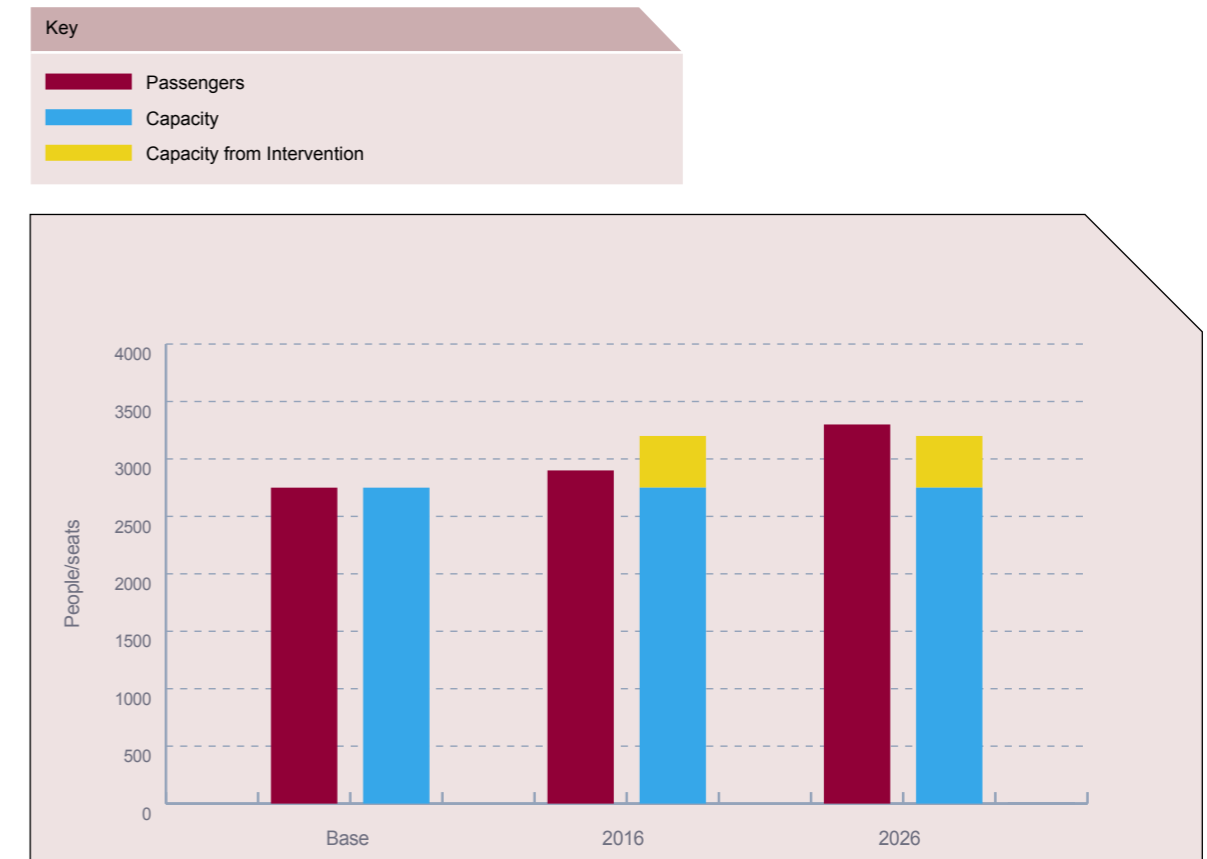
The principal challenge identified during this period is providing sufficient capacity quickly, to accommodate forecast passenger growth during peak periods.

Route 24: East of Scotland

- The Stirling – Glasgow corridor is the most overcrowded service group in the RUS area. The first step to relieve current crowding is for some six-car trains to call at Bishopbriggs, which will require extensions to the platforms there. In order to optimise the provision of capacity on

this corridor and provide some crowding relief to Edinburgh – Glasgow services, more of the Stirling trains should be formed of six cars and the peak-period stopping pattern reviewed. For most effective use to be made of the facility Glasgow Queen Street High Level should be capable of accommodating six-car trains in any platform. Options should be progressed to address current and long-term restrictions in the station. In the short term at least one additional six-car platform is required. Increasing capacity between Queen Street and Cowairs should also be considered. Figure 16 shows the potential effect if all peak trains were lengthened to six cars, against forecast growth in passenger demand (note that these figures are totals over three hours: the trains in the high peak will have disproportionately higher loads).

Figure 16: Stirling – Glasgow am peak 3 hour loads/capacity following the intervention

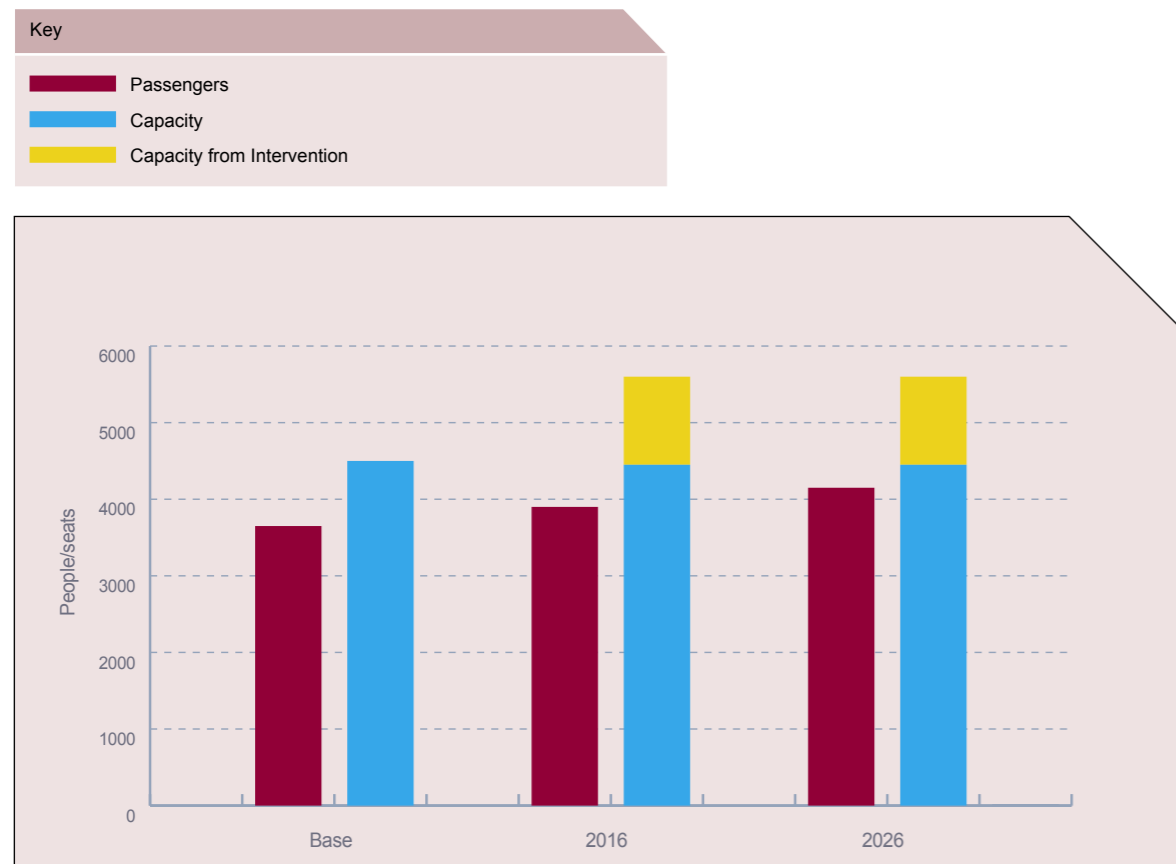


Source: Network Rail

- With the opening of the Stirling/Alloa/Kincardine line later in 2007, a number of freight services will be diverted via Stirling. To improve capacity and maintain performance in the Stirling area three aspect signalling will be implemented between Larbert and Stirling; and Stirling Middle Jn will be re-modelled to provide maximum flexibility in conjunction with a planned S&C renewal. The new layout will also provide direct access for passenger services to all south facing platforms except platform 10.
- In order to meet passenger demand and deliver competitive journey times, a timetable recast on the Edinburgh – Fife – Aberdeen corridor is recommended. This would provide a faster, hourly service

Edinburgh – Aberdeen, an hourly semi-fast service Edinburgh – Dundee and an hourly semi-fast service Edinburgh – Perth. In addition, the timetable recast would enable a faster service Glasgow – Aberdeen and the retention of the existing half-hourly services Edinburgh – Cowdenbeath and Edinburgh – Kirkcaldy. Overall it would deliver a more consistent stopping pattern for passenger services. Further timetable alterations and additional infrastructure would then be required in the medium term (Section 8.4.2). Figure 17 shows how this intervention would relate to the forecast growth in passenger demand within Fife (note that these figures are totals over three hours: the trains in the high peak will have disproportionately higher loads).

Figure 17: Fife am peak 3 hour loads/capacity following the intervention



Source: Network Rail

- To cater for the additional rolling stock which will be required to deliver this strategy, a new fuelling and cleaning depot is recommended, potentially at Perth. This would provide sufficient capacity for the proposed additional rolling stock on this corridor and remove the need for a stabling facility in Perth station, in turn freeing lines around the station for night-time maintenance. This element is still in the initial development phase and requires further consultation and analysis to confirm a positive business case.
- There are a number of proposals being developed by Edinburgh City Council that would incorporate rail and tram facilities into an interchange facility at Haymarket. In the short term, the proposal is for a new DDA compliant footbridge to be installed at the station, west of the current bridge. This would have lift access from Haymarket

platforms to ground level and would relieve passenger congestion on the concourse. It would address the gaps identified in the baseline and would be compatible with further works at the station. The additional platform constructed for use during the current works at Waverley station will be retained to provide additional capacity on the network.

- Following consultation an alternative option to the timetable recast originally proposed for the Edinburgh Crossrail service has been examined. Consultation responses highlighted the need for a direct service to Edinburgh Haymarket and Edinburgh Park from Newcraighall. Analysis indicates that Haymarket is a significant destination for passengers on these services and the proposal is therefore to divert the services on the Newcraighall line to operate to/from Fife. This would maintain the service to

Haymarket and provide a service to South Gyle on the other side of the business park from Edinburgh Park station. We believe this will improve the performance of the Edinburgh Crossrail service by reducing conflicting movements with other trains and providing more robust dwell times at Edinburgh Waverley.

- In the short term car park extensions within Central Scotland should be progressed, where capacity is insufficient (either now or within the next few years) and the development has a positive business case. Any development of car park capacity should be in accordance with the principles outlined in Section 8.2.6 above.

Route 25: Highlands

No specific short-term measures have been identified for this route but timetable options for the North and West Highlands are being developed.

Route 26: Glasgow and South West Scotland

- To provide additional capacity on the congested section between Glasgow and Kilmarnock it is intended to extend Lugton Loop to the south and extend the platforms at stations between Barrhead and Kilmarnock which will permit the operation of a half-hourly even interval service, with six-car trains at the peak.

- It is proposed to amend the Stranraer service to serve the local population better, if the anticipated closure of Stranraer as a ferry port in 2008 and the consequential reduction in passengers to/from the ferry is realised. This would provide a service between Stranraer, Ayr and Kilmarnock with some services extended to Glasgow as part of the enhanced Glasgow – Kilmarnock service. This links with a potential timetable recast between Kilmarnock and Carlisle, standardising origins and destinations and designed to meet passenger demand within the current resource base.

- Changes to the service between Glasgow and Paisley are being developed to deliver a more even stopping pattern that will improve performance and reduce crowding.

- The section between Annan and Gretna will be re-doubled with additional intermediate block signals between Gretna and Mauchline to increase capacity. This will meet potential freight growth and support the use of the route for diversionary purposes. Further provision for increased freight capacity would be provided by the creation of a loop facility at Kilmarnock and an extension to Stevenston loop, to facilitate the operation of trains conveying up to 27 modern bogie hoppers which would assist with access to Hunterston Import Terminal.

- An independent electrical feeder supply to Polmadie depot will be provided to facilitate infrastructure maintenance works without disrupting depot operations.

8.4.2 Medium term (Control Period 4: 2009 – 2014)

As set out in Scotland's Railways, Scottish Ministers see a requirement to increase the frequency of passenger services and reduce journey times from Glasgow and Edinburgh to Inverness and Aberdeen.

Route 24: East of Scotland

- The short-term strategy for Edinburgh Haymarket was explained above. This would deal with the immediate problems identified at the station, but further consideration of the strategic position of the station is required. To deal with increased patronage and congestion in the station, this proposal which incorporates the aspiration of external stakeholders for a tram interchange facility at Haymarket station, includes the extension of the station concourse over the adjacent car park, with further developments to the layout and circulation space available. It would resolve the anticipated congestion and circulation issues at the station for the next 20 years.

- Growth in passenger demand is expected to lead to more train services seeking to use the congested line into Glasgow Queen Street High Level from Cowairs. Short-term improvements at Queen Street are identified above, but in the medium term further steps will be required. Options should be explored to substitute additional trains on busy routes for lightly used services that could be diverted away from Queen Street to other destinations. Table 9 in Section 4 highlights passenger count data (averaged throughout the day) for a variety of services which currently operate from Queen Street High Level. With the development of light rail technology this might include the possible long-term conversion of some services to light rail. These alternatives require additional development including further consultation with key stakeholders to establish the best solution to deliver additional capacity where it is needed most.
- Following the short-term timetable recast on the Edinburgh/Fife service, additional benefits can be gained from the implementation of additional signalling to reduce headways between Haymarket and Inverkeithing.
- When the area around the Tay Bridge is re-signalled, the renewal will seek to modify the current operating restrictions that prevent any two trains from passing on the high girders.
- Further north, the provision of a southbound loop at Laurencekirk would enable the operation of additional freight services between Aberdeen and Dundee.
- The junction at Portobello has a restrictive layout combined with a very slow diverging line speed. The short-term proposal to recast the timetable, with Newcraighall services running to Fife, will provide some relief but a more strategic solution is required. It is proposed to re-double the junction and adjacent single line section to improve the robustness of the timetable

and facilitate the operation of the Scottish Borders Railway towards Tweedbank.

- In order to encourage access to stations by sustainable means, the car parking Implementation Group (Section 8.2.6) will consider car park provision/expansion and management (including charges) alongside potential improvements to other access modes. The measures it takes should seek to encourage mode shift to more sustainable modes in an efficient manner, both from road to rail and from car to bus/cycle/walking.
- In line with Scottish Ministers' aspirations, railways between Airdrie and Bathgate, to Edinburgh Airport and the Scottish Borders Railway will be progressed.

Route 25: Highlands

- To meet the requirement of a faster and more frequent service between Inverness and Perth additional infrastructure is recommended, as per the Room for Growth Study detailed in Section 5. Combined with rolling stock with enhanced performance this could deliver a reduced journey time and higher frequency service between Edinburgh and Inverness, with an aspirational end-to-end journey time of around three hours allowing for seven stops.
- Passenger numbers on the Aberdeen to Inverness route are outgrowing the capacity of the route. Platform extensions are recommended at Inch and Elgin to provide increased capacity by permitting the operation of six-car services at peak times. Beyond that "Scotland's Railways" includes a medium-term aspiration to improve the inter-urban service to hourly and the suburban service particularly between Aberdeen and Inverurie. Delivery of an enhanced service either throughout or at the ends of the route would require the construction of additional loops which should be progressed.

Route 26: Glasgow and South West Scotland

- Growth in passenger demand is expected to lead to more train services seeking to use the congested lines into Glasgow Central High Level. Some substitution or redistribution of destinations will be necessary to deliver additional capacity where it is needed most; Table 12 in Section 4 highlights passenger count data (averaged throughout the day) for a variety of services which currently operate from Central High Level. In particular, electrification of the Whifflet line and diversion of these services via Central Low Level would release platform space at Central High Level as well as better integrating the service on that line, but reallocation of trains over the critical Muirhouse Jn section would also be required.
- A review of all services between Glasgow and Edinburgh (via Falkirk, Shotts, Carstairs and Airdrie/Bathgate) will improve journey times, frequency and capacity between the two major Central Belt cities. Operating two additional limited stop services an hour via Carstairs or Shotts would better meet the needs of passengers travelling to or from the south side of Glasgow than the current service.
- To the west, the construction of the Glasgow Airport Rail Link (GARL) will provide additional capacity between Glasgow Central and Paisley Gilmour Street, relieving crowding on Ayrshire services which could also be lengthened in the peak periods. The GARL project will also provide additional platform capacity at Glasgow Central.
- To facilitate the extension of trains beyond the current six coach maximum, platform extensions on the Ayrshire and Inverclyde corridors would be required.
- The replacement of the signalling between Mauchline and Ayr (Falkland) would further

increase capacity for freight services in the south west.

- On the western approach to Glasgow, taking advantage of the opportunity provided by the junction renewal, Hyndland East Junction will be remodelled to provide an improved layout. This will help to improve performance and deliver the additional capacity required on the busiest section of the route.
- On the Law Junction to Carstairs section the traffic pattern limits access for engineering work. The Efficient Engineering Access workstream for the West Coast Main Line has identified an option to deliver sufficient access from 2009, which remains in development with stakeholders at the time of publication.

8.4.3 Long term (Control Period 5: 2014 – 2019)

Route 24: East of Scotland

Reduced journey times and increased capacity are aspirations which will need to be addressed in the longer term. Within Route 24 additional capacity is restricted by the terminal stations at Glasgow Queen St and Edinburgh Waverley. Although the short-term option detailed at Glasgow Queen St and the current works which are being progressed at Edinburgh Waverley will provide some additional capacity, analysis has highlighted that by 2016 a number of peak suburban services will be operating with passengers numbers significantly exceeding seated capacity.

In order to relieve crowding on these services, additional capacity will be required in the major conurbations. The rail industry will work with funders on the preferred solution to address these constraints and to consider the options for a significantly reduced journey time between Glasgow and Edinburgh as required by "Scotland's Railways".

- At Glasgow Queen St, long-term options will be considered to accommodate the forecast increase in use. These could

include a major redevelopment of the site to provide additional rail capacity and enhanced passenger accommodation.

- The eastern end of the route into Edinburgh could be developed in a number of radically different ways: more work is required to ensure the most appropriate solution is taken forward to meet demand and expectations beyond the next 10 years.

Route 25: Highlands

On the Highland Main Line it is anticipated that a positive business case can be developed for infrastructure works and rolling stock improvements to allow the further acceleration of the service.

As technology develops, signalling alternatives will be progressed to replace Radio Electronic Token Block (RETB) to improve capacity and reduce journey time.

Route 26: Glasgow and South West Scotland

Developments to provide further additional capacity in Glasgow Central High Level will also need to be considered. As a major terminal station, Glasgow Central needs strategic consideration to ensure sufficient capacity is available in the long-term.

Dependent on the rate of passenger growth, the implementation of a semi fast and stopping service on the East Kilbride line may be required to provide sufficient capacity.

Given the projected growth in freight and passenger traffic, provision of further additional capacity between Glasgow and Ayrshire needs to be considered and developed.

The double-track section between Eglinton Street Jn and Muirhouse Jn is likely to be a significant constraint on system capacity by the end of the RUS period. Land at this location should be reserved so that a third (bi-directional) line with associated crossovers could be constructed if required.

8.5 Alternative growth scenarios

The demand forecasts used in this RUS represent a consensus among the rail industry stakeholders. However, there are a number of uncertainties that require the consideration of alternative growth rates. In developing the strategy, it was agreed that growth is unlikely to be lower than the forecast, but a number of factors (eg. road congestion or pricing) could drive passenger demand to be higher than the forecast. Within the Scottish Planning Assessment (SPA), sensitivity tests were undertaken which concluded that passenger growth might be at most one or two percentage points higher on some corridors. The exceptions to this are the Ayrshire, East Renfrewshire and Fife routes where local forecasts suggest that unconstrained rail patronage could increase considerably over the next 10 to 20 years. The interventions recommended on Ayrshire and Fife routes will deliver some spare capacity across the peak period based on current growth predictions. In Ayrshire the recommendations included in this RUS would provide sufficient capacity even if the higher growth materialised but in Fife further additional capacity would be required should the greater passenger growth occur.

8.6 Contingent projects

The following section looks at contingent projects, which may impact on works being brought forward or additional works being required in addition to those detailed in this strategy.

8.6.1 Commonwealth Games 2014

Glasgow is a candidate city for the 2014 Commonwealth Games. The current proposals highlight the following locations as key venues for the event (and closest station):

- Hampden Park (Mount Florida/Kings Park)
- Kelvingrove Bowling Green (Kelvinbridge Underground)
- Scottish Exhibition Conference Centre (SECC) (Exhibition Centre)
- Tollcross Park Leisure Centre
- National Indoor Sports Centre – Dalmarnock
- National Velodrome – Dalmarnock.

All proposed venue locations (except Tollcross) are currently served by rail. As the bid develops the rail industry will continue discussions with the bid organisers as appropriate and will consider how rail can best contribute to the transport requirements. The successful bid will be announced in November 2007. If the Glasgow bid is successful, additional strategic direction will be required in 2009 – 2014 to ensure that sufficient capacity is delivered.

8.6.2 Intercity express programme (IEP)

This programme will review the current rolling stock utilised on a number of key long distance routes. This is being developed by the Department for Transport and will affect the rolling stock provided for Anglo-Scottish services particularly on the ECML. Changes could be implemented from 2014.



9. Next steps

9.1 Introduction

The licence conditions state

“the route utilisation strategy shall be established within the meaning of paragraph 3A.1, in the terms of the route utilisation strategy provided to the Office of Rail Regulation and published under paragraph 3A.3(c), 60 days after the date on which it was so provided and published, unless the Office of Rail Regulation shall have given a notice of objection in relation to it before the end of that 60 day period”

Extract from Network Rail Licence Condition 7

The Strategy contained in this document will form a key input to decisions made by industry funders and suppliers on, for example, franchise specifications and investment plans as highlighted in Figure 18. The following process forms an integral part in driving the RUS forward. On behalf of the rail industry, Network Rail has reviewed the current operating network and appraised a number of options which will accommodate future rail growth. Network Rail is currently funded to operate, maintain and renew the rail network.

9.2 High Level Output Specification (HLOS)

In 2007, Transport Scotland will be preparing its HLOS, which is a statement of the outputs which Scottish Minister's wish to purchase from the rail industry during the next regulatory control period for track access charges. This HLOS, and an accompanying Statement of Funds Available (SoFA), will be used by ORR to set the funding requirements of Network Rail over that period, taking into account other obligations and funders' reasonable requirements. The recommendations of this RUS, where they fall within the 2009 to 2014 period, are part of the rail industry's recommendations to be incorporated within the HLOS.

9.4 Network Rail Strategic Business Plan

The document supports ORR's Periodic Review of Network Rail's access charges for Control Period 3 (2004 – 2009) and Control Period 4 (2009 – 2014).

9.5 Network Rail Route Plans

The Route Plans for Network Rail's Strategic Routes 24 (East of Scotland), Route 25 (Highlands) and Route 26 (Strathclyde and South West Scotland) cover the geographical scope of this RUS. The Route Plans were published alongside the Network Rail Business Plan in March 2006, and are regularly updated. They list all significant planned investment on the route, including scheduled renewals as well as committed and aspirational enhancements. Those published last March cite some improvements that were then being considered by the RUS; the next edition, due for publication in March 2007, will incorporate the RUS conclusions.

9.3 Access charge review

ORR's review of Network Rail's funding requirements and access charges for the period 2009 – 2014 will conclude in 2008. Network Rail will request funding levels which are required to operate and renew the current railway infrastructure.

Key milestones in the process:

- June 2006: Network Rail cost submission for Control Period 4
- February 2007: ORR issues formal Access Charges Review notice to government funders
- July 2007: Scottish Ministers submits HLOS and SoFA to ORR
- October 2008: ORR announce agreed funding for Control Period 4

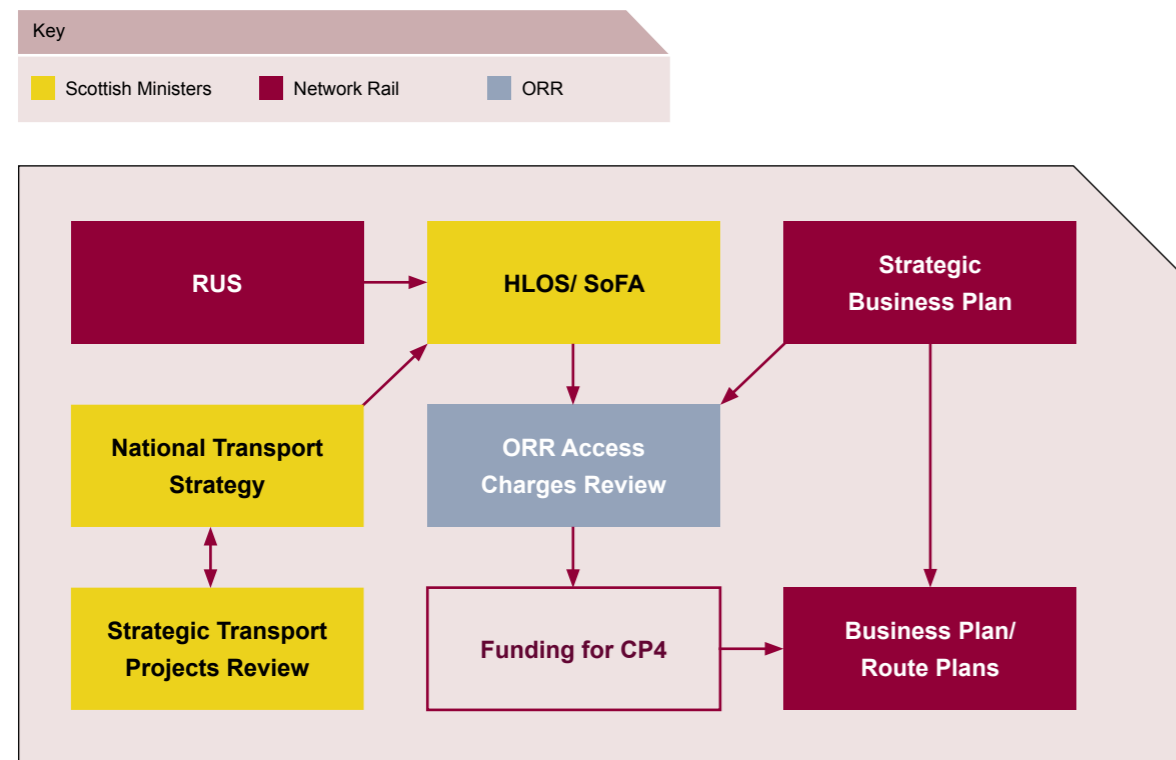
9.6 Ongoing access to the network

This RUS will also help to inform the allocation of capacity on the network through application of the normal Network Code processes.

9.7 Review

Network Rail is obliged to maintain a RUS once it is established. This requires a review using the same principles and methods used to develop the RUS when circumstances have changed, when directed by ORR, or when (for whatever reason) the conclusions may no longer be valid.

Figure 18: Rail industry funding process



Source: Network Rail

10. Appendices

Appendix A: Baseline report. Available at www.networkrail.co.uk

Appendix B: Working Paper: Baseline Demand. Available at www.networkrail.co.uk

Appendix C: Planned major renewals. Available at www.networkrail.co.uk

Appendix D: Base year and predicted (2016) rail demand. Available at www.networkrail.co.uk

Appendix E: Evaluation of options

Appendix F: Glossary of terms

Appendix E: Evaluation of Options

Each of the options described in Section 7 has been evaluated using STAG principles as far as practical. STAG requires the consideration of transport solutions from all modes to resolve identified problems but the RUS process is not remitted to consider non-rail options.

Results for each option are presented in the following tables. Except where stated, each option has been assessed independently of the others. In Section 7 of the main document the options are developed and combined in

order to show how the preferred strategy has been prepared.

Some options have been subject to a quantified or part-quantified appraisal. In those cases further information including costs, benefits and the resulting benefit-cost ratio (BCR) are shown. Costs and other benefits are shown as present values at 2002 prices. The usual appraisal period is 60 years, although demand growth is assumed to be flat after 20 years.

Assessment of Option 1.1

Glasgow Queen Street High Level station: Extend all platforms to six-car length

Concept

Only Edinburgh – Glasgow services currently operate in six-car formation. All other peak services currently operate with up to five-car 170/158 formations. This option aims to remove the current restrictions on the number of six-car formations that can operate in and out of the station, providing additional capacity between Glasgow and Stirling/Alloa/Dunblane.

Currently, four of the seven platforms can accommodate six-car trains. Extending all platforms to six-car length is a medium to long-term solution involving significant changes to the station. In the short term one of the three short platforms could be extended.

Conclusion

The extension of one platform would create some additional capacity for longer trains in Queen Street – how this might be used is examined in option 2.1. This idea should be developed in conjunction with the long-term solution, which is examined in option 1.2.

Assessment of Option 1.2

Glasgow Queen Street High Level station: Increase passenger circulation space

Concept

Whether or not the train capacity of the station is increased, forecast demand will require more space for passenger circulation. Expansion of the existing concourse is necessary and should be designed in a manner that also permits option 1.1 to be implemented. As major changes of this type can be made only infrequently, the design for the concourse should seek to accommodate passenger demand for the next 30 years. For evaluation, it has been assumed that a long-term solution to option 1.1 is included in the scheme definition, so that all platforms are extended to six-car length and a larger concourse is provided.

Operational analysis

Whether or not the train capacity of the station is increased, forecast demand will require more space for passenger circulation. Once the constraint of circulation space is addressed, passenger throughput could be increased by lengthening platforms (option 1.1) and trains. It is therefore appropriate to consider the two interventions together.

Infrastructure required

As this would be a major scheme and subject to protracted development and design work, the scope has been assumed only in terms of the outputs described in the option concept above. Cost has been estimated on an approximately proportionate basis from the current Edinburgh Waverley improvement scheme.

Environment

Provision of additional rail capacity at peak times will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to travellers who would switch from road to rail as a result of the increased rail capacity.

Economy

This option is at a conceptual stage so a quantified appraisal has not been undertaken. The investment cost has been estimated at around £30 million before optimism bias is added; in a full appraisal this would be added to the costs of the provision and operation of longer trains, less the revenue increase from the additional people being carried but including any other impacts on government (eg. loss of road fuel tax). This would be set against the decrowding benefits to existing rail users, journey time benefits to users who switch from road to rail, and decongestion benefits to other road users.

Integration

Improvements to the throughput and facilities at Queen Street will enhance its status as a transport hub in central Glasgow, increasing the use of the rail and bus networks serving it.

Accessibility and social inclusion

Increased capacity on peak rail services will create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

The evaluation shows that a wide range of benefits would arise from improvements to the platform capability combined with extension of the passenger space at Queen Street. This option is not a short-term scheme and requires further development with stakeholders and customers to identify the optimum outputs and design.

Assessment of Option 2.1

Central Scotland: Extend all platforms to six-car length

Concept

There are a number of platforms of inadequate length within Central Scotland. Extension of the platforms at Bishopbriggs, with the short-term improvement to the functionality of Glasgow Queen Street identified in option 1.1, would permit six-car trains to run between Glasgow and Dunblane/Alloa at peak times.

Operational analysis

On the Glasgow/Edinburgh/Dunblane triangle, it is anticipated that the stopping pattern of peak services could be recast to balance passenger numbers better between trains. The option would also allow Bishopbriggs to be served when an all-stations Edinburgh – Glasgow service operates as part of the contingency plan arrangements on this corridor.

Analysis shows that crowding on this route will worsen slightly without any intervention from that predicted in the base year model. This option would provide additional seated capacity for about 600 people during the peaks.

The additional capacity on the Stirling/Dunblane – Glasgow services would reduce the average am peak load factor on the service group. Analysis suggests the load factor would reduce from around 104% to 86% over the three-hour am peak.

An initial timetable was tested using MOIRA which showed a slight net disbenefit to passengers (excluding the impact of crowding). It is anticipated that the impact on passengers would be neutral once the timetable has been optimised.

Infrastructure required:

At Bishopbriggs both platforms would require extension to serve six-car trains. The work identified includes the platform structures (the extensions total 42 metres), a steel bridge extension and relocation of a signal-post telephone. At Glasgow Queen Street High Level it is assumed that one platform would be extended to accommodate six cars.

Environment

Provision of additional rail capacity at peak times will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to travellers who would switch from road to rail as a result of the increased rail capacity.

Economy

Only decrowding benefits have been included; additional benefits would accrue from road decongestion.

Options 1.1 and 2.1	Value (£m)
Cost (PV)	
Investment cost	5.4
Operating cost	20.9
Revenue	Not assessed
Total cost	26.3
Quantified Benefits (PV)	
Rail user benefits	34.9
Non user benefits	Not assessed
Total quantified benefits	34.9
Quantified BCR	1.3

Integration
The option will increase the use of the existing central Glasgow transport networks through the Queen Street hub.
Accessibility and social inclusion
Increased capacity on peak rail services will create more opportunities for households without cars to access employment opportunities in the city centre.
Conclusion
This option would relieve overcrowding on the Glasgow/Edinburgh/Dunblane triangle. Even without revenue and non-user benefits the quantified BCR is 1.3. The option's development will depend on availability of appropriate rolling stock and agreeing the scope of the changes with funders and stakeholders.

Assessment of option 3.1
Central Scotland: Undertake programme of car park extensions
Concept
Many of the station car parks in the Central Belt are fully occupied throughout the day. Over 80 percent of these are in railway ownership. This option proposes that car parks which are fully utilised in the peaks are extended to create additional capacity and encourage greater use of rail, particularly in the off-peak when there is spare capacity on the trains. Extension could be by decking where land is scarce. This option examines car park extensions holding other factors constant; option 3.2 considers the other solutions.
Operational analysis
A number of car parks, particularly on the Fife Circle, Edinburgh – Glasgow via Falkirk, Edinburgh – Glasgow via Shotts, Ayrshire and Inverclyde routes are regularly full enough (over 80 percent) to constrain growth from these areas. It is not well understood how much demand for the car parks is suppressed at these locations, but it is likely that extensions would have to be very large in order to retain some capacity in the off-peak without introducing or increasing charges for the peak. Any extensions should in practice be co-ordinated with capacity on the associated train service.
Infrastructure required
There are a number of car parks which are proposed for development by First ScotRail, local transport partnerships or local authorities. Within the Central Belt area, it is estimated that there are currently opportunities to develop 17 car parks. In practice these should be co-ordinated with capacity on the associated train service. All developments are subject to a positive business case.
Environment
There will be benefits in pollution and noise reduction from journeys transferring from road to rail; however these could well be outweighed by the disbenefits of increased road trips to station car parks as existing train users switch to car to get to/from the station. Depending on the locations of the car parks developed, drivers might start to 'railhead' ie. drive closer to their destination before joining a train.
Safety
Safety benefits and disbenefits will come from the shift of traffic between road and rail, so will follow a similar pattern to the environmental analysis above.
Economy
Crowding/decrowding and road (de)congestion effects will be similar to the environmental analysis. Unless there is a change in car park charging policy (see option 3.2) then increased use can be expected in the peak, so worsening on-train crowding and driving additional investment there. The extra revenue from car parks, at current rates (many do not charge) and rail fares is unlikely to cover the cost of the extensions if these are large enough to provide off-peak capacity.

Integration
Car park extensions alone only go a short way to improve integration, but they create opportunities to improve other facilities such as station approach routes for road traffic, cyclists and pedestrians; bus stops, cycle storage etc.
Accessibility and social inclusion
Larger car parks increase access to the network and bring inclusion benefits but for maximum effect should include measures to improve all modes not just car parking.
Conclusion
Additional analysis and development is required with external stakeholders to ensure the most appropriate locations are developed. Stations where car park extensions are progressed must be capable of accommodating additional demand on the train services. Feasible extensions are unlikely to be large enough to allow free/affordable parking and still have space in the off-peak, so consideration should be given to charging policy (option 3.2).

Assessment of option 3.2 Central Scotland: Review car park charging policy
Concept
A number of car parks in the Central Belt are fully utilised throughout the day. To encourage access to stations by public transport and more efficient allocation of scarce parking capacity, charging will be considered.
Operational analysis
Of 134 car parks in central Scotland, 115 are free. Most car parks fill up during the peak period so station parking is not available to off-peak users. If car parks were expanded it is likely that many would still fill up during the peak period, attracting some people from road to rail but also encouraging some (who access stations by public transport now) to switch to car. Peak charging at an appropriate level could be used to ensure car parking capacity is released for off-peak travellers.
Infrastructure required
This option would not require significant infrastructure works, although the mechanism to police any charges introduced could be infrastructure-based (eg. car park barriers).
Environment
Charging would encourage a modal shift of peak passengers to public transport for their trip to the station and could generate off-peak use of rail. However some passengers would shift to road for their entire journey or railhead to alternative stations. The exact pricing policy will determine which of these effects will be most significant.
Safety
The impact on safety depends on the shifts between travel modes which, in turn, depends on pricing.
Economy
Carefully calibrated charges will encourage people to use more sustainable modes to access the railway, while potentially providing a revenue stream to support improvements to all modes of access.
Integration
Carefully calibrated charges will encourage people to use public transport to access the railway, while potentially providing a revenue stream to support improvements to all modes of access.

Accessibility and social inclusion
This option would create negative impact because it penalises car-owning rail users who want to access city centres in the morning peak, especially those who are least willing (or able) to pay to park during the peak if charging were introduced.
Conclusion
The option is intended to encourage a modal shift towards sustainable transport to/from stations. Charging might in some cases result in a small modal shift away from rail, but there is evidence that car parks which currently charge are still fully utilised. Consideration should therefore be given to the locations of car parks that charge, the levels of charges and the time profile of charging. To maximise benefits and minimise disbenefits, this option should be implemented only in conjunction with improvements to car parks (option 3.1) and to other modes of access to the railway. Marketing strategies should be considered to spread demand for car parking between corridors.

Assessment of option 4.1 Construct Airdrie – Bathgate rail link
Concept
This project is being funded by Scottish Ministers and developed by Network Rail.
Conclusion
Scottish Ministers are committed to delivering this project, following an appraisal carried out by the promoter.

Assessment of option 4.2 Construct Edinburgh Airport rail link
Concept
This project is being funded by Scottish Ministers and developed by tie (transport initiatives edinburgh).
Conclusion
Scottish Ministers are committed to delivering this project, following an appraisal carried out by the promoter.

Assessment of option 5.1 Haymarket station: Increase passenger circulation space
Concept
This option proposes providing a larger concourse area, with a longer barrier line and a widened footbridge with lifts and escalators. It is proposed that this option would follow current works at Edinburgh Waverley.
Operational analysis
Haymarket serves an increasingly busy part of the city, and is becoming very heavily used at peak times. Congestion within the station is a serious problem from all platforms. About 4.5 million passengers per year use the station. This option addresses the current overcrowding problems and would not preclude any development for future expansion of the station and surrounding area.
Infrastructure required
New pedestrian footbridge to the west of the current overbridge, lifts to provide access to/from platforms, and additional concourse area to assist passenger flows.
Environment
Provision of additional capacity at key stations will encourage road users to switch to rail. This will reduce pollution and noise.

Safety
Creates step-free access throughout the station and increased circulation space. The improved facilities would encourage a modal shift to rail.
Economy
The investment cost has been estimated at around £5 million before optimism bias is added; initial modelling shows that a one to one benefit cost ratio is achieved when am peak passengers' average pedestrian journey is reduced by 45 seconds. This assumes conservative increases in passenger numbers over time.
Integration
The improved facilities would encourage a modal shift to rail.
Accessibility and social inclusion
The improved facilities would improve access for all users, particularly those with disabilities.
Conclusion
The short-term intervention to implement a DDA-compliant bridge should be progressed but would not preclude any of the proposals to develop the station and the surrounding area during the construction of the tram interchange.

Assessment of option 5.2 Haymarket station: Construct additional platform
Concept
As part of the Edinburgh Waverley re-modelling project, an additional temporary turnback platform has been created at Haymarket station to assist service operation whilst part of Waverley is not available. This option proposes the retention of this additional platform on a permanent basis.
Operational analysis
This platform will be utilised as part of the Waverley works. It is proposed that following the completion of the Waverley works, the platform would remain in operation and available for use to ease congestion when services are disrupted.
Infrastructure required
No new additional infrastructure would be required, as the platform has already been commissioned as part of the Waverley capacity works.
Environment
The platform would improve reliability, which would encourage modal shift, reducing noise and pollution from road use.
Safety
The platform would improve reliability, which would encourage modal shift, reducing road accident risk.
Economy
The costs of ongoing maintenance and renewal of the facility are weighed against the saving from not having to decommission and dismantle it.
Integration
No effect.
Accessibility and social inclusion
The facility will improve service reliability to all categories of user.
Conclusion
This platform has already been commissioned as part of the Waverley works. It is proposed that this platform be maintained for long-term use.

Assessment of option 6.1 Edinburgh Waverley: Extend all platforms to six car length

Concept

This option proposes lengthening the remaining west-facing bay platforms at Waverley so that each one can accommodate at least six cars.

Operational analysis

If all west-facing platforms could accommodate six-car trains then reliability would improve because of greater operational flexibility. However, benefits would be limited by the capacity constraints between Haymarket and Waverley, and the crossing moves necessary to access the platforms. In addition, capacity could be provided on services from the west and north. An increase from five to six-car formations would provide an additional 74 seats per service.

Infrastructure required

In order to allow a minimum of six-car formations in all west-facing platforms, platforms 12, 13 and 18 would have to be extended. This would necessitate removal of the carriageway ramp and associated vehicle access within the station, construction of a vehicle drop-off point at street level and relocation of the First ScotRail ticket office.

Environment

Platform lengthening would only provide benefits if undertaken with the provision of additional rail capacity, particularly at peak times, to encourage road users to switch to rail. This option would then reduce pollution and noise.

Safety

If platform lengthening is accompanied by longer trains then safety benefits would accrue to travellers who would switch from road to rail as a result of the increased rail capacity.

Economy

The investment cost has been estimated at around £40 million before optimism bias is added. This could not be justified by the value of the limited performance improvement the scheme might bring. Train lengthening could bring capacity benefits but then additional operating costs would also have to be considered.

Integration

Improvements to the capacity of Waverley would enhance its status as a transport hub in central Edinburgh, increasing the use of the rail and bus (and eventually tram) networks serving it.

Accessibility and social inclusion

Increased capacity on peak rail services would create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

The analysis suggests that the performance benefits arising from operational flexibility would not be sufficient to justify the investment cost of this option. Potential capacity benefits would only be realised if trains are lengthened at the same time as the platforms. This could be considered within the framework of increasing rail capacity into Edinburgh from the west and north, if demand rises faster than the growth rate forecast during the RUS period; eg. accordance with the alternative growth scenario discussed in section 8.5.

Assessment of option 6.2 Edinburgh Waverley: Increase passenger circulation space.

Concept

This option proposes redesigning the vehicle access into the station, to remove conflicts between passengers and vehicles and to create additional passenger circulation space.

Operational analysis

Enhancements to passenger access and circulation space within the station would reduce pedestrian transit times, but the marginal improvement after current station improvements are completed will be small unless demand grows faster than forecast.

Infrastructure required

The minimum scope would include creation of a new vehicular access point at street level and conversion of platform-level road space for passenger circulation. Scope variants could remove the existing ramp access.

Environment

Pollution from road vehicles inside the station would be reduced.

Safety

Removes potential vehicle/passenger collision.

Economy

The investment cost has been estimated at around £20 million before optimism bias is added. Passengers' pedestrian delays through the station would need to be unfeasibly large to establish a positive case against this cost, particularly given that the current works at Waverley have been designed to provide sufficient capacity to meet forecast passenger numbers in the medium term.

Integration

Improvements to the capacity of Waverley would enhance its status as a transport hub in central Edinburgh, increasing the use of the rail and bus (and eventually tram) networks serving it.

Accessibility and social inclusion

Increased capacity on the rail system would create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

Benefits to passengers from a reduction in crowding in the station are very unlikely to be sufficient to justify the investment cost of this option, particularly as the works currently underway at Waverley will provide sufficient capacity to meet medium-term needs. Potential capacity benefits would only be realised if improvements are made to the train service at the same time as the station. Changes to the station at Waverley could be considered within the framework of increasing rail capacity into Edinburgh from the west and north, if demand rises faster than the growth rate forecast during the RUS period; eg. accordance with the alternative growth scenario discussed in section 8.5.

Assessment of option 8.1 Portobello Jn - Niddrie South Jn: Timetable recast

Concept

Edinburgh CrossRail services to and from Bathgate and Dunblane transmit delays occurring in one area to other parts of the network. This option proposes splitting this service at Edinburgh to operate independently, with interchange required at Edinburgh Waverley for through passengers. This would improve performance and reliability of services on this corridor and would limit the reactionary delays on other parts of the network.

Operational analysis

The option as originally defined would reduce cross-Edinburgh delays but would require through passengers to change at Edinburgh Waverley. 40 percent of passengers on these services travel through Edinburgh Waverley with 30 percent terminating their journey at Edinburgh Haymarket and just under 10 percent terminating at Edinburgh Park. Consultation responses supported the analysis that an undue number of people were disadvantaged by the original proposal. The option has therefore been amended to propose services to operate between Newcraighall and Fife, via South Gyle, which would retain many of the performance benefits of separating out the service from those to Stirling/Dunblane. The revised option would provide a direct service from the east of Edinburgh to Haymarket and South Gyle, which caters for the majority of CrossRail passengers, and would create new through journey opportunities between the east of Edinburgh and Fife. West of Edinburgh the existing services to Bathgate and Dunblane would continue, retaining the opportunity for through passengers to stations on these routes to travel albeit involving a change of train. Analysis suggests this is a low volume of passengers (less than 100 passengers per day). Overall the performance improvements and new journey opportunities would outweigh the disbenefits from the few journeys that would now require interchange.

Infrastructure required

None.

Environment

The operational analysis concludes that the option will make rail more attractive, so it will encourage a shift from less environmentally friendly modes.

Safety

The operational analysis concludes that the option will make rail more attractive, so it will encourage a shift from less safe modes.

Economy

A marginal increase in operating costs is unlikely to be matched by increased revenue but should be exceeded by frequency and journey time benefits.

Integration

The revised option provides through journey opportunities for the majority of passengers and a new cross-Edinburgh link to/from Fife.

Accessibility and social inclusion

The revised option provides through journey opportunities for the majority of passengers and a new cross-Edinburgh link to/from Fife.

Conclusion

The revised option appears to retain performance benefits whilst actually improving through journey opportunities: it will be developed further and the economic case quantified.

Assessment of (new) option 8.2 Portobello Jn – Niddrie South Jn Reinstate double track

Concept

This option proposes re-doubling the junction and single-line section, with the provision of a second platform at Brunstane station. This would improve performance and reliability of services on this corridor and would limit the reactionary delays on other parts of the network even if through services across Edinburgh were maintained. It would increase capacity and performance, although slow speed approaches to the junction would still be in place.

Operational analysis

This option would provide flexibility to enable services to clear the East Coast Main Line and therefore improve performance on the eastern approach to the station. It is estimated that approximately 25 percent of the 13,000 minutes delay identified in the baseline would be saved if this option was implemented.

Infrastructure required

A second running line between Portobello Jn and Niddrie South Jn, an additional platform at Brunstane, associated S&C/signal work and electrification.

Environment

Improved performance leading to reduced train emissions and modal shift causing reduction in road noise and pollution

Safety

Improved reliability would encourage modal shift, reducing road accident risk.

Economy

Following a review of the original option the costs and benefits have been re-appraised. The infrastructure work has been estimated to cost £6.5 million excluding optimism bias.

There would be a positive effect on revenue, and performance benefits to a wide variety of ECML users.

Integration

No effect.

Accessibility and social inclusion

The additional infrastructure would improve service reliability to all categories of user.

Conclusion

Further development of this option is required to enable quantified appraisal to be done.

Assessment of option 9.1 Construct Scottish Borders Railway to Tweedbank

Concept

This option is being supported by Scottish Ministers and developed by Scottish Borders Council.

Conclusion

Scottish Ministers are committed to delivering this project, following an appraisal carried out by the promoter.

Assessment of option 10.1 Larbert – Stirling: Additional signalling to reduce headways

Concept

This option proposes to close-up the signal spacing and thus improve the operating headways on this corridor, increasing capacity and providing a better degree of performance resilience when delays occur. It would enhance the robustness of both the current timetable and the timetable that is under development for Hunterston – Longannet services on completion of the Stirling/Alloa/Kincardine project. It would also provide the opportunity to operate additional peak services over the corridor in response to projected growth in demand.

Operational analysis

Following the opening of Stirling/Alloa/Kincardine and the diversion of Hunterston – Longannet services over this route, this proposal would enable full use to be made of the new route by increasing capacity on a key approach to it. When the additional capacity is not taken up, it would generate an improvement in performance.

Infrastructure required

The signalling would be upgraded in association with the planned renewals, including an upgrade of the interlocking, and signalling.

Environment

Improved reliability encouraging modal shift for passenger and freight traffic, causing reduction in road noise and pollution.

Safety

Improved reliability encouraging modal shift for passenger and freight traffic, reducing road accident risk.

Economy

The quantified appraisal takes account only of performance benefits. The BCR would improve further if benefits from additional capacity were included.

Option 10.1	Value (£m)
Cost (PV)	
Investment cost	2.3
Operating cost	0
Revenue	-2.6
Other Government impacts	0.5
Total cost	0.2
Quantified Benefits (PV)	
Rail user benefits	3.5
Non user benefits	2.2
Total quantified benefits	5.7
Quantified BCR	28.5

This proposal is being developed through the Network Rail Discretionary Fund (NRDF) and is planned to be delivered as part of a renewals scheme during 2007.

Integration

No effect.

Accessibility and social inclusion

The additional infrastructure would improve service reliability to all categories of user.

Conclusion

This option is currently planned for implementation in 2007, funded via the NRDF.

Assessment of option 10.2 Infrastructure changes at Stirling station

Concept

This option proposes to re-model the track layout at the south end of Stirling station to provide parallel working for services to and from the Alloa branch and an additional freight loop facility. The option would enhance the robustness of the current timetable as well as the timetable that is currently under development for Hunterston to Longannet services on completion of the Stirling/Alloa/Kincardine project.

Operational analysis

Performance benefits have been identified from the increased operating flexibility that the changes would provide.

Infrastructure required

Additional signalling, track and switches would be provided in association with the planned S&C renewal.

Environment

Improved reliability encouraging modal shift for passenger and freight traffic, causing reduction in road noise and pollution.

Safety

Improved reliability encouraging modal shift for passenger and freight traffic, reducing road accident risk.

Economy

The quantified appraisal takes account only of performance benefits. The BCR would improve further if benefits of additional capacity were included.

Option 10.2	Value (£m)
Cost (PV)	
Investment cost	3.3
Operating cost	Not assessed
Revenue	-1.6
Other Government impacts	0.4
Total cost	2.1
Quantified Benefits (PV)	
Rail user benefits	4.1
Non user benefits	Not assessed
Total quantified benefits	4.1
Quantified BCR	1.95

This proposal is being developed through the Network Rail Discretionary Fund (NRDF) and is planned to be delivered as part of a renewals scheme during 2008.

Integration

No effect.

Accessibility and social inclusion

The additional infrastructure would improve service reliability to all categories of user.

Conclusion

This proposal would deliver significant benefits for freight flexibility and improved reliability of the passenger timetable.

Assessment of option 11.1 Recast timetable to divert trains via Alloa

Concept

A timetable recast is being undertaken to divert current services from Polmont onto the new Stirling/Alloa/Kinross corridor. The diversion should reduce the maintenance requirement on the constrained Polmont – Winchburgh section, and the revised requirement would be assessed against existing and potential engineering access opportunities.

Operational analysis

The diversion of freight trains away from the affected section of route (Polmont – Winchburgh Jn) will reduce the requirement for maintenance access.

Infrastructure required

New railway Stirling – Alloa – Kinross (currently under construction).

Environment

No effect.

Safety

No effect.

Economy

Reduces likelihood that lack of maintenance access would lead to service disruption, either through emergency possessions or speed restrictions.

Integration

No effect.

Accessibility and social inclusion

No effect.

Conclusion

The timetable recast and opening of the Stirling/Alloa/Kinross line will create additional freight capacity and ensure services are diverted from Polmont.

Six of the next seven options are inter-related: the definition of a solution for any one will affect one or more of the others. They have therefore been grouped together for evaluation.

Assessment of option 12.1 Dundee - Aberdeen: Recast timetable

Concept

The timetable pattern examined in this option accelerates the Edinburgh – Aberdeen service by introducing a new Edinburgh – Dundee semi-fast service along with additional Edinburgh – Perth services and alterations to local services in Fife to improve reliability and journey time.

Operational analysis

This option proposes service patterns as follows:

- hourly fast Edinburgh – Aberdeen scheduled to make six stops;
- hourly semi-fast Edinburgh – Dundee scheduled to make eight stops;
- hourly semi-fast Edinburgh – Perth scheduled to make five stops;
- hourly fast Glasgow – Aberdeen scheduled to make seven stops;
- half-hourly Edinburgh – Cowdenbeath calling at all stations;
- half-hourly Edinburgh – Kirkcaldy calling at all stations; and
- retention of existing Anglo-Scottish services.

The timetable has been developed to retain the existing freight services, except those to/from Longannet which would be diverted to operate via Stirling.

Infrastructure required

None required for the introduction of this option, but several proposals are being developed which would improve performance and could be introduced coincidentally or subsequently.

Conclusion

The timetable pattern was not assessed independently of the associated options; the combined evaluation is tabulated below.

Assessment of option 12.2 Improved functionality at Montrose

Concept

There is no southbound loop facility between Aberdeen and Dundee, which limits freight capacity on this corridor. This option proposed a bi-directional loop facility on the northbound side to improve reliability and provide the opportunity for additional freight services, balancing the northbound loop facility already planned for installation in 2007.

Operational analysis

This would provide a passing facility for services in the southbound direction to complement the facility currently being provided for northbound trains. As well as improving performance, this could provide capacity for at least one additional freight path per hour.

Infrastructure required

S&C and signalling equipment for the conversion of the siding.

Conclusion

This option as originally specified would deliver the capacity required and it is included in the quantified appraisal tabulated below. However, following a review with Network Rail engineers it became apparent that conversion of the Up siding at Laurencekirk could deliver the same capacity with greater flexibility at a lower cost.

Assessment of option 13.2 Edinburgh - Fife - Dundee: Recast timetable to separate services	
Concept	
	This option proposes splitting the Fife Circle to operate as two independent services. The current number of services calling at each station would be maintained under the proposed timetable. The option would improve performance and reliability between Edinburgh and Fife. It would also help to address gap 14.
Operational analysis	
	The service tested would split the circular Fife services into two out-and-back services: one to Glenrothes via Dunfermline; the other to Kirkcaldy via Burntisland. It would improve performance at the cost of services between Kirkcaldy and Glenrothes.
Infrastructure required	
	None.
Conclusion	
	Analysis and consultation responses indicate that the connectivity disbenefits from complete separation (ie. no services between Glenrothes and Kirkcaldy) would be significant, despite all the heaviest flows continuing to be served. If extra rolling stock were used then these journey opportunities could be maintained, but the operating and leasing costs would worsen the quantified BCR. However, if some of the circular services were retained, then there would still be some performance benefits from the partial separation, through journey opportunities would be retained but at a reduced frequency, and no extra rolling stock would be required. This modified proposal is recommended to be taken forward alongside the other associated options.

Assessment of option 13.3 Edinburgh - Fife - Dundee: Additional signalling to reduce headways	
Concept	
	This option proposes improving the operational headways between Haymarket and Inverkeithing to offer increased capacity for additional trains, particularly during peak periods. At other times it would reduce reactionary delays.
Operational analysis	
	This option will reduce the headway over this corridor from five minutes to three minutes.
Infrastructure required	
	Additional and altered signals are required which would be delivered in a phased project.
Conclusion	
	The headway improvement was not assessed independently of the associated options; the combined evaluation is tabulated below.

Assessment of option 13.4 Tay Bridge: Review operating restrictions	
Concept	
	The current signalling restrictions prohibit more than one train at a time over the 'high girders' section of the bridge. This option proposes a review of these restrictions, to improve passenger capacity over the bridge. A timetable recast would be required to make best use of the proposed alteration to capacity.
Operational analysis	
	The restriction exists to prevent two heavy trains meeting on the high girders. Two lightweight trains are permitted but the interlocking at present does not permit this. As many of the trains on this route are lightweight Sprinter-type vehicles, a less restrictive interlocking would give performance and possibly capacity benefits.
Infrastructure required	
	Alterations to the signalling interlocking that are best delivered within a renewal.
Conclusion	
	The headway improvement was not assessed as it would not deliver any significant benefits if delivered in isolation. It is proposed that when the bridge is resignalled the renewal will seek to modify the operating restrictions.

Assessment of option 13.5 Increase line speed between Hilton Jn and Ladybank	
Concept	
	This option proposes to increase the line speed above the current 55 mph, to various speeds in the range 65 mph - 90 mph. The improvement could be delivered in line with a number of phased planned renewals which are currently scheduled to be complete by 2009.
Operational analysis	
	This speed increase would reduce journey time by about four minutes for services from Edinburgh to Perth and Inverness.
Infrastructure required	
	Some minor signalling alterations are required, as well as the completion of the planned track renewals. These would potentially be funded from the NRDF.
Conclusion	
	The speed increase was not assessed independently of the associated options; the combined evaluation is tabulated below.

Assessment of option 14.2 Fife to Edinburgh: Recast timetable to include additional shoulder-peak trains	
Concept	
	Although it is not possible to operate additional services in the high-peak period without significant investment, an additional service within the wider am peak period would help to meet growing passenger demand between Fife and Edinburgh.

Operational analysis
One additional service arriving in Edinburgh at shortly after 07:00 would improve peak capacity and journey opportunities from Fife. Including this service in a wider timetable recast would deliver better utilisation of rolling stock and train crew.
Infrastructure required
None.
Conclusion
The additional services were not assessed independently of the associated options; the combined evaluation is tabulated below.

Assessment of option 12.1, 12.2, 13.2, 13.3, 13.5 and 14.2 Edinburgh – Fife – Aberdeen enhancements and timetable recast.

Environment	
Overall, the changes increase frequencies and reduce journey times, so encouraging greater use of rail rather than alternative modes. The increased energy use from the additional train miles is expected to be outweighed by the reduction in noise and pollution from car use.	
Safety	
The overall shift from road to rail use would generate safety benefits.	
Economy	
The marginally positive BCR takes account of some performance effects as well as journey time/frequency benefits but excludes expected significant decrowding and decongestion benefits.	
Options 12.1, 12.2, 13.3, 13.5 and 14.2	Value (£m)
Cost (PV)	
Investment cost	10.8
Operating cost	72.8
Revenue	-15.7
Other Government impacts	1.5
Total cost	69.4
Quantified Benefits (PV)	
Rail user benefits	68.8
Non user benefits	4.4
Total quantified benefits	72.3
Quantified BCR	1.04
Integration	
Frequency improvements will improve journey opportunities at any interchange station.	
Accessibility and social inclusion	
Frequency, journey time and reliability improvements will all generate accessibility and inclusion benefits.	
Conclusion	
The quantified benefits taken alone produce a low BCR, but this excludes expected significant decrowding and decongestion benefits, and unquantified benefits which are positive in every category. With refinements to elements of the combined scheme (such as the loop at Laurencekirk rather than Montrose; and the partial rather than full severance of the Fife Circle), the changes can be recommended in support of Scottish Ministers' declared objectives.	

Assessment of option 15.1 Review use of lightly-used stations

Concept
Within the Scotland RUS Draft for Consultation, 23 stations were listed as having fewer than 1,000 passengers per year. The option examined the economics of these stations, considering any requirement to invest in renewing the assets and also any local opportunities to develop traffic.
Conclusion
The review of the station renewal plan has revealed no significant investment or renewal is required at any of these stations within the next few years. Ongoing liaison is necessary between the rail industry, local authorities and developers to encourage land-use patterns that maximise the use of sustainable forms of transport.

Assessment of option 16.1 Perth station day time maintenance strategy

This option examines the introduction of a new maintenance strategy, which would introduce day time as well as night time infrastructure maintenance. This would allow flexibility within the maintenance teams and could integrate into the current daytime arrangements.	
Operational analysis	
Infrastructure maintenance in the Perth station area is often difficult to undertake because at night when it would normally be carried out there is usually a quantity of rolling stock stabled in the station. Taking possessions in a structured way during the day time, so that the station could continue to operate but with occasional restrictions to the layout, would enable the maintenance to take place.	
Infrastructure required	
None.	
Environment	
No effect.	
Safety	
An increased proportion of maintenance taking place during daylight hours should reduce the risk of accidents.	
Maintenance of the station can take place in a train free area.	
Economy	
Maintenance would be undertaken more effectively than under the current sporadic arrangements. However there would be negative effects on train performance from the day time possessions of parts of the station area.	
Integration	
No effect.	
Accessibility and social inclusion	
No effect.	
Conclusion	
Following consideration of this option with a number of stakeholders, an alternative solution was put forward. If the train fleet is expanded to cater for the demand predicted in the RUS, then the current stabling arrangements in the station area will be inadequate. A new depot facility is a more efficient option, and Perth would be a suitable location. This variant option is subjected to an outline evaluation in the table below.	

Assessment of (new) option 16.2 Perth new depot
Concept
This option examines the replacement of stabling in the station area with provision of a new depot at Perth to cater for an expanded train fleet.
Operational analysis
Infrastructure maintenance in the Perth station area is often difficult to undertake because, at night when it would normally be carried out, there is usually a quantity of rolling stock stabled in the station. Removing stabled trains from Perth station would provide flexibility for maintenance of the station, and for services such as freight that seek to pass through the station area at night. A new depot would facilitate timetable improvements on routes through Perth, and provide sufficient stabling for the proposed additional rolling stock required to deliver the timetable option discussed in gaps 12, 13 and 14.
Infrastructure required
Track and depot infrastructure would be required to accommodate approximately 60 diesel vehicles.
Environment
Fewer train movements in platform areas would reduce noise and pollution in the station.
Safety
Benefits would accrue to infrastructure maintenance staff from access to a train-free station at night, and to train maintenance staff and train crew from having a purpose-built stabling facility.
Economy
Both infrastructure maintenance and train servicing would be carried out more efficiently.
Cost is currently being analysed but based on previous new depot facilities it is estimated that it will cost between £6 million and £8 million at current prices excluding optimism bias.
Integration
No effect.
Accessibility and social inclusion
No effect.
Conclusion
This option is being developed by rail industry parties to quantify the business case. On the basis of this initial evaluation it appears preferable to the previous option.

Assessment of option 17.1 Inverness – Aberdeen: Extend platforms and trains to six-car operation
Concept
Train length on the route is constrained to five cars by the platform lengths at Inch and Elgin. This option considers extending these platforms to enable six-car peak services to operate. This would require platforms at Elgin being extended by 25 metres and at Inch by 17 metres. To operate the two morning peak services into Aberdeen and the evening peak return services would require the leasing of two additional vehicles.
Operational analysis
Although this option delivers benefits itself, full utilisation of this additional capacity requires the completion of option 17.2.
This option will deliver capacity to meet growth prediction in the future in line with Scottish Ministers, aspirations as detailed in "Scotland's Railways".

Infrastructure required
Platform extensions at Inch and Elgin and associated signal alterations.
Environment
Provision of additional rail capacity will encourage road users to switch to rail. This will reduce pollution and noise.
Safety
Safety benefits accrue to travellers who would switch from road to rail as a result of the increased rail capacity.
Economy
This option is at a conceptual stage so a quantified appraisal has not been undertaken. The investment cost has been estimated at around £2 million in current prices before optimism bias is added; in a full appraisal this would be added to the costs of the provision and operation of longer trains, less the revenue increase from the additional people being carried but including any other impacts on government (eg loss of road fuel tax). This would be set against the decrowding benefits to existing rail users, journey time benefits to users who switch from road to rail, and decongestion benefits to other road users.
Integration
No effect.
Accessibility and social inclusion
Increased rail capacity offers the opportunity for more passengers to travel by train from a rural area.
Conclusion
Further development work is required on this option to quantify the business case.

Assessment of option 17.2 Inverness – Aberdeen: Change infrastructure to operate an accelerated hourly service
Concept
The current positioning of the loops with long single-line sections constrains the timetable. This option examines a more frequent service, enabled by additional loops and line speed improvements.
Operational analysis
An additional loop between Elgin and Keith, increased line speed, and relocation of Forres loop and station would permit an hourly service to operate with an end-to-end journey time of approximately two and a quarter hours. Additional rolling stock (two units) would be required to deliver a regular hourly service. The technical specification of the scheme was developed to Level 4 by Network Rail in 2003 as part of the Incremental Output Statement Programme ¹ .
The option tested provides an additional seven services a day between Aberdeen and Inverness ² to a regular clockface pattern. Aberdeen – Dyce/Inverurie services would operate to a service pattern similar to the base case, at least initially. The infrastructure included in the option could enable cross-Aberdeen services to be extended to Inverurie at a later stage so providing a further improvement of service frequency to Inverurie – Aberdeen passengers and increasing the direct journey opportunities for Inverurie passengers. The timetable analysed would also enable the service to call at Kintore should the station be re-opened.
There were more than 900,000 passenger journeys involving travel over the route in the base year. Around 98,000 of these journeys were made between Aberdeen and Inverness. It appears that the patronage for that journey is low because services are relatively infrequent and irregular although overall journey times are similar to the car.
Capacity would be maintained for the existing level of freight services on this route.

¹ The scheme was developed as Aberdeen – Inverness Operational Flexibility, SRA Ref. 14.003.

² Three additional trains per day would operate Aberdeen – Inverness and four additional trains per day would operate Inverness – Aberdeen.

Infrastructure required	
The increase in capacity would be realised by constructing two additional passing loops on the route at Orton (between Elgin and Keith) and at Forres. The work at Forres would require the relocation and reconstruction of the station on a straighter alignment.	
To maintain overall journey time at the base-case level minor works would be required between Inverurie and Nairn to increase the line speed.	
Environment	
The changes increase frequency, so encouraging greater use of rail rather than alternative modes – notably the parallel A96. The increased energy use from the additional train miles would be outweighed by the reduction in noise and pollution from car use.	
Safety	
The overall shift from road to rail use would generate safety benefits.	
Economy	
Option 17.2	Value (£m)
Cost (PV)	
Investment cost	16.4
Operating cost	45.5
Revenue	-0.2
Other Government impacts	1.5
Total cost	63.2
Quantified Benefits (PV)	
Rail user benefits	35.8
Non user benefits	2.5
Total quantified benefits	38.3
Quantified BCR	0.6
Integration	
Frequency improvements will improve journey opportunities at any interchange station.	
Accessibility and social inclusion	
Increased frequency offers the opportunity for more passengers to travel by train from a rural area.	
Conclusion	
The quantified BCR for this option is 0.6, indicating that every £1 spent generates only 60p in socio-economic benefits. It is unusual to proceed with a scheme that performs this poorly in economic terms, but attention must be paid to the unquantified factors. The option improves connectivity between the two major northern cities of Inverness and Aberdeen and the intermediate towns on the route, improving social inclusion and supporting an aspiration which Scottish Ministers have included in “Scotland’s Railways”. It is suggested that a full multi-modal appraisal is undertaken before committing funds to this option. It might prove possible to identify a stronger economic case for certain elements of the option if implemented on their own.	

Assessment of option 18.2 Hyndland Jn – Finnieston Jn: Re-model Hyndland East Jn and reconstruct Hyndland station
Concept
This option proposes the re-modelling of Hyndland East Jn and the reconstruction of Hyndland station, concurrently with the renewal of the junction which is planned for 2010. This option would extend the four-track section from Hyndland East Jn to the east of Hyndland station using existing railway-owned land. It would also allow improved access to the adjacent Gartnavel Hospital.
Operational analysis
This would improve the operation of Hyndland East Jn and the congested two-track section of the North Electrics between there and Finnieston, which would improve performance and provide additional capacity. The baseline report identified that reliable operation of the Hyndland/Finnieston section was key to the reliable operation of the whole North Electric and Argyle Line service.
Infrastructure required
Additional track and signalling plus reconstruction of Hyndland station.
Environment
A more reliable timetable would reduce exhaust emissions and reduce road traffic due to modal shift towards rail.
Safety
The more reliable timetable would encourage modal shift which would improve road safety.
Economy
The option is at a conceptual stage so a quantified appraisal has not been undertaken. The investment cost has been estimated at around £23 million including optimism bias. A full appraisal including the development of the costs on this option is required.
Integration
This option would make the hospital more accessible and integrate the service better with other transport modes. This would enhance its status as a transport hub for an important local service.
Accessibility and social inclusion
Improved access to Gartnavel hospital would be created by this enhanced layout and will encourage more access to the hospital via rail.
Conclusion
The improved layout would deliver significant improvements to passengers by improving the accessibility of the congested Hyndland station and the performance of the trains on the North Electric corridor. The exact detail of the option to be taken forward is not yet finalised and further STAG appraisal work is currently being progressed by SPT to assist in finalising this.

Assessment of option 19.1

Bridge Street Jn – Muirhouse Jn: Operate fewer, longer trains

Concept

Platform capacity on the Glasgow South Electrics lines permits the operation of six-car trains. At present only one morning train in the high peak operates as six cars, the remainder consisting of only three cars, some of which are relatively lightly loaded. It would be possible to reduce the number of trains and retain the existing capacity by operating a reduced number of trains with a higher proportion of six cars. This option proposes the operation of fewer services during the peak period on the Cathcart Circle with strengthened services operating to/from Neilston/Newton. This would provide a performance benefit in the short term and capacity which would be available for additional East Kilbride and/or Kilmarnock trains in the longer term.

Operational analysis

This would permit the re-allocation of trains over the critical Muirhouse Jn section which would improve performance and reliability.

Infrastructure required

This would require no additional infrastructure.

Conclusion

This option was not assessed independently of the associated options: the combined evaluation is tabulated below (option 26.1).

Assessment of option 19.2

Additional track between Eglinton Street Jn and Muirhouse Jn

Concept

This option proposes the construction of a third bi-directional line between Muirhouse Jn and Eglinton Street Jn with additional crossovers at Eglinton Street Jn to permit better use of the four lines north of there. Space is available within railway industry ownership for all bar about 100 yards of the 1300-yard section for this line. This could be used on a tidal flow basis at peak times.

Operational analysis

This would permit the operation of additional trains over the critical Muirhouse Jn to Eglinton St Jn section on a tidal flow basis at peak times.

Infrastructure required

Construction of additional track, signalling and OHL equipment.

Environment

Provision of additional rail capacity at peak times will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to travellers who would switch from road to rail as a result of the increased rail capacity.

Economy

Initial estimates are that implementation of the scheme would cost approximately £50 million. Further development work would be required to improve the robustness of the estimate and assess the financial benefits of the scheme.

Integration

The option will increase the use of the existing central Glasgow transport networks.

Accessibility and social inclusion

Increased capacity on peak rail services will create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

Undertaking this on a stand alone basis would be expensive and disruptive but, in conjunction with renewals in the longer term, should be considered further. It is proposed that the land adjacent to the junction be reserved for potential development in the future with the land not currently in railway ownership procured should it become available.

Assessment of option 20.1

Glasgow Central High Level Station: Electrification and diversion of Whifflet services

Concept

This option proposes the electrification and upgrade of the line between Rutherglen East Jn and Whifflet to permit the integration of the Glasgow – Whifflet service into the Argyle Line through Glasgow Central Low Level. This would free up two paths per hour in each direction on the approaches to Glasgow Central and the associated platform capacity. Journey times would be extended slightly but passengers would have a wider choice of city centre destinations. The existing diesel rolling stock would require to be replaced by electric rolling stock.

Operational analysis

This option would provide two additional paths into Glasgow Central High Level, which could be utilised by additional services to/from other destinations. This would also free up platform capacity within the station.

Infrastructure required

Electrification of the line between Whifflet and Rutherglen East would be required. Re-modelling Exhibition Centre to provide a third platform is an option for consideration at a later date, although this is not essential to the implementation and delivery of this option.

Conclusion

The option was not assessed independently of the associated options: the combined evaluation is tabulated below (option 26.1).

Assessment of option 21.1

Law Jn to Carstairs engineering access: Improved signalling to increase flexibility

Concept

Several options have been considered, including simplified or full bi-directional signalling. Unfortunately due to the volume of night time traffic, these would not provide any window for maintenance access. This issue will continue to be addressed in line with the Rules of the Route and technological developments. Pending the development of new forms of technology, the performance risk on this issue will continue to be managed, under the current regime.

Operational analysis

Following a work stream as part of the "Efficient Engineering Access" development, sufficient access will be delivered following the implementation of the December 2009 timetable.

Conclusion

This option is being delivered as part of a package of works to provide sufficient maintenance opportunities on the West Coast Main Line (WCML).

Assessment of option 22.1

Rutherglen to Eglinton Street Jn: Separate power supply feed to Polmadie depot

Concept

This option proposes the installation of an independent electrical feeder supply to Polmadie depot, to facilitate the operation of the depot during maintenance works on the adjoining main lines.

Operational analysis

Due to the complexity of the on-board systems on the Pendolino trains, a 90-minute preparation time is required before the trains enter service. The available Rules of the Route maintenance windows have had to be curtailed as a result, with a consequential impact on infrastructure condition and train performance.

Infrastructure required

The Eglinton Street feeder station is being renewed during 2007/08. This provides a window of opportunity to progress these works at a significantly lower cost than if it were progressed as a stand alone project. Additional overhead line equipment to permit independent feeding of Polmadie depot is required.

Environment

There will be benefits in reduced pollution as the reliability of the infrastructure will improve and thus have a positive impact on performance and reliability. The ability to operate Pendolinos in Polmadie depot whilst undertaking routine maintenance will encourage the use of more electric traction and therefore have a positive impact on the environment.

Safety

Increased reliability of Virgin services will encourage a switch from road to rail therefore improving road safety.

Economy

Costs are shown in 2002 prices assuming implementation in 2007/08.

Option 22.1	Value (£k)
Cost (PV)	
Investment cost	770
Operating cost	Not assessed
Revenue	-860
Other Government impacts	250
Total cost	160
Quantified Benefits (PV)	
Rail user benefits	1,050
Non user benefits	1,270
Total quantified benefits	2,320
Quantified BCR	14.5

Integration

Improved reliability of the timetable will increase the use of rail.

Accessibility and social inclusion

Improved timetable reliability will attract additional passengers and will create more opportunities for households without cars to make leisure and business journeys.

Conclusion

This will deliver improved maintenance of the West Coast Main Line (WCML) in the Polmadie area and a more robust timetable for trains departing Polmadie depot.

Assessment of option 23.1 Glasgow/Paisley/ Ayrshire: Recast stopping pattern

Concept

Of the current eight off-peak passenger trains per hour on this corridor, six run non-stop between Paisley and Glasgow with the other two calling at the three intermediate stations. It is proposed to revise this to two services (probably to and from Ayr) running non-stop with the other six calling at one of the intermediate stations. This would balance out the differential in timings of passenger and freight services over the corridor, thereby creating a more resilient timetable as well as spreading the passenger load between Glasgow and Paisley better.

Operational analysis

It is anticipated that the changes will improve performance and create some additional capacity.

Ticket sales data record that there are, on average, fewer than two journeys a day between the three stations so the option would have little negative impact on users.

Infrastructure required

No additional infrastructure would be required.

Environment

Provision for a reduced journey time and consistent stopping pattern will encourage road users to switch to rail. A more reliable timetable would reduce exhaust emissions and reduce road traffic due to modal shift towards rail.

Safety

Safety benefits accrue to travellers who switch from road to rail as a result of the more reliable timetable and the resultant reduction in road traffic on the M8 and A77.

Economy

The change in stopping patterns has been analysed using MOIRA. The results of the test showed that there would be a net benefit to passengers from implementing this option if average lateness on the corridor can be reduced by around three to four seconds, which should be achievable.

Integration

The option will increase the use of the existing Glasgow transport networks through the hub at Central station.

Accessibility and social inclusion

There would be a small negative impact for passengers using the intermediate stations (particularly the very small number that travel between the intermediate stations) outweighed by more direct journey opportunities for all passengers and reduced journey time for passengers on the trains that make fewer calls.

Conclusion

The skip-stopping option would provide improvements to the majority of travellers on the Paisley corridor as well as providing additional capacity which could be utilised for additional passenger and freight trains.

Assessment of option 23.2 Ayrshire and Inverclyde: Extend platforms with longer trains	
Concept	Platform capacity on the Ayrshire and Inverclyde lines permits the operation of six-car trains. During the high-peak period all of the Ayrshire services operate in six-car formation and there is no capacity for any further growth. This option proposes the extension of platforms to permit the operation of longer trains to increase capacity.
Operational analysis	This option would incorporate the current timetable quantum, although journey times may be slightly extended due to the operation of selective door opening (SDO). This is expected to have minimum impact on the timetable; the distribution of the four stations which require SDO is such that in general any individual train would only encounter one such station. Any further stations identified for SDO would require a balance between the capital cost and the number of passengers to ensure safety or performance are not sacrificed.
Infrastructure required	As SDO will require to be fitted to the trains, it may be sensible to make use of this at further stations to reduce the capital cost. Further work is required to identify at which stations this will apply. There are a total of 43 stations on the Ayrshire and Inverclyde corridors. 32 of these would require infrastructure works in the shape of platform extensions to accommodate longer services. Analysis of the stations has highlighted that extensions are only feasible at 28 of these. This option proposes platform extensions on 49 platforms on the Ayrshire and Inverclyde corridors which would facilitate the operation of eight car services in the peak periods. The proposal includes the use of SDO at four stations. Various works would be required to accommodate the numerous platform extensions. This includes; relocation of stop board marker, relocation of station signal, platform extensions and OHL structure relocation. Additional trains will require to be obtained due to the expansion in the network anticipated as a result of options 4.1 and 24.2 as well as overall growth on the network. Due to the changes in specification over the years it is likely that four-car trains will be more cost effective than three-car trains.
Environment	Provision of increased capacity will encourage road users to switch to rail. A more reliable timetable would reduce exhaust emissions and road traffic due to modal shift towards rail.
Safety	Safety benefits accrue to travellers who switch from road to rail as a result of the more reliable timetable and the resultant reduction in road traffic on the M8 and A77.
Economy	Although an initial study of the infrastructure costs of this option has been completed, further work on the rolling stock costs and the associated benefits is required before a quantified financial appraisal can be completed.
Integration	The option will increase the use of the existing Glasgow transport networks through the hub at Central station.
Accessibility and social inclusion	Increased capacity on peak rail services will create more opportunities for households without cars to access employment opportunities in the city centre.
Conclusion	Further analysis of the benefits are required but this could help to relieve overcrowding on a capacity-constrained corridor.

Assessment of option 24.2 Construct Glasgow Airport rail link	
Concept	This option is being supported by Scottish Ministers and developed by Strathclyde Partnership for Transport (SPT). In addition to providing a direct link between Glasgow Airport and the city centre, links between Paisley and Glasgow will be improved with passengers having access to four more trains an hour in each direction between Paisley and Glasgow city centre – a total of 12 trains an hour, which will help to ease overcrowding on some of these services.
Conclusion	Scottish Ministers are committed to delivering this project, following an appraisal carried out by the promoter.
Assessment of option 25.1 Kilmarnock – Gretna/Stranraer: Recast timetable on Dumfries route	
Concept	Passenger services on the southern section of the G&SW Route between Kilmarnock, Dumfries and Carlisle currently operate on an irregular service pattern. The provision of a clockface pattern for passenger services with standard origins and destinations would also allow the provision of clockface slots for freight services on the line, thereby creating the potential additional paths. The proposed service would provide a similar quantum of service on each section of the route with origins and destinations being standardised. Further analysis of the timetable for both this option and for option 25.2 indicated that resources are currently very efficiently used. Any change would require to maintain this efficiency.
Operational analysis	A clockface pattern would improve reliability and provide a more understandable service. Although the revised proposal would not provide a strict clockface pattern, it would have a simpler timetable than currently with services aligned with the major flows on the route.
Infrastructure required	No specific additional infrastructure is required, although this item is linked to a number of other proposals.
Environment	Provision for an improved timetable will encourage road users to switch to rail. This will reduce pollution and noise.
Safety	Safety benefits accrue to travellers who would switch from road to rail as a result of the regular timetable. This in turn will improve road safety.
Economy	Following feedback and further analysis of the initial timetable developed for options 25.1 and 25.2, it was identified that the resource cost (additional vehicles and train crew) would significantly exceed the benefits identified from the revised timetable. Further work is ongoing to identify a revised timetable which can be delivered within the existing resource base.
Integration	The delivery of a regular timetable would enable improved integration with other modes of transport.
Accessibility and social inclusion	A regular timetable will create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

Further development of the timetable is required (together with option 25.2) to deliver the improvements at an affordable cost.

Assessment of option 25.2 Recast timetable on Stranraer route**Concept**

It is anticipated that shipping services from Stranraer to Ireland will be withdrawn in 2008. It is therefore proposed to review the train service to meet the needs of the local population better. The existing volume of passenger services to and from Stranraer would still be retained with origins and destinations being standardised.

Following a review of the timetable proposals and resources, it was considered appropriate that some services should continue to operate as through services between Glasgow and Stranraer. This will ensure connectivity is retained in line with a number of consultation responses received and that rolling stock resources are efficiently utilised.

Operational analysis

This will provide a service appropriate to the needs of local passengers, by providing trains at more suitable times.

Infrastructure required

This option will not require any additional infrastructure.

Environment

Provision of a regular timetable will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to travellers who would switch from road to rail as a result of the regular timetable. This in turn will improve road safety.

Economy

Following feedback and further analysis of the initial timetable developed for 25.1 and 25.2, it was identified that the resource cost (additional vehicles and train crew) would significantly exceed the benefits identified from the revised timetable. Further work is ongoing to identify a revised timetable which can be delivered within the existing resource base.

Integration

The delivery of a regular timetable would enable improved integration with other modes of transport.

Accessibility and social inclusion

A regular timetable will create more opportunities for households without cars to access employment opportunities.

Conclusion

Further development of the timetable is required (together with option 25.1) to deliver the improvements at an affordable cost.

Assessment of option 25.3 Glasgow and South West (G&SW) line: Additional infrastructure to reduce headway between Kilmarnock and Gretna**Concept**

This option proposes the complete or partial re-instatement of double track on the single-line section between Annan and Gretna Jn and the provision of additional intermediate block signals between Kilmarnock and Annan. This would provide an improved planning headway of 15 minutes. To deliver the potential growth in coal to English power stations, similar alterations would be needed south of Gretna, which are included in the Freight RUS.

Operational analysis

This will provide an improved planning headway of 15 minutes, permitting the operation of additional services and improving performance for existing services.

Infrastructure required

Additional track and signalling.

Environment

Provision for a regular timetable with increased capacity will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to travellers who would switch from road to rail as a result of the regular timetable. This in turn will improve road safety.

Economy

Option 25.3	Value (£m)
-------------	------------

Cost (PV)

Investment cost	46.1
Operating cost	-2.4
Revenue	-11.4
Other Government impacts	10.3
Total cost	42.6

Quantified Benefits (PV)

Rail user benefits	17.4
Non user benefits	43.2
Total quantified benefits	60.6

Quantified BCR

1.4

This option has been assessed on the assumption that Freight RUS Sensitivity Test 1 does not materialise. Should the additional coal anticipated to be required by English power stations occur, the BCR would be much higher. The benefits are based on the improved performance of existing trains and the increased ability to use the route for diversionary purposes.

Integration

The delivery of a regular timetable would enable improved integration with other modes of transport.

Accessibility and social inclusion

A more reliable timetable will create more opportunities for households without cars to access employment and leisure opportunities.

Conclusion

This option should be progressed for implementation.

Assessment of option 25.6 Additional functionality at Kilmarnock

Concept

This option proposes creating a loop facility at Kilmarnock which would allow 23 vehicles to be stabled clear of the main line but the maximum length that can be accommodated within railway-owned land would only be 21 wagons. To create a longer loop additional land would need to be purchased and this option is now being developed.

Operational analysis

The provision of a run-round facility at Kilmarnock would permit trains to/from Greenburn and New Cumnock coal loading points to reverse at Kilmarnock instead of proceeding via Barassie and Ayr to reverse avoiding the use of two congested single line sections.

Infrastructure required

Additional track would be required.

Environment

The facility would reduce the mileage for each train by about 10 for a total of about 12 trains per day, reducing emissions.

Safety

The improved reliability provided for passenger and freight services due to the reduced capacity utilisation would encourage greater use of the network by passengers reducing road accident risk.

Economy

Benefits accrue from more efficient use of resources by the freight operators and the greater reliability on congested sections of the network. Initial cost estimates are around £500,000 although this is dependent on the cost of the additional land, currently estimated at approximately £100,000.

Integration

No effect.

Accessibility and social inclusion

No effect.

Conclusion

Further development of this option is required but the current indication is that it would be viable.

Assessment of option 25.7 Extend loop at Stevenston

Concept

This option proposes the extension of the existing loop to permit standage of longer trains awaiting acceptance to Hunterston. This would deliver a more reliable operation of trains to Hunterston and hence improve the reliability of both the Ayrshire and G&SW lines.

Operational analysis

There are about 20 freight trains per day to Hunterston for loading at present. This option will facilitate freight growth and reliability on this corridor. Growth could occur either if Freight RUS Sensitivity Test 1 occurred or the proposed container import terminal was constructed. If either of these occurred it is likely that more trains would require to be held awaiting acceptance into Hunterston Terminal with possible consequential delays.

Infrastructure required

This would require additional track and signalling works.

Environment

Provision for increased capacity will encourage companies to convert to rail freight. This will reduce pollution and noise.

Safety

Safety benefits accrue to freight hauliers who would switch from road to rail as a result of the increased capacity. This in turn will improve road safety.

Economy

Cost £3 million excluding optimism bias. Efficiencies would arise from increased freight capacity.

Integration

Increased reliability of passenger services would improve integration with other modes of transport.

Accessibility and social inclusion

No effect.

Conclusion

This option should be progressed on the basis of the anticipated growth in traffic to/from Hunterston.

Assessment of option 25.9

Improved signalling to reduce headway between Mauchline Jn and Annbank

Concept

This option proposes the removal of the ground frame and token signalling systems on this route and replacing them with a modern signalling system. This would reduce journey time, increase capacity and improve performance particularly within the Mauchline area.

Operational analysis

This will reduce headways and increase capacity on this single line section.

Infrastructure required

Additional/improved signalling.

Environment

Provision of additional rail capacity with consequential improved reliability will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Safety benefits accrue to freight hauliers who would switch from road to rail as a result of the increased capacity. This in turn will improve road safety.

Economy

Cost £1.5 million excluding optimism bias. Improved reliability of freight services will improve performance for both freight and passenger services. Further analysis of the benefits is required to fully appraise the business case but initial indications are positive.

Integration

Improved performance of passenger services would enable better integration with other modes of transport.

Accessibility and social inclusion

Increased capacity would create more freight opportunities and have a positive impact on businesses.

Conclusion

This intervention will improve the reliability of freight services and therefore have a positive impact on performance for freight and passenger services.

Assessment of 26.1 Glasgow – Kilmarnock: Extend platforms and trains and operate extra trains off-peak

Concept

Additional capacity can be provided by a programme of platform lengthening works to allow longer trains to operate and the construction of an extension to the existing loop at Lugton. The former (together with additional rolling stock) would deliver additional peak capacity while the latter would permit a more frequent off-peak and contra-peak service.

Operational analysis

The additional infrastructure works would enable a half-hourly service to operate between Glasgow and Kilmarnock.

Infrastructure required

Station works at Dunlop, Stewarton and Kilmaurs.
Track and signalling works to provide an enhanced loop.

Environment

Provision for increased capacity will encourage road users to switch to rail. A more reliable timetable would reduce exhaust emissions and reduce road traffic due to modal shift towards rail.

Safety

The more reliable timetable and increased capacity would reduce road traffic on the M8 and A77. This in turn would improve road safety.

Economy

ARUP assessed the impact of timetable changes associated with a package of options using MOIRA. The benefit cost ratio is less than one but this excludes the impact on future crowding on this route, which has not been quantified. The impact on passenger crowding, in combination with wider benefits generated, is likely to deliver a scheme with a positive economic case.

Options 19.1, 20.1 and 26.1	Value (£m)
Cost (PV)	
Investment cost	66
Operating cost	45
Revenue	-10
Other Government impacts	1
Total cost	101
Quantified Benefits (PV)	
Rail user benefits	81
Non user benefits	3
Total quantified benefits	84
Quantified BCR	0.8

Integration

The improved capacity would enable improved integration with other modes of transport.

Accessibility and social inclusion

A regular timetable will create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

Although the quantification of the identified options does not create a positive BCR, the unquantified benefits (particularly passenger crowding relief) that could be gained suggest that a positive economic case for the scheme can be developed.

Assessment of option 27.1

Ayr – Kilwinning – Hunterston: Improved signalling to increase flexibility

Concept

The original proposal was to provide bi-directional signalling to permit engineering work on one line during quiet periods.

Operational analysis

Assessment of the option for the RUS Draft for Consultation indicated that even with such signalling the volume of traffic would not normally permit engineering work during traffic hours.

Infrastructure required

Additional signalling to provide bi-directional capability.

Environment

No specific environmental impacts.

Safety

Operation of trains during engineering work with single line working would worsen safety for track and other engineering staff.

Economy

As the option did not meet the gap, the costs were not assessed.

Integration

No specific impacts.

Accessibility and social inclusion

No specific impacts.

Conclusion

No viable short-term options to improve engineering access have been identified. Pending the development of new forms of technology, the performance risk on this issue will continue to be managed, under the current regime. This option will continue to be addressed in line with the Rules of the Route and technological developments. Further consideration should be given to bi-directional signalling in line with the renewals currently scheduled for 2016/17.

Assessment of option 28.1
Glasgow – East Kilbride: Recast timetable supported by additional infrastructure

Concept

This option proposes a timetable recast to deliver a mixture of semi-fast and stopping trains on the route. This would require the provision of a new turnback siding at Busby (the extent of the double track section) and the re-instatement of a double junction at Busby Jn.

Operational analysis

The option includes semi-fast and stopping services, providing up to six trains per hour in the peak period. This will include additional services terminating at Busby.

Infrastructure required

This includes a turnback facility at Busby and re-instatement of a double junction at Busby junction.

Environment

Provision for increased capacity would encourage road users to switch to rail. A more reliable timetable would reduce exhaust emissions and reduce road traffic due to modal shift towards rail.

Safety

The more reliable timetable and increased capacity would reduce road traffic on the M8 and A77. This in turn would improve road safety.

Economy

Option 28.1	Value (£m)
Cost (PV)	
Investment cost	12
Operating cost	42.4
Revenue	-2.8
Other Government impacts	0.2
Total cost	51.8
Quantified Benefits (PV)	
Rail user benefits	21.8
Non user benefits	0.6
Total quantified benefits	22.4
Quantified BCR	0.43

Integration

The option will increase the use of the existing Glasgow transport networks through the hub at Central station.

Accessibility and social inclusion

Increased capacity on peak rail services will create more opportunities for households without cars to access employment opportunities in the city centre.

Conclusion

The quantified economic case for this scheme is, at this stage, very weak. There are insufficient quantified economic benefits to justify this level of investment in this scheme but, dependent on actual growth levels, options to enhance capacity need to be kept under review.

Assessment of option 29.2
Edinburgh – Glasgow via Shotts: Additional trains, skip-stopping pattern

Concept

This option proposes a half-hourly limited stop service giving each station between one train every two hours and two trains per hour depending on the volume of business on offer. This would provide a half-hourly faster service from principal stations as well as a more competitive end-to-end journey time.

Operational analysis

This service is compatible with the existing freight services on the route and provides an enhanced service to principal stations.

Infrastructure required

No additional infrastructure would be required to implement this option, although to deliver the optimum timetable, some line speed improvements would be beneficial.

Environment

Provision for increased capacity would encourage road users to switch to rail. A more reliable timetable would reduce exhaust emissions and reduce road traffic due to modal shift towards rail.

Safety

Modal shift from car as a more frequent timetable is delivered. Safety benefits accrue to travellers who would switch from road to rail as a result of the increased rail capacity.

Economy

Option 29.2	Value (£m)
Cost (PV)	
Investment cost	Not assessed
Operating cost	58.7
Revenue	-38.8
Other Government impacts	3.5
Total cost	23.4
Quantified Benefits (PV)	
Rail user benefits	186.8
Non user benefits	11.7
Total quantified benefits	198.5
Quantified BCR	8.5

Integration

Improvements to the throughput and facilities at Glasgow and Edinburgh will enhance the status of the major conurbations, increasing the rail, bus and tram networks.

Accessibility and social inclusion

Although this option would provide more fast journey opportunities between Glasgow and Edinburgh, it would disadvantage some of the more deprived locations along the Shotts route.

Conclusion

Discussions with stakeholders identified that this option created difficulties as some stations had a service reduced from hourly to two hourly, raising a number of accessibility and integration issues. An alternative option was developed by Faber Maunsell on behalf of the consortium of local authorities and Transport Scotland consisting of an alternate fast (with a reduced journey time) and stopping service each hour, which also had a positive quantified economic case albeit worse than this option. A further option has emerged to provide two semi-fast trains per hour between Glasgow Central and Edinburgh. Further analysis of this option is required to develop a robust business case.

Assessment of Room for Growth Option: Highland Main Line capacity and journey time improvement

Concept

This option, which was developed in the Room for Growth studies, looks at the infrastructure, timetabling and rolling stock requirements to deliver an hourly service between the Central Belt and Inverness. This option also includes a timetable recast to provide a journey time improvement.

Operational analysis

An hourly service would be created between Edinburgh and Inverness, which delivers a journey time of three hours, with seven stops.

Infrastructure required

New rolling stock, with improved performance characteristics, would be required to deliver increased acceleration and higher speeds.

Track, structures and signalling would be required, including re-doubling of four miles and an additional passing loop.

Environment

Provision of additional rail capacity at peak times will encourage road users to switch to rail. This will reduce pollution and noise.

Safety

Provision of additional rail capacity at peak times will encourage road users to switch to rail.

Economy

These figures are extracted from the Room for Growth studies described in Section 5.5. In the recommended scenario it is expected that in the opening year around 59,000 passenger trips will be generated by the improvements to service frequency and journey times, which driven by underlying passenger growth will rise to 85,000 by 2020.

	Value (£k)
Cost (PV)	69.5
Quantified Benefits (PV)	81.7
Quantified BCR	1.18

Integration

The improved frequency would enable improved integration with other modes of transport.

Accessibility and social inclusion

Increased frequency and capacity will create opportunities for households without cars to access employment and tourism opportunities between the Central Belt and Highlands.

Conclusion

This project generates a positive BCR and would deliver one of the commitments in "Scotland's Railways".

APPENDIX F GLOSSARY OF RAILWAY TERMS

Absolute Block Signalling is a long established form of signalling mainly, but not necessarily, associated with semaphore signals and one signal box for each signalling section. Its purpose is to ensure that only one train is within a given section of line at a time. Each signal box is equipped with Block Indicators, which show Line Blocked, Line Clear or Train on Line.

ATOC Association of Train Operating Companies

Bogie hopper High capacity coal-carrying wagon

CP Control Period

DDA Disability Discrimination Act

DfT Department for Transport

Dwell time The time a train is stationary at a station

Engineering Access is the time on the rail network when no trains operate. This provides the means by which maintenance/renewals and enhancement works are undertaken.

EWS English, Welsh and Scottish Railway

FOC Freight Operating Company

GRIP (Guide to Railway Investment Process) Network Rail investment process, which ensures consistency and value for money in all capital expenditure programmes.

Headway on a particular route is the minimum time necessary between the passage of similar trains which will ensure that the driver of the second train will always be travelling under green aspects (ie. not double or single yellows). On certain Track Circuit Block Lines with four aspect signals the headway is two minutes whereas on a line with Absolute Block Signalling the headway may be ten minutes or more.

HITRANS Highlands and Islands Transport Partnership

HLOS High Level Output Specification

Infrastructure includes signalling, track, structures and telecom assets associated with the rail network.

Interlocking is the collective name for the various pieces of equipment which ensure that points and signals are properly interlocked to ensure safety.

Intermodal trains are freight trains which convey traffic which could be moved by road, rail or sea (eg. container traffic).

KPI Key Performance Indicator

Loading factor The amount of seats occupied on a train service expressed as a percentage of total seats available.

Loading gauge The profile for a particular rail route within which all vehicles or loads must remain to ensure that sufficient clearance is available at all structures.

Multiple Unit Trains (DMU & EMU) are trains composed of self-contained units, coupled together so that they work in unison under the control of the driver at the front of the leading unit. Each unit is normally composed of two or more semi-permanently coupled vehicles and a driving compartment is provided at each end of every unit. There are diesel multiple units (DMU) and electric multiple units (EMU).

Network Rail owns and operates Britain's rail infrastructure. Network Rail is a company with liability limited by guarantee. Its purpose is to deliver a safe, reliable and efficient railway for Britain. As a company limited by guarantee, it is a private company operating as a commercial business. It is directly accountable to its members and regulated by the Office of Rail Regulation (ORR).

NRDF Network Rail Discretionary Fund

ORR Office of Rail Regulation

OHL Overhead line

PDFH Passenger demand forecasting handbook

Public Performance Measure (PPM)

combines figures for punctuality and reliability into a single performance measure. It covers all scheduled services, seven days a week. PPM measures the performance of individual trains against their planned timetable. PPM is therefore the percentage of trains 'on time' compared to the total number of trains planned.

Radio Electronic Token Block (RETB) is a form of signalling used on lines with an infrequent train service. The basis of the system is a computer and a centrally controlled radio network (operated by a signaller) which sends out an electric 'token' to the driver as authority to enter the section ahead then receives it back again from the driver when the train reaches and clears the other end of the section.

Route Availability (RA) is the system which determines which types of locomotive and rolling stock can travel over any particular route. The main criteria for establishing RA usually concerns the strength of underline bridges in relation to axle loads and speed, although certain routes have abnormal clearance problems (eg very tight tunnels). A locomotive of RA8 is not permitted on a route of RA6 for example.

RUS Route Utilisation Strategy

Shoulder-peak Period immediately before and after the high peak

S&C Switch and Crossings

SDM Strategic Demand Model

SEStran South East of Scotland Transport Partnership

SPA Scottish Planning Assessment

SPAD Signal Passed at Danger

SPT Strathclyde Partnership for Transport

SRA Strategic Rail Authority

Scottish Transport Appraisal Guidance

(STAG) is a tool to aid transport planners and decision-makers in the development of transport policies, plans, programmes and projects. The structure and breadth of the Guidance make it suitable for application across a wide spectrum of transport planning areas.

Standard Length Unit (SLU) is a railway term of measurement. One SLU = 6 metres or 21 feet. By describing a length of a train in SLUs, it is easy to establish if it can or cannot be accommodated in a particular loop or siding.

Strategic Routes Network Rail is structured with 26 Strategic Routes, which are aligned closely to the traffic flows to enable direct use of route plans for delivery.

TOC Train Operating Company

Track Circuit Block Signalling (TCB) is a signalling system which requires the entire line to be track circuited. The presence or otherwise of trains is detected automatically by the track circuits. Consequently many of the signals on TCB Lines operate automatically as a result of the passage of trains. The associated equipment ensures that only one train can be in a "section" at any given time.

Traffic mix Combination of freight and passenger services operating over a corridor. This can be further sub-divided to consider fast, semi-fast and slow services and rolling stock types.

Network Rail
40 Melton Street
London NW1 2EE

020 7557 8000

www.networkrail.co.uk

018/March 2007