

Sewta Rail Strategy Study

Executive Summary

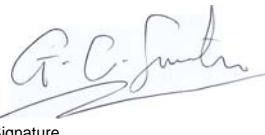


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1 EXECUTIVE SUMMARY

1.1 Introduction and Study Process

The South East Wales Transport Alliance (Sewta) is responsible for the strategic planning of public transport in South East Wales. The region covers 10 local authorities spreading from Monmouthshire in the east to Bridgend in the west and Cardiff in the south to the Heads of the Valleys in the north. The Sewta Region is the Capital Region and contains 48% of Wales' population. The area is experiencing a decline in traditional manufacturing, has a low employment rate and low average earnings, especially in the Valleys to the North of Cardiff, Newport and Bridgend. There has been a growth in service sector employment in the M4 corridor and coastal area resulting in a growth in commuting into Cardiff and Newport from the surrounding areas.

The rail network, radiating from Cardiff, Bridgend and Newport, provides an attractive alternative to the use of the private car on the congested highway network. In 2002/03 there were around 14 million rail passenger trips per year to / from and within the Sewta area. 73% of rail trips are to / from Cardiff and other key local destinations are Newport, Pontypridd and Caerphilly.

Sewta has recently introduced new services on the Vale of Glamorgan Line with new stations at Rhoose Cardiff International Airport and Llantwit Major. Sewta is currently implementing a five year improvement programme involving new stations at Llanharan, Energlyn and Brackla, new services and new stations on former freight lines in the Ebbw Valley and improved services to provide half-hourly minimum weekday headways to most parts of the region.



This study was required to look beyond at the medium / long term and develop a strategy to take services in South East Wales into the second decade of the 21st Century.

The study was undertaken in 2 parts; Part 1 reviewed the sub-regional objectives and issues and shortlisted schemes from a long list of options, and; Part 2 developed and applied passenger forecasting models, undertook engineering and operations analysis and used financial, economic and cost / benefit assessments to determine the recommended strategy for the period 2009 to 2018.

Consultation with regional stakeholders was undertaken in both stages of the study. Firstly to agree the regional objectives which formed the criteria against which options were assessed and to identify the long-list of options. In the second consultation stakeholders reviewed the results of the appraisal of shortlisted schemes and were able to influence the development of the recommended strategy and comment on the programme and implementation issues.

This executive summary presents a broad overview of the study, focusing on the recommendations. The detail of the study is contained in separate documents; Part 1 report; Final Report and Final Report Technical Appendices. In addition, a further report covers the more detailed assessment of Magor with Undy Station which was undertaken in parallel to inform Network Rail's Newport Area Signalling Renewal Project.

1.2 Strategy Objectives and Key Issues

The majority of the existing rail network is double track with some sections of single track on the Valley Lines to the North of Cardiff and Bridgend. The Main Line between Cardiff and Severn Tunnel Junction has 4 tracks with the relief lines used by freight services.

All trains are diesel powered and passenger services are provided by a mix of rolling stock both in terms of age and carrying capacity. Around two-thirds of services are provided with 2-car trains, mostly Class 14x 'Pacers', though some longer trains are being provided to cope with peak demands, as the fleet expands with the acquisition of Class 150 and Class 175 stock for urban and regional services respectively.

The network is constrained by the mix of services (fast and slow passenger services and freight) especially on the South Wales Main Line to the West of Cardiff. Some junctions between routes in the network provide constraints due to the conflicting train movements especially at Cardiff Central. The single track sections on the branches also constrain the frequency of passenger services and influence service reliability. Finally, the signalling and track capacity influences the capacity of the network where there are high volumes of rail services such as at and between Cardiff Queen Street and Cardiff Central stations.

The National and Regional, economic, social and transport objectives as well as passenger priorities were reviewed to define the criteria to be used in the appraisal of the strategy options. The resulting criteria were:

- Preserving or enhancing the **Environment**
- Improving **safety** and security
- Enhancing the **economy** and providing good value for money
 - Especially in terms of improving access to jobs and training
- Improving **integration** between modes and between policies
 - Especially integration with the Spatial Strategy
- Enhancing **Accessibility**
 - Especially between the Valleys and Cardiff and Newport
- Improving regional **Connectivity** between activity centres
- **Reducing Car Travel**
 - Especially in Cardiff and Newport
- **Making Best Use** of infrastructure
- Minimising adverse **passenger impacts**
- Ensuring **deliverability** through robust planning

Key passenger priorities for the rail network and services are **reliability** and **seat availability**. Capacity analysis showed sufficient capacity on the Marches and Gloucester Lines throughout the strategy period, however, if passenger growth continues at 5% per annum there will be a need to provide additional train services as well as longer trains on the Valley Lines.

1.3 Recommended Strategy 2009 - 2018

The **recommended** Sewta Rail Strategy for the period 2009 – 2018 is designed to make better use of existing rail services, provide for passengers' needs, and achieve the regional economic and social objectives. Figure 1 shows a summary of the recommended strategy geographically and a Figure 2 summarises the strategy elements against the regional objectives. It is recommended to invest in;

- **Additional rolling stock** to strengthen peak trains to provide for passenger growth and to avoid overcrowding and **rolling stock renewal** to replace the ageing Pacer fleet and secure further benefits to the region including performance improvements. In addition it is recommended to lengthen platforms on the Barry Line to accommodate 6-car trains;
- **Station improvements** including improved station facilities, information, security and access - including **additional parking** - to encourage greater use of rail to access Cardiff and Newport and to make better use of existing trains. It is recommended to develop programmes of works based on the larger stations, where there are specific network issues and in line with the spatial strategy;
- **Reliability and capacity improvements;** It is recommended to develop and implement network infrastructure improvements to reduce delays and improve the ability to cope with performance problems; specifically at **Cardiff Central, Cardiff Queen Street, Barry, Cogan Junction, and Llandaf**;
- **Frequency enhancements on existing lines;** It is recommended to improve the levels of service on selected routes to meet passengers' expectations (of at least a half-hourly service and a turn-up-and-go service within the core journey to work area of Cardiff) and increase the transfer of car trips to rail. Specifically:
 - New half-hourly local services on the **Abergavenny** and **Chepstow Lines**;
 - A second hourly service on the **Ebbw Valley Line** between Ebbw Vale and Newport;
 - Additional services on the **Rhymney Valley** and **Taff Vale** lines to cope with passenger demand growth; and
 - an additional hourly service on the **Vale of Glamorgan** Line between Cardiff and Bridgend via Rhoose Cardiff International Airport.
- **Investment in Capacity;** Providing additional services to the north of Cardiff to deliver additional capacity to accommodate sustained growth in peak passenger demand will require a significant investment in the capacity of the network **at and between Cardiff Queen Street and Cardiff Central Stations**;
- **New stations on existing lines;** Five new stations are recommended to improve access to the rail network, especially in association with recent and future development and integrated with the development of new and improved services; specifically at **Caerleon, Magor with Undy, Llanwern, Coedkernew and St Mellons**. With those on the main line between Cardiff and Severn Tunnel sited on the Relief Lines;

Figure 1 Recommended Sewta Rail Strategy 2018



Figure 2 Sewta Rail Strategy Summary Appraisal

Scheme	National Objectives			Sewta Regional Objectives						
	Environment	Safety	Economy	Integration with Spatial Strategy	Accessibility Valleys - Jobs	Centre - Centre Connectivity	Mode Shift	Making Best Use	Existing Passenger Impact	Deliverability
Rolling Stock										
Train Lengthening	+	+	+	+	+	+	+	++	++	++
Rolling Stock Renewal	++	+	++	++	0	0	+	++	++	+
General Measures										
Station Access (Ped/Cycle)	+/-	0	+	+	+	0	+	++	++	++
Customer Information	+/-	0	+	+	0	0	+	++	++	++
Security/CCTV	+/-	++	+	+	0	0	+	++	++	++
Park and Ride	+/-	+	+	++	++	0	++	++	+	++
Service Reliability Measures										
Barry Town	+	+	++	+	0	0	+	++	++	++
Cardiff Platforms turnbacks	+	+	++	+	0	0	+	++	++	Cardiff Re-signalling
Llandaff Signal	+	+	++	++	+	0	+	++	++	Cardiff Re-signalling
Cogan Junction	+	+	++	+	0	0	+	++	++	Cardiff Re-signalling
Cardiff Queen Street	+	+	++	++	++	++	++	++	++	Cardiff Re-signalling + TWA
Bus Connections										
Cymmer - Maesteg	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Blackwood frequency	0	0	0	+	+	+	0	+	0	Revenue Funding Availability
Penalta - Ystrad Mynach	0	0	0	+	+	+	0	+	0	Revenue Funding Availability
Blaenavon - Pontypool	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Ebbw Vale Town - EV Parkway	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Brynmawr - Abertillery - Llanhilleth	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Bedlinog - Treharris - Abercynon	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Additional Services										
Abergavenny + Caerleon	+/-	+	++	+	+	+	++	+	+	+ (Depends on Cardiff turnback)
Abergavenny 2nd tph	+	+	++	+	+	+	++	+	+	+ (Depends on Cardiff turnback)
Gloucester + Magor + St Mellons	+	+	++	++	0	+	++	+	++	+ (Depends on Cardiff turnback)
Chepstow + Llanwern + Coedk'w	+/-	+	++	++	0	+	++	+	++	+ (Depends on Cardiff turnback)
Ebbw Vale Town - Newport	+	+	+	++	++	+	++	+	++	+
Vale of Glamorgan Bridgend	+	+	+	++	+	+	++	+	+	+
Pontypridd - Cardiff 10 tph	+	+	+	+	+	++	++	0	+	Dependent on Queen St and Phasing
Energlyn - Caerphilly - Cardiff 6 tph	+	+	+	++	+	++	++	-	+	Dependent on Queen St and Phasing
New Stations										
St Mellons	-	0	+	+	0	-	++	0	0	+
Caerleon	-	+	++	++	0	-	++	+	0	+
Coedkernew	-	0	+	++	+	-	++	0	+	Depends on Main Line Upgrade + Development
Llanwern	-	0	+	++	+	-	++	0	+	Depends on Main Line Upgrade + Development
Magor/Undy	-	0	+	+	0	-	+	0	+	Possible Relocation of Severn Tunnel J
Line Extensions										
Ebbw Vale North	+	+	+	++	++	++	+	+	+	+
Beddau	+/-	+	++	++	+	+	++	0	-	Dependent on Main Line Capacity

- **Network extensions and new stations;** Two extensions of the network are recommended for further evaluation to improve access to expanding communities and locations in need of improved access to employment. Specifically extending to **Ebbw Vale Town** and from **Pontyclun to Beddau** with new stations at Talbot Green, Llantrisant, Gwaun Meisgyn & Beddau (Tynant); and
- **Rail-link Bus Services;** to extend the reach of the rail services to communities remote from the network, specifically providing access to the **Valleys** to the north of Cardiff and Newport.

1.4 Strategy Implementation Recommendations

The recommended strategy has a capital cost of around £155m over the period 2009 to 2018. The availability of further EU Objective 1 funding could reduce the overall capital funding requirement, advance the programme in the target areas and inflate the programme by enabling funding of a further network extension project, between **Ystrad Mynach and Bedlinog** with stations at Nelson and Trelewis, which would otherwise be recommended for the longer term.

The recommended strategy requires an increasing rail subsidy in the order of £2m to £7m per annum.

In taking the strategy forward a number of critical success factors were identified including continued passenger demand growth and integration with Network Rail's Cardiff Area and Newport Area **Signalling Renewal Projects**. The signalling renewal projects are major schemes to be implemented between 2008 and 2012 which involve like for like replacement of infrastructure based on the existing service pattern. It is recommended that Sewta and the Assembly work in partnership with Network Rail including further optioneering to take account of this recommended strategy and to seek investment efficiency by planning or providing the additional infrastructure at this stage.

In addition it is recommended that the signalling renewal scheme optioneering stages investigate the best option for improving capacity and reliability through Cogan Junction and that consideration is given to implementing the recommended Barry turnback earlier.

It is recommended that timetabling and capacity assessments are undertaken in two locations; on the Barry/ Penarth lines to identify the most efficient scheme for the strategy whilst maintaining the benefits of the standard pattern timetable, and; on the main line west of Cardiff to take forward the Pontyclun – Beddau assessment and identify any further infrastructure requirements.

It is recommended that local planning authorities safeguard the sites for the recommended new stations including sufficient land for platforms, accesses and car parking. They should also consider land use allocations within the catchment areas of the stations and seek developer contributions towards the infrastructure. In addition for two stations suggested for longer term development (Sebastopol and Llantarnam on the Marches Line) it is recommended that a park and ride strategy is developed for the corridor and further examination of the business case. In addition, private sector finance opportunities should be sought to improve the affordability of marginal stations.

Similarly, authorities should protect the alignment and station locations for longer term schemes identified in the study – specifically on the Pontyclun – Beddau and Aberbeeg – Abertillery routes. If other stations are to be developed in the longer term it is recommended that local authorities review the reasons for the deferment of the scheme in this strategy period, presented in the main reports, and assess whether these could be overcome in the future – such as through appropriate land use allocations.

It is also recommended that existing Rail-link bus services are secured and further routes developed, integrated with the development of the network and services, through a partnership between the train operator and local authorities with dedicated funding from the Assembly.

In taking the rail strategy forward it is recommended to:

- Merge the rail strategy with the ongoing bus and cycle strategy studies to form a coherent integrated regional transport plan and feed the results into the forthcoming Wales Rail Planning Assessment, franchise plans and strategies of neighbouring regions.
- Undertake further technical assessment and economic evaluations of the recommended measures to prepare their business cases and extend the evaluations in line with government appraisal guidance, examining the impact on buses in more detail to enable more holistic plans to be developed.
- Undertake monitoring and review the performance of recent and planned rail service improvements and develop the assessment of train capacity for improved fleet planning.
- Undertake specific development work to ensure that schemes are ready for implementation in the strategy period – particularly the Cardiff Queen Street scheme.

1.5 Conclusions

In combination, the strategy improves the environment and contributes to road safety and the reduction of accidents, provides significant economic benefits and is integrated with the regional spatial strategy through its improvement of connectivity between main centres. Most of the recommended measures improve accessibility to jobs from the Valleys and / or encourage significant modal shift to Newport and Cardiff. The strategy contributes to making best use of the network and provides positive impacts for existing passengers as well as increasing access to rail in a manner that encourages new rail use.

The recommended strategy will deliver a more reliable network, significant additional passenger capacity, more attractive and accessible stations and up to 10 new stations on existing routes and on selected network extensions. Overall it will meet passengers' expectations in terms of service frequency and the investment in new rolling stock would further enhance public perceptions increasing the attractiveness of the services. The strategy is integrated with the land-use strategy and the benefits of its improvements in rail connectivity between main centres aids the economic development strategy for the region.

Sewta Rail Strategy Study

Final Report



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1 INTRODUCTION

1.1 Background

The South East Wales Transport Alliance (Sewta) has been established as a formal Local Government Committee (Board) responsible for the strategic planning of public transport in South East Wales. The region covers 10 local authorities spreading from Monmouthshire in the east to Bridgend in the west and Cardiff in the south to the Heads of the Valleys in the north. Sewta has 6 topic groups covering policy, bus, rail, finance, communications and public affairs and monitoring, bringing together the previous transport partnerships of SWIFT and TIGER covering South East Wales.

The Sewta Region is the Capital Region and contains 48% of Wales' population. The area is experiencing a decline in traditional manufacturing, has a low employment rate and low average earnings, especially in the Valleys to the North of Cardiff, Newport and Bridgend. There has been a growth in service sector employment in the M4 corridor and coastal area resulting in a growth in commuting into Cardiff and Newport from the surrounding areas.

Rail transport is seen as particularly important in the region. In this part of Wales the rail network, radiating from Cardiff, Bridgend and Newport, provides an attractive alternative to the use of the private car on the congested highway network. In 2002/03 there were around 14 million rail passenger trips per year to / from and within the Sewta area. 68% of these trips were made wholly within the Sewta area, of which 73% were to / from Cardiff. Other key local destinations are Newport, Pontypridd and Caerphilly.

This rail strategy study is being undertaken in parallel to a bus strategy study¹. However, it is recognised that rail services are more reliable than bus services (especially in the peak periods) and serve the longer distance travel market in the region. Where commercial bus services parallel rail services, which generally operate along radial corridors, they often serve different, usually more local, markets.

Sewta is currently implementing a five year improvement programme involving new stations, new services on former freight lines and improved services to half-hourly minimum weekday headways to most parts of the region. This study was required to look beyond at the medium / long term and develop a strategy to take services in South East Wales into the second decade of the 21st Century.



The rail strategy is aimed at taking forward and delivering the Sewta economic, social and transport objectives and the study has focused on defining a strategy that is realistic, practical, and deliverable.

1.2 Study Process

The study follows on from and brings together existing strategies for the former TIGER and SWIFT areas. The study was required to develop the Sewta rail strategy for the period 2009 – 2018 and was undertaken in 2 parts:

¹ Sewta Bus Strategy Study, ongoing to be completed early 2006

Part 1 involved:

- Review of the existing sub-regional transport strategies to identify the objectives for the rail strategy;
- Consultation with stakeholders within the Sewta region;
- Identification of potential scheme options and issues, including an assessment of passenger growth and rail capacity issues;
- An initial sift of the long list of options against the defined objectives; and
- Recommendation of schemes for more detailed investigation in Part 2.

Part 2 involved:

- Development and application of models to assess the passenger demand for the options;
- Engineering and operational assessments including cost estimation;
- Assessment of benefits and financial and economic evaluation;
- Recommendation of the elements for the Rail Strategy;
- Consultation with Stakeholders; and
- Assessment of funding and programming issues and identification of further work to take the recommended strategy forward.

The Sewta Rail Strategy Study, Final Part 1 Report, August 2005, and the Consultation Statement, May 2005, describe the Part 1 study process and results in more detail. This report presents the recommended strategy and a separate Technical Appendix² presents more details of the assessment of the shortlisted options leading to the recommendations.

A further separate report³ presents the results of a more detailed investigation of the potential for a new station at Magor with Undy which was undertaken during Part 2 of the study to inform Network Rail's Newport Area Signalling Renewal Project.

1.3 Report Structure

Following this introduction, section 2 of the report outlines the existing rail network and services and section 3 outlines the short term investment programme. Section 4 highlights the key strategy issues and regional objectives which were used to shortlist options for the strategy. Section 5 describes the processes undertaken to develop the medium term rail strategy and section 6 describes the recommended Sewta Rail Strategy. A separate document provides supporting appendices presenting the detailed appraisal information, which was used to determine the elements of the recommended Sewta Rail Strategy.

² Sewta Rail Strategy Final Report – Technical Appendix, January 2006.

³ Sewta Rail Strategy Study, Severn Tunnel Junction / Magor / Undy Station, October 2005

2 EXISTING RAIL NETWORK

2.1 Introduction

The existing rail network within the Sewta Region (Figure 1) is focused on Cardiff and comprises:

- The South Wales Main Line (SWML) running east-west between Pyle / Bridgend and Severn Tunnel Junction and providing for services beyond the region to Swansea and West Wales, the West Country, South Coast, Midlands and London;
- The Vale of Glamorgan coastal route between Bridgend and Cardiff via Barry, with branches to Barry Island and Penarth;
- The Maesteg Line north of Bridgend;
- The Valley Lines to the North of Cardiff serving:
 - Treherbert via Pontypridd and Porth;
 - Aberdare via Pontypridd and Abercynon;
 - Merthyr Tydfil via Pontypridd and Abercynon; and
 - Rhymney Valley via Caerphilly and Bargoed.
- The Coryton Line serving north Cardiff;
- The Cardiff Bay Branch running south from Cardiff Queen Street Station;
- The City Line providing an alternative route to Pontypridd via west Cardiff;
- The Ebbw Valley Line (former freight only line);
- The Abergavenny (Marches) Line north of Newport, with services to north Wales and north west England; and
- The Gloucester line north of Severn Tunnel Junction, serving Caldicot and Chepstow with services to the Midlands.

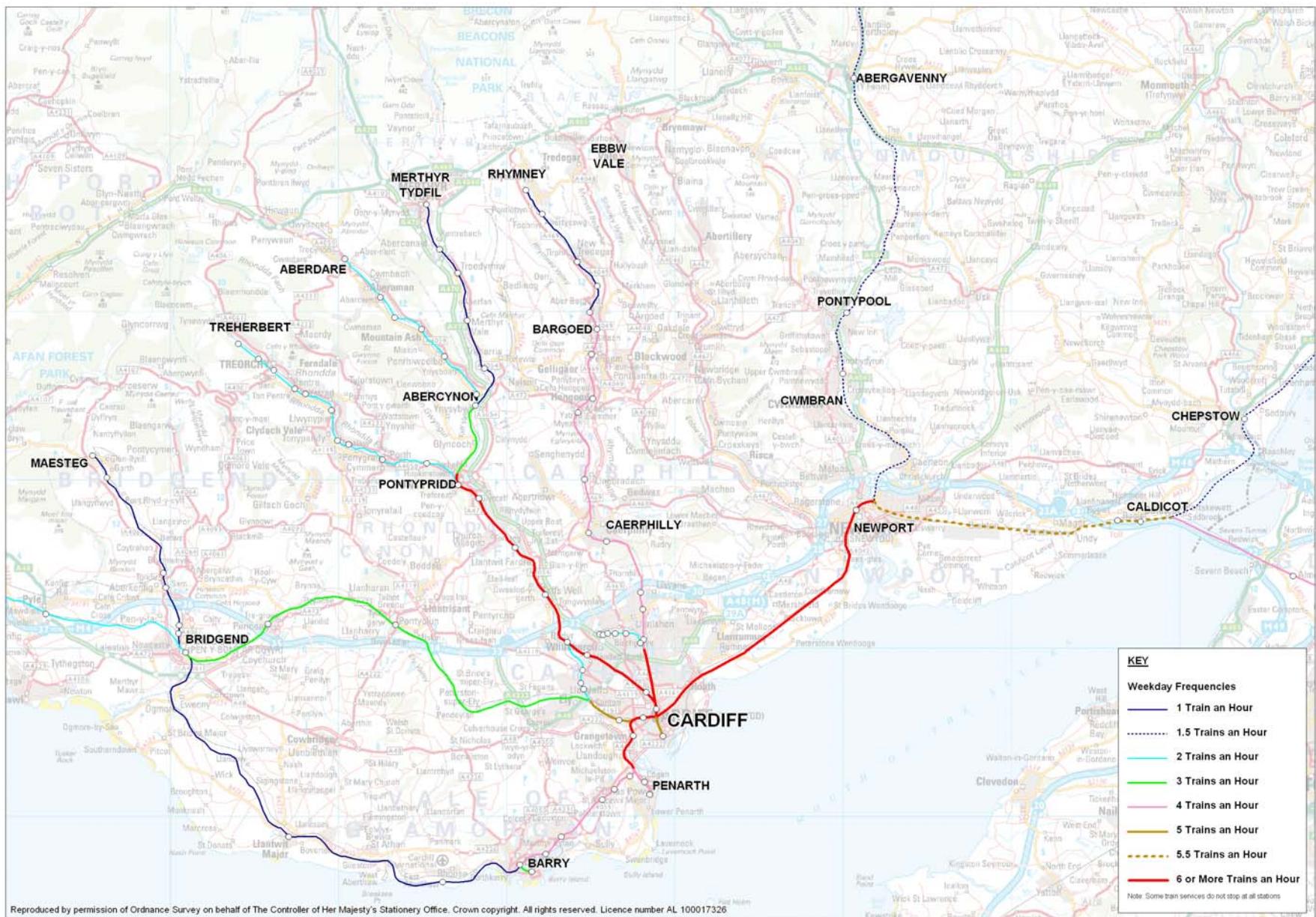
2.2 Capacity Constraints

Capacity for passenger train services within the Sewta area is a function of the rail infrastructure, the mix of train services operated, the running speeds and the calling patterns of the trains.

Assessment of capacity is described in four sections, as follows:

- General issues effecting capacity in the Sewta area;
- The South Wales Main Line that is within the study area, from Bridgend to Severn Tunnel Junction;
- The semi-independent Cardiff Valley Lines network; and

Figure 1 Sewta Rail Network and Service Frequencies at December 2005



- Branches to Ebbw Vale, Abergavenny and the Marches, Chepstow and Gloucester.

2.2.1 General Capacity Issues

The rail routes in the Sewta area involve a wide range of types, from single-track branch lines to multiple-track trunk routes. Route alignments vary from steeply graded and curvaceous routes, originally operated largely for freight traffic, to high-speed alignments.

Where manual signalling exists it is based on the principle of track sections which can only hold one train at a time (so capacity is related to section length and running speed), whereas multiple-aspect colour-light signalling is generally placed at closer intervals thus improving route capacity. The long single track sections on the northern sections of the Valley Lines are key constraints to operations.

Operation is exclusively by diesel traction, with almost all passenger services operated by unit stock capable of being driven from either end. Three morning peak and evening peak journeys from / to Rhymney respectively are currently operated by locomotives with four coaches. These will be replaced with multiple units with increased seating capacity with the introduction of the Standard Pattern Timetable (SPT) in December 2005. In addition, all Marches Line services will increasingly be operated using newer Class 175 trains from December 2006.

A variety of rolling stock is used on Sewta services and some is not well optimised for the steep gradients, frequent stops and crowded conditions often encountered – particularly on the Valley Lines. The older stock which is being replaced in the short term has low power and in most cases insufficient doorways, extending station dwell times. Revenue collection and protection is generally undertaken by the on-train guard, who also has control of the doors at each end of the train on most services. More modern rolling-stock now becoming available by cascade (Class 158) is optimised for longer-distance services, with a longer/narrower body allowing only two abreast seating and only narrow carriage-end doors and vestibules. Speed capability ranges from 75 mile/hr for suburban stock to 125 mile/hr for high-speed passenger trains of up to ten-vehicle length which are used on services to/from London.

The Standard Pattern Timetable committed by Arriva Trains Wales under its franchise for introduction in December 2005 simplifies and enhances the operating pattern to deliver frequency enhancements on a number of routes. Key details include:

- Independent operation of the Cardiff Bay branch.
- 6 trains per hour to / from Pontypridd.
- 4 trains per hour to / from Caerphilly.
- 4 trains per hour to Bargoed, Penarth and Barry.
- 2 trains per hour along the City line throughout the day.

The timetable will operate largely unchanged throughout the day, providing performance benefits of regularity as well as user benefits for off-peak traffic, though an interruption to the sequence occurs during the middle of the day to permit freight trains to run between the Cynon Valley and Aberthaw. Similarly, from December 2005 a new freight service is scheduled to operate between Cwmbargoed and Aberthaw via the Rhymney Line. This will displace two off peak Pontypridd services through Queen Street.

2.2.2 South Wales Main Line

The route has multiple-aspect signalling throughout, which is due for renewal during the early part of the strategy period.

West of Cardiff this route is a fast double-track railway on which capacity is limited by the mix of service speeds. Intermediate stations at Pontyclun and Pencoed (and a proposed station at Llanharan), as well as freight trains, reduce capacity below the theoretical maximum. Local / regional services to Maesteg and to Swansea serve the intermediate stations.

East of Cardiff the route is served by both main and relief lines. The relief lines, on the south side of the alignment matching the majority of freight facilities, are currently mainly used by freight trains as the tracks have comparatively low speed limits of 40 mile/hr. Network Rail's Newport Area Signalling Renewal Project will be examining the potential of upgrading the relief lines – particularly important for accommodation of any new stations and additional services, but also to improve the speed of mainline services during maintenance of the main lines.

Present passenger traffic is therefore timetabled wholly on the high-speed main lines. While theoretical headways permit a maximum usage of 12 trains per hour on the main lines, the current mix of freight, fast and slow trains means it is difficult to find regular paths for any additional trains in peak periods. The limitation may be eased by the scheduled resignalling of the Newport station area, where a complex layout is to be enhanced by restoration of a fourth platform, as the station currently acts as a bottleneck on services from Cardiff.

East of Newport the configuration of the relief lines changes at Bishton where the up relief line is carried over to the north side of the main lines by a flyover which imposes speed limitations to the relief lines in both directions. The flyover leads directly into the sequence of crossovers forming the bifurcation of routes at Severn Tunnel Junction station. From here the number of services towards London / Bristol is currently influenced by the mix of train speeds over the long section through the Severn Tunnel, which is limited to 7.5 trains per hour per direction (subject to various factors and special situations), although possibilities for enhancement are being sought by Network Rail in parallel with resignalling.

The route currently has no stations between Newport and Severn Tunnel Junction and the use of the main lines by two London and up to four regional passenger services per hour, all timed at the full line speed, mean that capacity to create and serve any intermediate stations on the main line is limited, however, new stations could be located on the relief lines which would need to be upgraded in this case.

2.2.3 Cardiff Valleys

The Valleys network is focused on Cardiff Queen Street and Cardiff Central stations. Most trains serve all stations and there is little freight traffic, so that frequencies are limited only by signalling densities and by passing facilities on single lines. Most of the branches terminate with single-track sections at the ends of the routes, limiting the maximum frequency. Within the 'rules of the plan' turnaround margins at these single-track ends are low, often only three minutes, meaning that the timetable has to be constructed with significantly greater layovers at one of the outer ends of routes to allow recovery from any service disruption.

South of Queen Street the route continues to Cardiff Central station where the Valley Lines services use Platforms 6 and 7 exclusively. The high throughput of Valley Lines services results in limited available capacity and flexibility at Cardiff Central, such as for attaching or detaching units. The number of route destinations south and west of Central station does not equal that north of Queen Street and to the east, so that ideally a facility to turn back trains is required. Existing turnback arrangements provide a capacity constraint and some trains proceeding towards the City Lines (Radyr) and Penarth are currently operated largely to form a convenient turnback mechanism, rather than as a response to market need.

Other than the single track sections, the principal limitations on the Valley Lines capacity are Queen Street station, the junction immediately to the north and signalling on Valley Lines northwards. Peak station dwell times at Queen Street are extended for large numbers of passengers to board or alight. Cathays station, less than a mile north of Queen Street, has significant passenger boarding requirements and also forms a constraint on maximising movements through the junction under current signalling.

The 12 trains per hour in each direction through Queen Street Station, once the SPT is introduced in December 2005, is considered to be the maximum practical capacity. Studies between 1999 and 2003 were examining ways to provide a substantial increase in capacity at Queen Street but were halted in favour of the short to medium term strategy of lengthening existing trains to cope with increasing passenger demands.

South and west of Cardiff services mainly serve routes to Penarth and Barry, diverging at the critical Cogan junction. The single-lead junction leading directly onto the single-track branch to Penarth at the limit of the four track section provides a further constraint to the network as a whole. Beyond Barry the route continues as the Vale of Glamorgan line, re-opened for one passenger train per hour in June 2005. The service operates to a re-instated (east) bay platform at Bridgend ensuring independence of performance of Valley Lines services irrespective of any main line perturbations.

2.2.4 Branches east of Cardiff

(a) Ebbw Valley Line

This branch is in course of refurbishment to support an hourly passenger service to Cardiff from Spring 2007, involving the reinstatement of a length of double track to allow trains to pass on the branch. While the branch also has a direct chord towards Newport, further double track initially proposed to allow a second hourly service to Newport has not been provided under the initial reopening works.

(b) Marches Line

This route diverges immediately east of Newport, and is a two-track railway with 90mph maximum line speed. Colour-light signalling from Newport to Cwmbran is due to be extended to Little Mill (north of Pontypool and New Inn station) from where manual signalling with long signal sections exists. The route is shared with a number of freight trains and capacity north of Cwmbran is fully utilised at certain times of the day, particularly as the freight trains can be slowed by a lengthy incline north of Abergavenny.

Although a turnback facility is currently available at Abergavenny under existing manual signalling, this is only for trains terminating in platform 1 lying on the main northbound line. For a more intensive service to operate it would be preferable for overall route capacity to have flexibility to spend the necessary turnaround time more responsively to the needs of other services through an enhanced turnback facility. Such a facility would not be introduced through the planned Newport Area Signalling Renewal scheme without 3rd party funding to Network Rail, though the Signalling Renewal offers the opportunity to implement this measure cost effectively. Sewta is seeking to ensure that the opportunity to add value to the renewals schemes is not lost and is working closely with the Assembly and Network Rail to achieve this.

(c) Chepstow Line

This double-track 90 mph route diverges at Severn Tunnel Junction and continues to Gloucester. The route has multiple-aspect signalling throughout, facilitating its use as a diversionary route to Gloucester in the event of planned or unplanned Severn Tunnel closures. The route is shared with a small number of freight trains, although routeing strategies could potentially significantly increase the number of such trains.

A turnback facility at Chepstow already exists under the current power signalling arrangements. This involves running a short distance beyond the station to change direction and subsequently to occupy the Cardiff-bound platform, with an addition of around three minutes to round-trip time compared with direct entry to and reversal in the platform of departure.

3 INVESTMENT PROGRAMME: 2005 – 2009

3.1 Commitments

There is significant ongoing investment in rail in the region, including £50m investment in additional rolling stock through the Wales and Borders Franchise, which is operated by Arriva Trains Wales. This investment will be used to lengthen trains, to provide a 20% increase in passenger capacity into Cardiff in peak periods and regular clock-face timetables.

Arriva Trains Wales is implementing a standard pattern timetable (SPT) from December 2005 as part of franchise commitments to improve services. In the Sewta area this will provide: additional stops at Pencoed, Pontyclun, Pyle and Cwmbran stations; two morning peak arrivals at Cardiff from Maesteg; additional early morning and late evening services to Aberdare; a regular 15 minute service to Cardiff Bay and; changes in rolling stock to relieve overcrowding between Cardiff and Abergavenny in the evening peaks.

The existing Sewta Rail Improvement Programme covers the period from 2005 to 2010 and includes a number of significant investments and improvements to the rail network and services. A number of commitments are in the course of delivery:

- Enhanced frequencies to Bargoed (4 trains per hour) from January 2006;
- Additional Rolling Stock to reduce peak overcrowding from June 2005;
- Platform extensions (to 4-car) on the Aberdare Line from June 2005;
- Two new services:
 - Vale of Glamorgan Line; the extension of Valley Lines services from Cardiff south-westwards to Bridgend via Barry and with new stations at Rhoose Cardiff International Airport and Llantwit Major (opened on 12th June 2005); and
 - Ebbw Valley Line; Phase I of the Ebbw Valley passenger rail service, from Ebbw Vale Parkway to Cardiff, calling at new intermediate stations at Rogerstone, Risca, Crosskeys, Newbridge and Llanhilleth (due to open in spring 2007).

3.2 Other Planned Improvements

In addition there are a number of programmed improvements which have received indicative support from the Minister of Economic Development and Transport:

- Cynon Valley frequency enhancement to half hourly (largely delivered by the Standard Pattern Timetable);
- Merthyr Tydfil frequency enhancement to half hourly;
- Abercynon Station remodelling and park and ride;

- Platform extensions - Treherbert and Rhymney Lines for 6-car trains, Maesteg Line for 4-car trains;
- New Stations at Llanharan, Brackla and Energlyn;
- Rhymney corridor frequency enhancements (2 tph to Rhymney);
- Maesteg Line frequency enhancement (to 2 tph); and
- Station improvements – Abergavenny, Cwmbran, Severn Tunnel Junction, Cardiff Queen Street and Newport.

The station improvements developed for Pontypool & New Inn Station have been reprogrammed to beyond 2009.

4 STRATEGY ISSUES AND OBJECTIVES

4.1 Regional Economic Objectives

The purpose of this study is to develop a rail strategy for South East Wales which meets the requirements of the region in the period 2009 – 2018. It was therefore important to define relevant evaluation criteria for appraising possible strategy elements and assessing the contribution of the resultant rail strategy.

To define the appraisal criteria a review of National, Regional and Local policy and strategy documents was undertaken. In addition current issues associated with the rail network and passengers' expectations and priorities were also reviewed. The key conclusions of the reviews formed a presentation to the Stakeholders at the consultation event held on 12th April 2005 where further views were taken on board. The key issues are documented in a separate Consultation Statement report and summarised in this section.

4.1.1 National Objectives

The key national objectives were identified from four key documents; 'Wales a Better Country', which sets out the Strategic Agenda for Wales; 'A Winning Wales', which sets out the National Strategy for Economic Development; 'People, Places, Futures', which outlines the Spatial Plan for Wales, and; the Transport Framework for Wales, which defines the transport plan and priorities between modes.

The documents emphasise the importance of transport in providing for the connection between people and jobs and to improve the opportunities for those without jobs to gain employment in the growth areas. Transport should assist the continued growth of the region through delivering the labour supply needed by business. The emphasis should be on the connection between the Valleys and the Coastal Plain. In addition, transport should also aid the regeneration of the Valleys and enhance the potential for inward investment.

The National transport strategy aims to achieve sustainable accessibility and is focused on:

- Improving strategic corridors;
- Improving ports and airports;
- Increasing rail freight;
- Providing for those without access to cars;
- Discouraging car use in urban areas;
- Providing free bus travel to the elderly and disabled; and
- Enhancing public transport access to employment.

A key objective for the Sewta region is to influence the modal split in the urban areas of Cardiff and Newport through encouraging the use of sustainable modes as an alternative to the use of private cars.

Within the Sewta region the rail network provides a strategic transport network segregated from the highway network and offers sustainable travel choices. Improving the rail network and services will help to achieve the transport strategy and national objectives.

The National Transport Framework adopts the Department for Transport (DfT) national transport objectives and appraisal criteria based on the five objectives of Environment, Safety, Economy, Accessibility and Integration.

4.1.2 Regional Considerations

The South East Wales Development Strategy's vision is for the Sewta region to become one of the most prosperous in Europe and provide opportunities for all to share the prosperity. It identifies 'Connectivity' as one of 5 key drivers of competitiveness and aims to secure an Integrated Regional Transport Network.

Between 1981 and 2001 the population of the East and South of the region grew substantially (particularly, Monmouthshire, Cardiff and the Vale of Glamorgan) whilst the populations of the northern Valleys declined – particularly Blaenau Gwent and Merthyr Tydfil. The population of South East Wales is expected to grow by 1% between 2006 and 2011, by 1.2% between 2011 and 2016 and by 1.1% between 2016 and 2021.

Passenger priorities for rail service, train and station improvements have been identified through research by the Oxford Research Company for Arriva Trains Wales. These have been defined in terms of Primary Drivers, Secondary Drivers and other key factors;

(a) Service Factors

- **Primary Drivers:** Punctuality/reliability, value for money and journey time.
- **Secondary Drivers:** Train frequency, train connections.

(b) Train Factors

- **Primary Drivers:** getting a seat, cleanliness.
- **Secondary Drivers:** Seat comfort, ease of access, temperature and announcement of delays.
- **Other key Factors:** Toilets.

(c) Station Factors

- **Primary Drivers:** Staff available.
- **Secondary Drivers:** Toilets, announcements of delays, announcements of arrivals/departures, train time information, CCTV cameras.

Consultation with the regional stakeholder group provided additional views on the priorities and appraisal criteria which are needed when evaluating elements of the rail strategy. The key regional objectives were defined as accessibility and social inclusion. For example; emphasis needs to be placed on providing transport improvements to those areas where accessibility is important, even though these routes may not be as profitable as busy commuter routes. The strategy should make provision for the less advantaged, and for economically deprived areas.

4.1.3 Strategy Appraisal Criteria

Within the overall framework of the National Transport Objectives ten appraisal criteria were defined as outlined below.

(a) Environment

A key sustainability objective for transport is to preserve or enhance the environment – taking account of the direct and indirect impact on the physical environment and also air quality and noise.

(b) Safety

Improving safety and security through investment in transport is a key national objective. Public Transport investment encourages a switch from congested highways with a resultant reduction in the incidence of accidents.

(c) Economy

An objective of transport investment is to enhance the economy and it should also represent good value for money.

Improving the economy of the Sewta region is a core regional and national objective. It was agreed that investment in transport directed at improving the economy through improving access to jobs and widening labour market catchment areas would lead to the achievement of other national and regional sub-objectives related to employment, health and education.

It was agreed that the strength of the business case, which influences the likelihood of funding, was a key criteria within the development of the rail strategy.

(d) Integration

At a National level the integration objective relates to integration between modes and integration between policies including land-use.

Integration with the Regional Spatial Strategy is an important objective for determining the rail strategy. A regional distinction can be drawn between needs in the core 'journey to work' area and the needs of the communities beyond.

- The core Cardiff and Newport journey to work areas extend out to Barry, Pontypridd, Caerphilly and Cwmbran. Here there is a need to provide attractive rail services to access jobs in Cardiff and Newport, and to reduce use of the highway network.
- Towards the Heads of the Valleys the social impact of the railway is more important, although peak commuting from the lines north of Pontypridd and Caerphilly is important in the Sewta Strategy.

While there is a need for better integration of transport with land use policy (e.g. in employment areas in Newport and Cardiff, major residential areas and tourist areas), this policy should involve locating development at rail-accessible locations, rather than extending the rail network.

(e) Accessibility

Enhancing accessibility is a key National Objective and improving access to the rail network is a key regional objective – specifically between the Valleys and Coastal Plain employment areas (including Cardiff Airport). Dimensions of the Sewta Rail Strategy include:

- In the Mid-Valleys there is housing development and population growth with a need for access to jobs in Newport and Cardiff, which rail can influence;
- Other employment locations - including important developments around motorway junctions - are remote from stations and will require integration with the bus network; and
- Reverse flows of people from the region to other areas should also be provided for.

A key measure is the change in spatial accessibility of locations determined by the Spatial Strategy, and particularly of employment locations. Sewta is prepared to pay a premium price to secure the ‘option value’ of accessibility, where necessary.

(f) Connectivity

Improving connectivity is an important regional objective. The railway should serve the polycentric development of the region, in which a core rail network would provide frequent fast services between the main centres. Further integration with ‘social’ rail routes and bus routes would serve other corridors and catchments.

Key targets for rail connectivity included:

- east – west movements, especially between the key centres and along the M4 corridor (including preserving international routes);
- movements to the Midlands and to Bristol; and
- movements along the valleys.

(g) Reducing Car Travel

Traffic congestion is a key regional problem where rail can have a significant impact, particularly where additional park and ride capacity is provided. The key congested areas within the region were defined as in and around Cardiff and Newport, which are the focus of the rail network.

(h) Making Best Use

Optimising the use of infrastructure in the region was identified as an important objective. Preserving and enhancing reliability is a key passenger priority and an important objective for the rail industry. This was seen as especially important on the Main Line.

Adequate capacity, both of train services and of car parks, needs to be provided. Reducing the barriers to rail travel is important through investment in stations and improved rolling stock. Usage is influenced by the pricing of transport as well as by physical accessibility. Introduction of smart cards could help change fares structures and ease of use.

The Assembly has specified a minimum rail service level in Wales of 1 tph, and 2tph in journey to work areas. Within the expanding journey to work areas of Cardiff and Newport the basic passenger frequency expectation is for at least a half-hourly service, with higher 'turn-up-and-go' service frequencies in the core journey to work area.

There is a potential conflict between freight trains and passenger services and the interpretation of regional objectives suggests that the Sewta rail network strategy should emphasise movement of people rather than of freight. However, freight operators have pathing rights in the region and therefore investment should seek to balance both needs and provide capacity that would enable both markets to grow together.

(i) Passenger Impact

The impact of journey quality on the strategy will be important in terms of existing travellers who would be influenced by changes in journey time, train capacity and crowding. The demand modelling takes specific account of these impacts in terms of assessing value for money.

Overcrowding has been identified as a key regional issue which diminishes the quality and attractiveness of rail services. Overcrowding is particularly evident for those passengers boarding at the mid valleys and outer Cardiff urban stations on inbound journeys. For passengers on return journeys there is an added issue that those destined for outer stations would seek, as a result of overcrowding at City Centre stations, to join the train at Cardiff Central rather than risk not being able to board a specific peak train at Cardiff Queen Street. Similarly, some users of Cathays station join the trains at Cardiff Queen Street in the peak.

The SRA's national overcrowding standards are based on London and the South East of England and are not appropriate for South East Wales. Despite peak road congestion, driving to Cardiff and Newport is still an option for many commuters and door-to-door journey times can be similar to rail. Rail must offer a comfortable and stress-free alternative to driving to be successful at influencing the modal split for trips into the urban centres. Passenger research has shown that getting a seat is a key passenger priority for train services and is defined as a primary driver of demand.

(j) Deliverability

A key criteria for development of the rail strategy is the practicality of schemes and their interdependence.

4.2 Passenger Growth and Capacity Issues

4.2.1 Valley Lines

There has been considerable growth on Valley Lines services within the Sewta region over the last few years – leading to peak period overcrowding and investment in additional rolling stock to lengthen trains to accommodate demands.

The current Sewta rail improvement plan to 2010 includes considerable investment in longer platforms throughout the region to enable further train lengthening to meet even greater demand growth.

There are two key issues for the Sewta Rail Strategy to address for the period between 2009 and 2018:

- The requirement for additional rolling stock – with additional subsidy requirements; and
- Whether the investment in longer trains will accommodate anticipated demand on the Valley Lines north of Cardiff. If not there might be a need for additional frequency – requiring additional capacity in the Cardiff Queen Street/ Cardiff Central area. This would involve a major infrastructure investment which would need to be a key part of the Sewta Strategy.

These key questions were examined by the application of growth factors to observed peak train counts⁴ and an assessment of the future demand against the planned maximum line capacities. The analysis concentrates on selected Valley Lines routes within the Sewta region where capacity problems are forecasted during the Strategy period.

4.2.2 Newport Services

Table 1 shows the recent change in demand for regional services on the lines serving Newport. Train count and rolling stock data supplied by Arriva Trains Wales revealed that there was 64% - 80% spare capacity (standing/seating) on Chepstow Line peak trains. Marches Line services will increasingly be operated using class 175 trains from December 2006 and there will be between 32% and 47% spare seating capacity. There is significant scope for lengthening trains on these services with the only constraint to 4-car length trains being at the down platform at Caldicot (3-car).

Table 1 Other Sewta Stations Patronage Change

Line	Average Annual Growth 2003 – 2005
Marches Line (Abergavenny, Pontypool&New Inn, Cwmbran)	2%
Chepstow Line (Chepstow, Severn Tunnel Junction, Caldicot)	8%
Average	5%

4.3 Passenger Growth Forecasts

Table 2 shows the growth in patronage on Valley Lines services between 1998 and 2004 and between 2001 and 2004 by line. There was little growth in 2001/2002 probably as a result of the network disruption following the Hatfield accident. The table shows that there was an average growth of 10% per annum between 1998 and 2004 with all lines growing by at least 5% per annum on average and most lines growing between 7% and 10% per year.

The table also shows that between 2001 and 2004 there was significantly less growth – 5% per annum on average across all lines. The Aberdare line frequency was increased from hourly to half hourly (throughout most of the day) in September 2003 and this line grew at 3% per annum before this change. Some lines may already be capacity constrained – affecting the potential for demand to grow – particularly the Barry Line. Other lines have significant spare capacity and potential to grow – such as the Cardiff Bay, Penarth, Coryton and City Lines, however, individual peak hour trains are heavily used.

⁴ Spring 2005 data, figures subject to change as a result of the introduction of the SPT December 2005

Table 2 Average Growth per Annum, Valley Lines

Line	1998 - 2004	2001 – 2004
Bay	28%	15%
City	6%	5%
Aberdare	17%	11%
Barry	8%	0%
Penarth	10%	5%
Coryton	5%	5%
Merthyr	8%	-1%
Treherbert	7%	1%
Rhymney	7%	3%
Maesteg	-	11%
All Lines	10%	5%

To estimate the potential impact of passenger growth on the Valley Lines throughout the evaluation period the 2004 peak train counts provided by Arriva Trains Wales were summed for the 2 hour AM peak (0730 – 0930 arrivals at Cardiff) and for the 2 hour PM peak (1630 – 1830 departures from Cardiff) for the most heavily used lines.

Two demand forecasts were applied:

- Central Demand based on GDP Growth; and
- High Demand – using the average Valley Lines Growth between 2001 and 2004 (5% per annum).

The Central GDP based forecast is the approach recommended in the Rail Passenger Demand Forecasting Handbook (PDFH) used in the rail industry. The Forecast GDP growth was derived from the Royal Bank of Scotland Quarterly Economic Update (5th April 2005) for the period between 2004 and 2007 and the long term GDP growth forecast was taken from the Treasury Budget March 2005 report. The GDP rates applied were 2.6% to 2005, 2.7% to 2006, 2.5% to 2007 and 2.25% per annum between 2008 and 2018.

The impact of planned frequency increases between 2004 and 2010 were also taken into account on the Rhymney Line, Merthyr Line and Maesteg Line.

In addition Cardiff Council is considering the introduction of a congestion charge for the Capital – to improve traffic flows and generate income to invest in transport projects. Such a scheme would probably be integrated with the current Severn Bridge Tolls and possible tolls on an M4 relief road planned to be constructed around Newport. A congestion charge would alter the relative generalised costs of travel between road and rail in the region and would be expected to have a significant impact on the demand for rail services.

The estimated impact of a Congestion Charge on rail demand used the procedures recommended within the Rail Passenger Demand Forecasting Handbook (PDFH) assuming a flat rate congestion charge of £2.50 per day introduced in 2013. For a typical trip (Pontypridd – Cardiff) the scale of impact on the total journey costs for car users was estimated by applying a cross elasticity of rail demand to car cost of 0.4 (a 100% increase in car costs would lead to a 40% increase in rail demand). The resultant factor was an 18% increase in rail demand.

4.4 Capacity Analysis

The increase in rail demand was compared with the base capacity for each line and also the planned maximum capacity taking account of the maximum train length and frequency for each line, assuming all peak period trains are lengthened to the maximum possible. Both capacity measures took into account seating and standing. In addition, the impact on the 'peak train' on each line was examined through analysis of the difference between the peak train count and the average peak period count for each line.

On the Marches and Chepstow Lines there will be sufficient capacity to accommodate anticipated growth in passenger demand on the planned services. However, the analysis suggests that there will be a requirement for additional rolling stock on Valley Lines services if peak period demand increases are to be accommodated without overcrowding or demand suppression. We have estimated the additional rolling stock requirements over and above 2008. This assumes that rolling stock increases are funded between now and 2008 to meet the needs of demand growth identified in the current short term improvement programme. The analysis concentrated on the period between 2009 and 2018.

The capacity analysis for each line was included in detail in the Part 1 report⁵, based on 4-car trains on the Aberdare, Barry Island and Merthyr Lines and 6-car trains on the Treherbert and Rhymney Lines. The conclusions are:

- Under the high growth forecast there is a need for a frequency increase (at least to relieve the peak train) on the following lines;
 - Aberdare PM peak (2018);
 - Barry Island AM peak (2016) and;
 - Rhymney Line AM peak (2014).
- Assuming the high growth scenario the additional impact of the possible Congestion Charge could result in the need for;
 - Additional rolling stock to strengthen trains on the:
 - Aberdare Line;
 - Barry Island Line;
 - Maesteg Line;
 - Merthyr Line;
 - Rhymney Line; and
 - Treherbert Line.
 - Additional need to increase peak frequencies on the:
 - Aberdare Line around 2016;
 - Barry Island around 2014;
 - Merthyr Line around 2018; and
 - Rhymney Line in 2013 and 2018.

When peak periods train loads are high it may be difficult for the train guard to undertake the passenger count which might result in an under-reporting of train usage. It is recommended that additional independent surveys are undertaken to validate the peak period train counts for the purpose of rolling stock planning and the further assessment of capacity requirements.

⁵ Sewta Rail Strategy Study, Final Part 1 Report, August 2005

An under-prediction in the train counts would result in the need for additional service frequency through Cardiff Queen Street station earlier than suggested above.

4.4.1 Capacity Analysis Conclusions

In conclusion, if rail demand grows at the Central Growth rate (based on GDP) there will be a significant need to invest in additional rolling stock to lengthen trains on the Valley Lines services – making use of the investment in longer platforms in the region.

However, demand on the Valley Lines has been growing at a rate significantly above GDP – possibly as a result of the economic changes in the sub-region, including the growth of the Capital City in providing jobs, retail and leisure activities at a greater rate than other centres in South East Wales resulting in its widening area of influence. If this high rate of growth in rail demand is continued and overcrowding is to be avoided, there will be a need for:

- Significant investment in additional rolling stock, providing the opportunity to secure increased benefits to the region from a new build of trains for the region; and
- A moderate frequency increase on the Valley Lines north and south of Cardiff Queen Street / Central of around 2 trains per hour (tph) in the peak, with additional operating costs in the order of £2.5m per annum.

Within the SPT, Barry Island trains run to Merthyr Tydfil and Aberdare, where platforms are designed for 4-cars. This means that the line will be unable to accept trains from Rhymney which limits timetabling flexibility. Under the high growth scenario the Barry Island peak trains will be unable to cope with demand and there will therefore be a need to lengthen platforms on the Barry Line to 6-cars. This will have a knock on impact for platform lengths on the Merthyr and Aberdare Lines or will require the SPT to be recast.

In addition, the congestion charge could result in a significant transfer of trips to rail, placing additional pressure on heavily loaded services and requiring additional train strengthening on most if not all Valley Lines. This impact would require further detailed analysis but could be in the order of:

- 6 + additional vehicles⁶, with annual operating costs of £3.0m for lengthening existing trains; and
- Additional frequency increases (with further additional operating costs in the order of £2.5m per annum) and increasing the number of trains through Queen Street station by a further 2 trains per hour in the peak.

As Queen Street station is considered to be operating at capacity in December 2005 when the SPT is introduced, there will be a need for a significant investment in additional capacity for both trains and passengers to be made at the station if the high growth demand forecast is to be realised. There would be a need for further additional capacity if the Congestion Charge was introduced.

⁶ Many trains in the region are currently operated with 2-car (vehicle) sets.

Assessment of the appropriate infrastructure scheme would need to take account of the long term requirements for capacity and performance as this is a critical section of the Sewta Rail network. An ongoing study for the Assembly is reviewing capacity issues at Cardiff Queen Street station, capacity between Queen St and Cardiff Central and the operation of the Cardiff Bay branch.

Network Rail is currently at the early stages of optioneering for the Cardiff Area Signalling Renewal Scheme. If enhancements for growth are to be built into the resignalling Network Rail will require commitments from Sewta / WAG to enhance the scheme if the marginal cost opportunity for frequency increases is not to be lost.

5**DEVELOPMENT OF THE SEWTA RAIL STRATEGY****5.1 Introduction**

The development of the rail strategy for 2009 – 2018 was undertaken in two stages. Firstly a long list of aspirations was examined against the Sewta Objectives / Criteria and, using available data, a short list of schemes was produced for detailed assessment. The more detailed evaluation involved the development and application of new demand forecasting models, the application of an operating cost model, site visits, an engineering review, capital cost estimates and economic analysis. Alternative options were compared and emphasis was placed on the strength of the business case in selecting the elements for the recommended strategy.

5.2 Operations, Engineering and Costs

Delivery of the timetable is a complex combination of many elements that are managed separately by Network Rail and the Train Operating Companies. The practicality of proposed schemes depends on whether track layouts are available, and whether appropriate resources are proposed for rolling stock and staff diagrams. Local passenger services need to be accommodated on infrastructure, which is shared in part with significant high speed long distance, regional passenger and freight traffic.

Whilst it was not possible to undertake detailed timetable analysis for the wide range of schemes that needed to be assessed in the study within the study resources available, we have taken account of network capacity issues and, where necessary, included initiatives to ensure that the performance of existing services is not compromised.

Operating cost estimates were based on the latest Jacobs Consultancy model developed over a wide range of projects including franchise replacement and past bids through the Strategic Rail Authority's (SRA) Rail Passenger Partnership funding. We have adapted the model to reflect the Arriva Trains Wales operations. The model takes on board the length and proposed timetable of services, the assumed rolling stock and a range of other factors including staffing, maintenance and Network Rail costs and produces base level estimates at Q1 2004.

An experienced rail engineer has estimated the infrastructure requirements for the various schemes through site visits and the use of in-house experience of rail scheme development and costing. We have liaised with Network Rail included provision for a robust – first order – estimate of the costs (at Q1 2005), taking account of the Guide to Railway Investment Projects (GRIP) and a qualitative assessment of risks.

5.3 Passenger Demand Forecasting

Demand forecasting procedures were adopted for the assessment of changes to the existing rail network and services, for additions to the network and new services. To ensure that the various schemes under consideration were assessed on a common basis, with common understanding of the level of underlying passenger demand growth, the rail industry "Passenger Demand Forecasting Handbook" (PDFH) techniques, inputs and assumptions have been used.

The base demand estimates developed using PDFH methods over a 15 year horizon are based on:

- Available forecasts for regional GDP (taking into account Government projections); and
- Analysis of trends in passenger growth, which have been higher than the GDP forecasts would have predicted.

Scheme assessments were undertaken using the regional GDP forecast – of underlying long term growth of 2.25% per annum. The appraisal of the Valley Lines North / Queen Street capacity improvement scheme assumed 5% growth per annum – which would trigger the need for the scheme.

(a) Moira modelling

For service changes between existing stations we used a “Moira” model⁷ provided by Arriva Trains Wales as:

- It was ready to use with the latest available rail industry passenger volume and timetable data;
- It uses the industry accepted PDFH procedures and values;
- It models individual train service departure times, unlike many other models which consider only journey time and frequency. This is useful when considering relatively infrequent train services or particularly peaked demand profiles e.g. commuting into Cardiff; and
- The model contains zoned data for the whole of the UK, providing adequate detail for the study area, but also covering other areas including stations on the routes to Swansea, Hereford, Gloucester and Bristol for local services, and stations as far afield as the North West of England and Cornwall for the long distance inter-regional services which strengthen the local services in the Sewta area.

A 2009 base model was developed by updating the timetable from that which was in place in June 2005, firstly to the Standard Pattern Timetable for December 2005 and, secondly, to include the proposed service level increases on the Maesteg, Merthyr and Rhymney Lines.

(b) New stations and routes

Where base data does not exist, as in the opening of a new station, we developed an ‘analogous trip rate’ model using SPSS⁸ to calibrate the model against existing station flows. The model takes account of the catchment characteristics as well as travel times and costs. Demographic data was taken from the 2001 Census, including population numbers and car ownership and GIS techniques were used to produce the information for concentric zones around new and existing stations at 800m and 2km.

⁷ An integrated elasticity based demand forecasting model for rail services, combining passenger journey, network, timetables and earnings allocation between train operators.

⁸ Statistical Analysis Package for the Social Sciences, a data management and statistical analysis computer programme.

For the majority of stations account was taken of the overlapping of catchment areas with the data being allocated to the nearest station. The journey details included distances, times and fares (and in combination as forecasts of generalised travel times). The database also took account of station characteristics such as parking availability and competitive bus operations.

Models were developed for the key flows - to Cardiff and Newport - and expanded to all flows using an average uplift factor for the whole network and by analogy with trips from existing 'shadow' local stations with similar characteristics and service levels.

More detail on the development and form of the model is provided in the Appendix to the separate Technical Appendix to this report.⁹ This model was applied to new stations in Part 2 of the study, however, for stations previously assessed in detail and recommended in the earlier TIGER study¹⁰ those forecasts have been used.

5.3.2 Economic Evaluation.

The economic evaluation has been undertaken in line with the latest government guidance including the SRA bidding guidance and business case manual and the DfT's New Approach to Appraisal of Transport schemes.

(a) User benefits

Journey time benefits were derived from the generalised time outputs taken from the Moira model, combined with values of time and value of time growth as specified by DfT in their Transport Appraisal Guidance. Additional user benefits associated with other features of the investment schemes, such as reductions in crowding were calculated based on PDFH guidance.

(b) Non-user benefits

The main non-user benefit associated with rail service changes, new stations and related schemes is the impact on road congestion costs associated with passengers switching between road and rail. The passenger demand calculations provided the estimate of the changes in rail passenger demand volumes. This was combined with estimates of the proportion of passengers transferring to / from car, based on available data. Suitable values for road user congestion benefits associated with net changes in vehicle kms on the road were taken from the SRA bidding guidance. In addition accident benefits were added by factoring up decongestion benefits and air quality benefits were calculated based on the reduced car trip kilometres and appropriate rates/values derived from appraisal guidance.

5.3.3 Appraisal

The economic evaluation brought together the capital and operating costs with revenues and forecast user and non-user benefits using procedures in line with DfT/SRA guidance. The price base and discounting base is 2002 and all capital costs included risk and contingency and a general 'optimism bias' factor of 57%.

⁹ Sewta Rail Strategy Final Report – Technical Appendix, January 2006.

¹⁰ TIGER Rail Strategy Study Final Report 2001, Updated TIGER Rail Strategy Final Report September 2005

In determining the business case of schemes account was taken of the DfT's guidance¹¹ on value for money for transport schemes. Specifically most schemes with a quantified benefit cost ratio (BCR) of 2.0 or above would be supported, some schemes with BCR between 1.5 and 2.0 would be supported and few schemes with BCR below 1.5 would be supported.

However, where a scheme has significant non-monetised benefits, such as providing economic regeneration benefits to an assisted area, the BCR and funding decision could be raised by one category - i.e.: a scheme with BCR above 1.5 would be likely to be supported subject to available funds.

¹¹ Guidance on Value for Money: Explanatory Note, DfT, 15.12.04

6 RECOMMENDED STRATEGY FOR 2009 – 2018

6.1 Introduction

The Sewta Rail Strategy for 2009 to 2018 should build on Sewta's current and ongoing investment in the capacity and performance of the network. The current investment programme includes:

- Longer platforms to accommodate longer trains;
- Improved junctions, reduced signal spacing and dynamic passing loops to improve journey times and reduce delays;
- Improved access to stations – including investment in car parking at key locations; and
- Improvements in station environments including safety measures.

The **recommended** Sewta Rail Strategy for the period 2009 – 2018 is designed to achieve three core objectives to; make better use of existing rail services; provide for passengers' needs, and; achieve the regional economic and social objectives.

In summary the strategy (shown in Figure 2) includes:

- **Additional rolling stock** to strengthen peak trains to provide for passenger growth and to avoid overcrowding and **rolling stock renewal**;
- **Station improvements** including improved station facilities, information, security and access - including additional parking;
- **Reliability and capacity improvements**; changes to the network to reduce delays and improve the ability to cope with performance problems; specifically at Cardiff Central, Cardiff Queen Street, Barry, Cogan Junction and Llandaff;
- **Frequency enhancements on existing lines**; improving the levels of service on selected routes to meet passengers' expectations and increase the transfer of car trips to rail; specifically new services on the Abergavenny, Chepstow, Ebbw Vale, Rhymney Valley, Taff Vale and Vale of Glamorgan Lines. Additional services to the north of Cardiff are required to cope with the growth in passenger demand and will require a significant investment in the capacity of the network **at and between Cardiff Queen Street and Cardiff Central stations**;
- **New stations on existing lines**; improving access to the rail network and integrated with the development of improved services; specifically at Caerleon, Magor with Undy, Llanwern, Coedkernew and St Mellons. With those on the main line between Cardiff and Severn Tunnel sited on the Relief Lines;
- **Network extensions and new stations**; to investigate further improving access to the rail network through extending to Ebbw Vale Town and from Pontyclun to Beddau (with stations at Talbot Green, Llantrisant, Gwaun Meisgyn & Beddau); and
- **Rail – Link Bus Services**; to extend the reach of the rail services to communities remote from the network, specifically providing access to the Valleys to the north of Cardiff and Newport.

Figure 2 Recommended Sewta Rail Strategy 2018



A summary appraisal of the strategy against the identified National / Regional objectives is provided in Appendix A.

6.2 Additional Rolling Stock and Rolling Stock Renewal

6.2.1 Additional Rolling Stock Requirements

The passenger demand growth and capacity analysis presented in sections 4.2 to 4.4 highlighted that if rail demand within the Sewta area continues to grow there will be overcrowding of peak trains and a need for additional rolling stock to enable demand to continue to grow. Table 3 shows the rolling stock requirements and subsidy issues under the high growth assumptions (5% per annum). Under central growth assumptions the additional rolling stock required at 2018 would be 4 vehicles¹².

The analysis assumes train strengthening using Class 150 vehicles which are available as 2 and 3 car trains and can be used in combinations. The operating costs assume a 50% ‘bounce-back’ – i.e.: that half of the additional rolling stock would be on trains that complete more than 1 journey into Cardiff in the peak period. Performance and operational constraints at Cardiff Central and Queen Street Stations limit the opportunity to couple / decouple trains to reduce off-peak operating costs. As a result the evaluation has assumed an average operating cost of £250,000 per vehicle.

Table 3 Rolling Stock Requirements, Subsidy and Benefits 2009 – 2018

Year	Additional Rolling stock (Vehicles) (High Forecast)	Subsidy Required £k	Decongestion Benefits £k
2009	2	£327	£261
2010	3	£467	£429
2011	4	£590	£621
2012	5	£706	£822
2013	7	£1,066	£1,034
2014	8	£1,169	£1,256
2015	10	£1,504	£1,507
2016	12	£1,814	£1,794
2017	14	£2,101	£2,117
2018	17	£2,589	£2,513
Totals		£12,332	£12,353

The demand released by the provision of additional rolling stock would generate revenues which would only serve to partially offset the additional operating costs and would result in a subsidy level growing from £0.3m in 2009 to £2.6m in 2018. However, the assessment of non-user benefits alone shows that the subsidies are justified with a ratio of benefits to net costs of around 1.2. In addition there would be significant additional user benefits associated with crowding relief and also wider regional benefits associated with the journey to work opportunities taken up as a result of the capacity provided, particularly to the Valleys to the north of Cardiff.

¹² Many trains in the region are operated with 2-car (vehicle) units.

It is **recommended** that additional rolling stock is funded for lengthening the Valley Lines services over the strategy period to meet the rising demand for peak rail travel. It is also **recommended** to investigate the potential to encourage peak spreading to make best use of peak period train capacity. In addition it is **recommended** that the strategy should examine the need for further platform lengthening to increase train lengths to meet peak demand needs and increase the flexibility to operate 6-car trains – specifically on the Barry Line.

6.2.2 Rolling Stock Renewal

There is an opportunity to secure new rolling stock instead of cascading old rolling stock from elsewhere. Arriva Trains Wales have identified that there will be a lack of suitable (Class 150 'Sprinter') rolling stock available for the additional Valley Lines operations and that modification of available Class 158 stock is impractical for a more intensive urban operation. In addition, the Class 14x (Pacer) rolling stock will be at least 30 years old by the end of the strategy period and, coupled with the need for significant investment in capacity to allow for passenger growth, there is a need to secure new rolling stock for the Sewta services.

There would be a number of possible advantages of rolling stock renewal:

- Positive image impact for the region;
- Specification of Valley Lines stock;
 - Faster acceleration for journey time savings / performance benefits;
 - Large number of doors for faster access / egress; and
 - 3-car sets designed for improved capacity / lower operating costs / revenue protection (conductors).
- Possible link with technological development, such as Fuel Cells to provide the benefits of regenerative braking.

It is strongly **recommended** that the opportunity to secure new rolling stock rather than cascaded rolling stock is evaluated in detail in the negotiations for the second half of the Arriva Trains Wales franchise. The fleet strategy needs to be developed in the short term.

6.3 Station Improvements and Park and Ride

It is **recommended** to improve the attractiveness of rail service through investments in the quality of stations and improves access to the rail network. These suggested measures include:

- Station Facility improvements – such as improved waiting shelters and, at larger staffed stations, toilets;
- Station access improvements – such as improved pedestrian and cycle access;
- Customer information improvements;
- Security measures, including CCTV; and
- Park and ride expansion.

The measures are designed to make better use of the existing infrastructure and services, encouraging more rail use, attracting extra revenue and encouraging modal shift. They would tend to be packages of small schemes which can be funded and delivered through the annual Transport Grant bidding process and / or future franchise specifications. They are likely to be relatively good value for money and could be targeted to meet the objectives of the spatial strategy and to provide improved access to jobs.

Station improvement schemes could be developed as line improvements, where the investment involves line-side / whole route measures, such as provision of electronic Customer Information Systems and upgrading and extending CCTV systems. Otherwise station improvements would have more overall impact when delivered as a package of measures, improving all aspects of the journey through the station to provide maximum impact. This is currently envisaged in the existing Sewta rail improvement programme which specifies:

- Improved opportunities for interchange and integration between modes (car, rail, bus, taxi, cycling and walking);
- Equality of accessibility for mobility impaired people;
- Improved waiting facilities;
- Measures to increase throughput of passengers;
- Up-to-date real time information; and
- Maximising personal security.

6.3.1 Station Improvements

Station improvement schemes within the current 5 year rail improvement programme include several of the larger stations in the Sewta area including, Abergavenny, Cwmbran, Severn Tunnel Junction, Barry, Bridgend, Merthyr Tydfil and Porth. The programme needs to be further developed to ensure that these first order (based on passenger throughput / strategic importance) stations are all meeting a specified standard and then addressing further locations based on a combination of passenger throughput and regional importance. This could take into account station roles, such as interchange, as well as local factors, such as neighbouring land-uses and the spatial strategy to support redevelopment and regeneration.

Account should also be taken of other investment programmes and initiatives – for example the SRA/DfT ‘Access for All’ fund could include fully staffing some stations in the region, possibly Penarth and Pontypridd. However, many stations in the region are not fully accessible. It would be necessary to undertake audits of stations and to develop a programme of accessibility improvements schemes for individual locations.

We **recommend** a systematic process of audit, design and development to develop a programme of station quality improvement schemes based on stations that generate over 100,000 passenger journeys a year and taking account of the regional objectives including the spatial economic strategy.

We would envisage that CIS schemes could be important in some other locations, such as where there are interconnecting bus services, stations with various services / routes, stations where more than 1 platform is used to serve the same destination and where significant other investment is proposed and the combined investment could produce greater benefits (eg Park and Ride expansions). However, we also recognise that provision of CIS increases passenger confidence in using rail services, which can be particularly valuable even where service frequencies are low.

Some suggested priority locations for general station facility improvements within the strategy are;

- Aberdare
- Abergavenny
- Bargoed
- Barry
- Cadoxton
- Caerphilly
- Cathays
- Chepstow
- Cwmbran
- Llandaff
- Merthyr Tydfil
- Penarth
- Porth
- Pontypool & New Inn (when service frequency is increased)
- Radyr
- Taffs Well
- Treherbert
- Ystrad Mynach

The SRA Minimum Facilities at Stations (MFAS) programme categorised stations according to their level of use, specified facility levels for each station category and defined station improvements required to meet the standards. Design work has been undertaken and a pilot scheme was implemented at Trefforest Station.

Funding for the programme has been curtailed, however, there are approved designs for facility improvements such as waiting rooms, toilets, customer information systems and public address systems at a number of the stations listed above.

The SRA 'Access For All' programme aims to improve access for mobility impaired travellers and has recommended customer information and public address system improvements at some stations in the Sewta region. This programme has funding and Sewta could therefore work in partnership with the DfT / Welsh Assembly to develop jointly funded station improvement packages within the strategy.

From the number of stations within the Sewta Area over the specified threshold, and assuming a number already meet the standards or will be improved between 2005 and 2009, it is recommended that a programme of investment of 2 stations per annum through the period 2009 to 2018 is developed.

6.3.2 Park and Ride Expansion

Park and ride schemes could have a greater impact on the objectives of the spatial strategy by providing improved access to jobs for residents of the valleys. Table 4 shows the available data for use of the existing park and ride sites. Note that some stations may have low parking demand as a result of low service frequency and / or security problems, (eg: Pontypool & New Inn and Maesteg).

From this information the priorities for expansion of existing car parks have been determined as:

- Taff Vale Line, between Radyr and Pontypridd;
- Rhymney Line, South of Bargoed;
- Aberdare Line;
- Between Bridgend and Cardiff; and
- Barry Station.

Park and ride expansion schemes within the station improvement packages in the existing Sewta rail improvement programme are currently planned for Abergavenny, Cwmbran, Severn Tunnel Junction, Abercynon, Pentrebach and Wildmill. Also, further park and ride opportunities will be provided in association with the new stations proposed at Brackla and Llanharan. A further expansion of Caerphilly Station is planned alongside an improved access scheme. This programme could deliver in the order of 1,000 additional spaces which will assist the continued growth in use of the rail network between 2005 and 2010.

From the assessment of the greatest pressure for parking, and where there could be latent demand, it is **recommended**, taking account of the current programme, that a further programme of park and ride expansions is developed within the Strategy between 2010 and 2018. This could include expansions at;

- Aberdare (and other stations along this branch where possible)
- Barry
- Cadoxton
- Llanbradach
- Pontyclun
- Pontypool and New Inn (when the service frequency is improved)
- Radyr
- Taffs Well
- Treforest

Modal shift is a key objective of the Transport Strategy for Wales and the regional Spatial Strategy. In addition there would be an increased need for a greater supply of parking to access rail if a congestion charge or other form of road pricing were introduced in the region. It is **recommended** that parking spaces are provided at any new stations implemented in the strategy, where possible. Also, that the business cases for other stations that could provide park and ride opportunities are reviewed if a congestion charge is introduced during the strategy period.

Table 4 Park and Ride Capacity and Occupancy¹³

Line/ Station	Capacity	Observed Peak Weekday Occupancy
Rhymney Valley Line		
Rhymney	23	18
Pontlotyn	10	8
Tir-Phl	8	5
Pengam	42	85
Hengoed	40	46
Ystrad Mynach	102	93
Llanbradach	10	10
Aber	130	53
Caerphilly	210	232
Lisvane & Thornhill	100	50
Llanishen	21	24
Merthyr Tydfil/ Aberdare Lines		
Merthyr Tydfil	36	32
Aberdare	47	47
Cwmbach	19	19
Mountain Ash	5	5
Abercynon North	8	13
Treherbert Line		
Treorchy	14	9
Ystrad Rhondda	28	6
Llwynpia	12	7
Dinas	10	6
Trehafod	13	2
Trefforest	117	134
Taffs Well	93	90
Radyr	130	162+
Llandaf	108	58
Maesteg Line		
Maesteg	29	8
Tondu	14	0
Sarn	10	8
Bridgend	100	100
Pontyclun	23	22
Barry Line		
Llantwit Major	78	*
Rhoose	61	*
Barry	130	132
Cadoxton	31	41
Eastbrook	31	5
Cogan	55	21
Abergavenny Line		
Abergavenny	67	61
Pontypool and New Inn	16	6
Cwmbran	121	121
Chepstow / Severn Tunnel Line		
Severn Tunnel Junction	59	59
Newport	181	181

* stations opened 12 June 2005

¹³ Based on available information supplied by the client group

6.4 Reliability and Capacity Measures

Measures to improve the reliability of the rail network are important to make best use of the network, provide a robust timetable and to provide the ability to cope with problems to minimise delays to passengers. Four specific measures have been identified; Barry Station, Cogan Junction, Cardiff Central and Llandaf.

6.4.1 Barry Station

At Barry station a signal is required to enable trains to start back from the down platform. In the event of service delays this would allow trains to recover up to 8 minutes running time compared with turning back at Barry Island. Initial appraisal of train running suggests that the facility could be extensively used, and notional estimated costs appear broadly in line with the anticipated benefits. This is one of a number of schemes which Network Rail are currently evaluating which could enable performance related enhancements to be brought forward ahead of its signalling renewal schemes.

6.4.2 Cogan Junction

Cogan junction is an additional network constraint where the Barry Lines reduce from four tracks to two, combined with a single lead junction directly onto the single-track Penarth branch. Greater practical capacity could be delivered by measures to allow southbound Penarth trains to operate independently through the junction and / or to allow trains for the branch to await entry clear of the main line, or by more extensive junction modification.

As demand for Barry line services is greater than for the Penarth Line it might initially be possible to secure additional capacity towards Barry by a corresponding reduction in the service to Penarth. However this would raise concerns in moving away from the Standard Pattern Timetable. The study examined extending the down goods loop to the Penarth Branch. However, in the short term converting the goods loop to passenger train operation would enable holding a late running Penarth train clear of other trains. These options need to be examined further in the Cardiff Area Signalling Renewal Project.

6.4.3 Cardiff Central Platforms 6 / 7

At Cardiff Central Platforms 6/7 there would be significant benefits if services from the west could reverse in the platform, for example by means of a west-facing bay. This would, in the event of partial or full blockage of the lines to Queen Street, enable services to continue to be provided to Penarth, Barry/Bridgend, and Pontypridd/Valleys. This scheme would be delivered by the installation of full bi-directional working as part of the Cardiff Area Signalling Renewal Project and should be examined within that process.

6.4.4 Llandaf

At Llandaf an intermediate signal section on the up line would allow northbound trains to proceed closer to the junction at Radyr. Northbound trains cannot proceed through the junction when the section is occupied by a preceding train or a southbound City Line train. Should either route be running slightly off timetable this measure would reduce overall delays.

6.4.5 Evaluation Results

The Barry, Cogan Junction and Llandaf schemes were evaluated using Arriva Trains Wales information on passenger performance benefits for the Barry scheme. The Moira model was used to assess the benefits of Cogan Junction and Llandaf schemes, where an indicative 0.5 minutes time-saving to existing passengers was assumed. The results are shown in Table 5.

Table 5 Illustrative Evaluation of Reliability Measures.

Measure	Capital Cost	Net Present Value	Benefit Cost Ratio
Barry	£0.5m	£13.8m	26.0
Cogan Junction	£2.7m	£3.5m	4.4
Llandaf	£0.5m	£1.2m	4.0

The analysis suggests that all schemes would provide a high level of benefits if the indicative time savings can be achieved. For inclusion in the rail strategy an average time saving of at least 0.25 minutes each way at Cogan Junction and 0.25 minutes northbound at Llandaf would need to be achieved. This requires assessment of the level of incidence of delays and scale of each delay from monitoring data at the next stage.

It is **recommended** that all three schemes are examined in detail in the Cardiff Area Signalling Renewal Project. Also, it is recommended that the Barry Turnback is provided sooner if funding is obtained as a result of a bid for performance related enhancements. The strategy may require additional capacity between Barry and Cardiff which should be taken into account in determining the appropriate scheme.

6.5 Frequency Enhancements on Existing Lines

New services on existing lines were evaluated across the network and those **recommended** for inclusion in the strategy are summarised in Table 6.

Table 6 Summary Economic Evaluation New Services

	Capital Cost	Operating Cost	Subsidy (year 1)	Subsidy/Pass	Net Present Value	Benefit Cost Ratio
Abergavenny/ Chepstow Lines #	£34m	£5,173k	£2,114k	£2.33	£154m	4.5
Vale of Glamorgan (Bridgend – Cardiff)	£0m	£1,526k	£1,426k	£32.76	£18.6	1.75
Valley Lines North (Pontypridd – Cardiff and Energlyn – Cardiff)	£30m	£1,463k	£1,320k	£11	£23m - £26m	1.5 – 1.6

note includes Tiger Strategy development assumptions for new stations.

It is **recommended** that the Cardiff Queen Street remodelling be developed to provide capacity for additional services on the Rhymney and Taff Vale Lines to enable peak period passenger growth during the strategy period. The recommended strategy is to implement the major capacity improvement with additional hourly services between Cardiff and Pontypridd and Energlyn via Caerphilly in 2012 and a further frequency increase in 2017. This will be required to meet the forecast peak train service capacity requirements assuming continued growth at 5% per annum – particularly on the Rhymney Line.

The Valley Lines scheme would provide additional benefits in terms of increased peak period frequency to relieve overcrowding, capacity for further growth in rail trips from the Valleys to the north, accommodate additional freight traffic and provide the opportunity to fill in the gaps created by freight trains. There is an opportunity to integrate the development of the scheme with Cardiff Area Signalling Renewal Project. Hence it is **recommended** that the scheme should be developed for implementation between 2009 and 2012.

There are two options for increasing the frequency of service to half hourly to the new stations at Rhoose Cardiff International Airport and Llantwit Major. Although the Greater Western franchising exercise examined the cost of extending Bristol to Cardiff services to / from Rhoose Cardiff International Airport, it would appear from this study that the best approach for both options would be to do so as part of the Valley Lines network. Extending a current Cardiff – Barry service would be cheapest but would lead to increased overcrowding of peak trains between Barry and Cardiff. The next best and **recommended** option is a new Cardiff – Bridgend service as an extension of the Valley Lines network which could have the advantage of reducing overcrowding between Barry and Cardiff, but may require additional capacity between Cardiff and Cogan junction. Switching a Penarth Line service would be an option but would lead to an irregular timetable on that line.

It is **recommended** that further analysis of the timetable options on the Barry and Penarth lines is undertaken to identify the most efficient scheme whilst maintaining the benefits of a standard pattern timetable. Also, that further capacity analysis of the route is undertaken to ensure that the scheme can be introduced without additional measures to preserve performance.

The **recommended** Abegavenny / Chepstow Lines package of measures was developed in the TIGER strategy and involves a half hourly service between Cardiff and Abergavenny, an additional two hourly service to Gloucester and an additional hourly service to Chepstow. New stations are proposed at Caerleon, Magor with Undy (possibly as a replacement for Severn Tunnel Junction station), Llanwern, Coedkernew and St Mellons and, in the longer term, at Llantarnam and Sebastopol.

Whilst the Vale of Glamorgan and Valley Lines North schemes have monetised benefit cost ratios of between 1.5 and 2.0, the wider economic and social benefits of the schemes – improving access to Cardiff International Airport from both the east and west, improving the performance of the network and improving access to the Valleys to the north of Cardiff – suggest that these schemes could receive Government funding support.

It was not recommended to improve the frequency of the Swan Line Service, nor to extend the Vale of Glamorgan service beyond Bridgend to Swansea – due to the poor value of money assessments of these options.

6.6 New Stations on Existing Lines

Most of the aspirations for new stations on existing lines were not shortlisted for detailed investigation. This was because of the negative impact of the increased journey times experienced by other passengers as a result of additional station stops.

It is **recommended** that the schemes which have the potential for inclusion in the strategy are:

- **Caerleon station** on the Newport – Abergavenny Line should be introduced with the new services being proposed.

- **Magor with Undy station** on the relief lines of the South Wales Main Line between Newport and Severn Tunnel Junction stations, with the improvement of the Gloucester – Cardiff service and possibly as a relocation of Severn Tunnel Junction Station.
- **Llanwern and Coedkernew stations** on the relief lines of the South Wales Main Line between Cardiff and Magor with Undy station with the introduction of additional services to Chepstow. The timing of the stations is related to the timescale for development within their catchment areas.
- **St Mellons station** to be developed in parallel to the other stations on the relief lines of the South Wales Main Line east of Cardiff and to be served by the proposed Abergavenny and Gloucester / Chepstow local services.

In addition it is observed that:

- **Sebastopol and Llantarnam stations** in the longer term should be developed to be served by the proposed enhancement to the Abergavenny local services. They have no significant impact on the economic evaluation for the frequency improvement as they increase rail demand and revenue but increase the capital costs of the investment package. It is **recommended** that these schemes could be developed to relieve parking pressures at Cwmbran and to provide more capacity to remove car traffic from the main A4042 route coming north from west Monmouthshire and Torfaen. Further development in their catchment areas would improve their forecast demand. Third party funding could also be secured to enhance their affordability.
- **Bridgend College station** could be developed on the Vale of Glamorgan Line – however, it had a negative impact on the benefit cost ratio and would be difficult to construct.
- **Upper Boat station** could be developed on the Valley Lines to the south of Treforest station but has some practical difficulties to be overcome. It may conflict with the Beddau network expansion scheme and (depending on timetable planning) may have a negative impact on existing passengers. In addition, as a remote park and ride station, security could be a problem. It is therefore **recommended** to expand the parking facilities at Treforest and Taffs Well stations before providing a new park and ride station at this location.

It is **recommended** that Torfaen Council consider the future of land allocations in the catchment areas of the proposed stations at Sebastopol and Llantarnam and consider protecting the station sites including land for car parking and access routes. This would enable the business case for these stations to be reassessed in the future. Opportunities for securing private sector finance should be sought in line with new developments to reduce the call on Government funding and the impact of the stations on the affordability criteria.

The **recommended** strategy for the Ebbw Vale Line is to provide an hourly service between Ebbw Vale Town and Newport and to extend the initial hourly Cardiff service to Ebbw Vale Town from Ebbw Vale Parkway. The Cardiff service could not stop at additional stations and the demand forecasts for stopping the hourly Newport service are low, therefore the stopping at further new stations (Cwm, Crumlin, Pye Corner) would not be justified bearing in mind the impact on the journey times for users of the other stations on the Line.

It is **recommended** that local planning authorities in the Sewta region safeguard the sites for new stations highlighted in this report (both for development within the strategy period and those suggested as longer term options), including sufficient land for platforms, accesses and car parking. They should also consider land use allocations within the catchment areas of the stations and seek developer contributions towards the infrastructure.

If other stations are to be developed in the longer term it is **recommended** that local authorities review the reasons for the deferment of the scheme in this strategy period and assess whether these could be overcome in the future – such as through appropriate land use allocations. The stations that were evaluated but have not been highlighted and which are not recommended to be taken forward in the period to 2018 are covered in the corridor evaluations within the Part 1 study report¹⁴ and final report technical appendix¹⁵ and summarised in the strategy decision matrix in Appendix B.

6.7 Network Extensions and New Stations.

Table 7 shows the summary results of the network extension options that were evaluated in the study. From these results it is **recommended** that the following schemes are included in the rail strategy:

- **Ebbw Vale Town to Newport and Cardiff** - Extensions to Ebbw Vale Town and / or Abertillery could provide a better business case for the introduction of the additional Ebbw Vale to Newport service than if it were to run only as far as Ebbw Vale Parkway. The recommendation to run to Ebbw Vale Town is based on the objective to provide at least half hourly services to key stations in the Sewta region and the increased capital costs compared to extending the network to Abertillery.
- **Cardiff – Beddau** half hourly service - with new stations at **Talbot Green, Llanstrisant, Gwaun Meisgyn** and **Beddau (Tynant)**. This provides a new rail link to a growing area needing improved access to Cardiff, as well as providing rail operational benefits for through running services from Cardiff Central. However, this service would operate on a congested section of the network (the Great Western RUS¹⁶ reported that 90% of the capacity was utilised), though the Cardiff Area Signalling Renewal Project presents opportunities to relocate conflicting movements at the west end of Cardiff Central to improve performance and capacity. A capacity review of the South Wales Main Line west of Cardiff (possibly in partnership with SWITCH) needs to be undertaken in parallel with the optioneering for the signalling project.

It is **recommended** that the Ebbw Valley Phase 2 scheme is developed in parallel to the implementation of the Phase 1 scheme but that the economic evaluation is checked when the Phase 1 demand is known. Ideally the implementation of the scheme should be integrated with the Masterplan for Ebbw Vale.

It is **recommended** that the proposed Rail-link bus service between Abertillery and Llanhilleth station should be integrated with the train services and ticketing system and financially supported through a partnership between the train operator and local authorities funded by the Assembly.

¹⁴ Sewta Rail Strategy Study, Final Part 1 Report, August 2005

¹⁵ Sewta Rail Strategy Final Report – Technical Appendix, January 2006

¹⁶ Great Western Main Line Route Utilisation Strategy, SRA, June 2005

The Council should protect the alignment to Abertillery and seek to secure a station location at the town through the local planning process to enable that scheme to be developed in the longer term. In the interim consideration could be given to developing a cycle route on the formation to increase access to the train services.

It is **recommended** that further assessment is undertaken of identified critical factors on the Cardiff - Beddau route in the near future given the urgency of a decision on plain-lining the route through Pontyclun.

Table 7 Summary Economic Evaluation Network Extension Options

Scheme	Capital Cost	Operating Cost	Subsidy (year 1)	Subsidy/ Pass	Net Present Value	Benefit Cost Ratio
Hirwaun – Aberdare	£22m	£676k - £1,058k	£361k - £501k	£2 - £5	£-5m - £20m	0.8 – 1.8
Ebbw Vale Parkway - Newport	£29m	£1,307	£833k	£2.80	£15m	1.38
Ebbw Vale Town	£36m	£1,500k	£290k	£0.38	£54m	2.1
Ebbw Vale & Abertillery	£46m	£1,307k	£0	£0	£108m	3.45
Cardiff – Beddau Hourly	£20m	£1,236k	£728k – £898k	£2 - £4	£-0.3m - £22m	1.0 – 1.8
Cardiff – Beddau Half Hourly	£23m	£2,017k	£804k - £1,152k	£1 - £2	£49m - £91m	2.3 – 4.2
Queen St + Cardiff – Energlyn and Pontypridd Phased #	£30m	£1,463k	£1,320k	£11	£26m	1.5
Queen St Phased + extended to Bedlinog #	£46m	£2,193k	£1,728k	£4	£36m	1.2 – 1.5

Note these schemes evaluated assuming 5% passenger growth compared to 2.25% GDP based growth for other schemes.

It is also **recommended** that, instead of extending the rail line to Hirwaun (which would have a relatively high cost compared to forecast benefits), the rail strategy provides improved access to Aberdare station through maintenance of the Rail-link bus service and increased parking provision.

A Cardiff – Bedlinog service requires more capacity at Cardiff Queen Street and is compared with the option of Cardiff - Energlyn shuttle (without the network extension) in Table 7. The lower forecast benefit cost ratio suggests that the additional demand and benefits of the service extension and new stations would not cover the additional costs. It is therefore **recommended** that the scheme is deferred and assessed again at a later date, with a Rail-link bus service to either Abercynon Station or Ystrad Mynach station being provided from the Bedlinog corridor during this strategy period to 2018.

It is **recommended** that the potential for development of the Bedlinog Corridor rail service in the future is protected by safeguarding the station sites including land for the platforms, accesses and parking. It is also recommended that Caerphilly and Merthyr Tydfil Councils consider future land use allocations in the station catchment areas to provide an opportunity to review the business case in the future. The councils should also seek private sector contributions towards the infrastructure to improve the affordability of the scheme and thereby improve the business case.

6.8 Rail-link Bus Services

The parallel Sewta Bus Strategy study is ongoing and will be examining how to improve the bus network to deliver the economic and social objectives in the region. That study recognises the role of rail in providing reliable strategic public transport services to the core city centres especially over longer distances. The largely complementary bus network serves more local markets and locations which are remote from the rail network.

Rail-link bus services currently provide access to communities in the south east Wales Valleys between Maesteg and Caerau, Ystrad Rhondda and Ferndale / Maerdy, Aberdare and Hirwaun / Rhigos and Ystrad Mynach and Blackwood. These services require significant subsidy and provide increased access to rail for social and economic reasons as well as in some cases enabling a direct rail connection to replace those that have been lost or are impractical. When the Ebbw Vale Parkway – Cardiff services are introduced in 2007 further Rail-link bus services are planned for access to Ebbw Vale Town and Abertillery / Brynmawr.

When the train service frequencies are improved within the next 5 years there are aspirations to extend the Caerau service to Cymmer and to increase the frequency of the Blackwood service. There are also aspirations to develop a Pontypool and New Inn to Abersychan and Blaenavon service when the train service frequency is improved between 2009 and 2018. It is also recommended to consider introducing Rail-link buses between Pontyclun and Llantrisant / Beddau as a pre-rail service and between Abercynon and Bedlinog to improve access to that corridor within the strategy period.

These services extend the influence of the rail network and would perform best if integrated with rail ticketing and information systems. It is therefore **recommended** that they are incorporated into the Rail Franchise process through a partnership between the train operator and local authorities with dedicated funding from the Assembly. If not Sewta will require a significant additional revenue budget to maintain the existing services and securing the new services. It is therefore also **recommended** that other opportunities to secure the bus services are sought including integration with commercial and other subsidised services and that developer contributions to pump-prime service development are secured.

6.9 Strategy Summary and Effectiveness

The recommended rail strategy elements for the period 2009 – 2018 and, where calculated within the study their value for money, are summarised in Table 8. The recommended rail strategy for 2009 to 2018 will result in:

- At least half hourly rail services to most stations in the region;
- Turn – up – and – go service frequencies in the Cardiff Journey to work area;
- Improved reliability and improved ability for the rail industry to cope with delays to minimise secondary impacts for passengers;
- Improved connectivity by rail between main centres including, Cardiff, Newport, Pontypridd, Caerphilly, Barry, Ebbw Vale, Cwmbran, Abergavenny, Chepstow and Rhoose Cardiff International Airport;
- Five new stations on existing lines at Caerleon, St Mellons, Magor with Undy, Llanwern and Coedkernew - providing improved access to existing communities and to serve important development areas;

- Improved access between the Valleys and employment centres in Cardiff, Newport and new employment locations;
- Extension of the network to Ebbw Vale Town and to the housing growth area between Pontyclun and Beddau, including 4 new stations; and
- Improved stations, improved and new Rail-link bus services and additional station parking supply to reduce car trips and relieve congestion on the radial routes into Cardiff and Newport.

Table 8 Summary of Recommended Rail Strategy Elements

Scheme	Value for Money (BCR)
Additional Rolling Stock and rolling stock renewal	1.2
Station Improvements	-
Park and ride expansion	-
Rail-link Bus Services	-
Barry Station Turnback	26.0
Cogan Junction Capacity improvement	4.4
Llandaf additional signal	4.0
Cardiff Central station turnbacks	-
Queen Street Station Capacity Improvement and additional services to Pontypridd and Energlyn	1.5 – 1.6
Half Hourly Vale of Glamorgan Service	1.75
Additional hourly Abergavenny Service and Caerleon Station	7.8
Improved Gloucester Service and Magor with Undy and St Mellons Stations and Relief Line Upgrade	3.1
Further additional Abergavenny Service	Over 10.0
Additional Hourly Cardiff – Chepstow Service + Llanwern + Coedkernew stations	3.27
Ebbw Vale Phase 2 – additional hourly service between Ebbw Vale Town (new station) and Newport	2.09
Cardiff – Beddau half hourly service and new stations at Talbot Green, Llantrisant, Gwaun Meisgyn and Beddau (Tynant)	2.33

Appendix A summarises the assessment of the recommended strategy against the identified National / Regional Objectives. This shows that, in combination, the strategy improves the environment and contributes to road safety, the reduction of accidents, provides significant economic benefits and is integrated with the regional spatial strategy through its improvement of connectivity between main centres. Most measures improve accessibility to jobs from the Valleys and / or encourage significant modal shift to Newport and Cardiff. The strategy contributes to making best use of the network and provides positive impacts for existing passengers as well as increasing access to rail in a manner that encourages new rail use.

For schemes not recommended for the Rail Strategy for the period 2009 to 2018 local authorities need to assess the evaluation results and give consideration as to whether the reasons for deferring the scheme can be overcome in the future, such as through providing additional housing development within station catchment areas, providing park and ride and whether therefore to preserve opportunity for the scheme through the land-use planning process.

7 STRATEGY IMPLEMENTATION

7.1 Introduction

This section summarises the key issues related to the delivery of the rail strategy, the programme and funding issues.

7.2 Strategy Delivery

Table 9 summarises the key strategy schemes and deliverability issues including dependency and identified critical success factors. In addition to the continued growth in passenger demand driving the need for additional rolling stock and the frequency increases through Cardiff Queen Street and the business case for the capacity improvement at that location, the table reveals significant dependency on available route capacity. The opportunity presented by Network Rail's planned signalling renewal projects during the strategy period must not be missed as these are major projects, within which there can be a significant integration of additional infrastructure measures.

In addition it should be noted that all schemes will need to be designed to maintain or improve service performance in accordance with the Arriva Trains Wales performance thresholds.

7.2.1 Newport Area Signalling Renewal Issues

The Newport Area Signalling Renewal Project is to be implemented in 2 phases, east of the Severn Tunnel (Patchway) towards Cardiff including the Abergavenny Line, as far as Llantarnam, in 2008 and east of Severn Tunnel Junction to Chepstow / Gloucester, the south end of the Ebbw Vale Line (Park Junction and north of Llantarnam to Little Mill in 2011. The signalling renewal project needs to take account of the recommended Sewta Strategy and to seek to maximise the efficiency of investment in the short term for the delivery of later programmed projects. Specifically:

- Turn-back facilities at Abergavenny and Chepstow;
- New Stations at Caerleon, Sebastopol and Llantarnam, Magor with Undy (possibly as a replacement for Severn Tunnel Junction Station), Llanwern and Coedkernew Stations – and in the longer term at Sebastopol and Llantarnam;
- New half hourly services between Cardiff and Abergavenny;
- Improved Gloucester service (to hourly) and additional Cardiff – Chepstow hourly service; and
- Ebbw Valley Phase 2, hourly Newport to Ebbw Vale Town service.

This part of the strategy requires upgrading of the relief lines to supply the capacity for the additional services and new stations on the South Wales Main Line. Specifically, its line speed needs to be increased, and the track upgraded to passenger standard.

Network Rail are undertaking the Newport Area Signalling Renewal scheme on a like for like basis so the inclusion of additional measures that provide for increased services will need to be justified and the associated funding agreed between Sewta, the Assembly and Network Rail.

Table 9 Critical Success Factors

Scheme	Dependency	Other factors
Rolling Stock Strategy/ renewal	Continued passenger growth.	Available rolling stock / new build programme. WAG funding for new or cascade stock. Depot capacity for stabling and maintenance. Platform lengthening implemented.
Station Improvements	-	Possible linkage with DfT/NR 'Access for All' funds and MFAS designs available for some.
Park and ride expansion	-	Land available + Planning permissions.
Rail-link Bus Services	Continued Funding.	Additional revenue funding available.
Barry Station Turnback	-	Cardiff Area Signalling Renewal.
Cogan Junction Capacity improvement	-	Land Availability and Cardiff Area Signalling Renewal.
Llandaf additional signal	-	Cardiff Area Signalling Renewal.
Cardiff Central turnbacks	-	Cardiff Area Signalling Renewal.
Queen Street Station Capacity Improvement and additional services	Continued high demand growth. Capacity north and south of Cardiff. Rolling Stock.	Cardiff Area Signalling Renewal. Securing land through Transport and Works Act. Final Scheme design and acceptable implementation programme.
Half Hourly Vale of Glamorgan Service	Route Capacity. Rolling Stock.	Further growth in demand at Llantwit Major and Rhoose Cardiff International Airport.
Additional Abergavenny Service and Caerleon Station	Turnback at Abergavenny. Redevelopment of Hospital site. Rolling Stock.	Newport Area Signalling Renewal. Ability to turnback at Cardiff or integration of services. Detailed location of St Mellons station re: freight terminal access.
Improved Gloucester Service and Magor with Undy and St Mellons Stations and Relief Line Upgrade	Relief Lines Upgrade. Protection of Station Sites. Rolling Stock.	Newport Area Signalling Renewal. Ability to turnback at Cardiff or integration of services.
Further Additional Abergavenny Service	Route Capacity. Rolling Stock.	Newport Area Signalling Renewal. Ability to turnback at Cardiff or integration of services.
Additional Hourly Cardiff – Chepstow Service + Llanwern + Coedkernew stations	Turnback at Chepstow. Development at Station Sites. Rolling Stock.	Newport Area Signalling Renewal. Ability to turnback at Cardiff or integration of services. Development demand forecast assumptions. Confirmed location / access re: Llanwern.
Ebbw Vale Phase 2	Route Capacity. Development at Ebbw Vale. Rolling Stock.	Newport Area Signalling Renewal. Demand forecast assumptions and Performance of Ebbw Vale Phase 1 service. Protection of alignment to Ebbw Vale Town and station location.
Cardiff – Beddau Service	Route Capacity. Scheme details. Rolling Stock.	Cardiff Area Signalling Renewal. Practicality of relocation of junction w. Pontyclun and retention of branch access.

7.2.2 Cardiff Area Signalling Renewal Issues

The Cardiff Area Signalling Renewal Project is to be developed and implemented in 2010 / 2011. Cardiff Central station presents a capacity constraint on the network. There is an imbalance between the number of services approaching Cardiff from the east (including the Valley Lines to the north) compared to the West (and south). The Cardiff Bay branch offers potential for turning back services from the Valley Lines to the North but increases train conflicts at Queen Street Station, and misses the station stop at Cardiff Central.

The additional train services from each direction are summarised as:

- **From the East;**
 - 2 trains per hour to Abergavenny
 - 0.5 trains per hour to Gloucester
 - 1 train per hour to Chepstow
- Plus later in the strategy period and possibly running from Cardiff Bay;
 - 2 trains per hour to Energlyn via Caerphilly
 - 2 trains per hour to Pontypridd
- **From the West;**
 - 2 trains per hour to Beddau
 - 1 train per hour to Bridgend via Barry

Therefore there is a need for additional turn-back facilities to be provided at Cardiff Central to implement the strategy. There is a need to maximise flexibility in operations by enabling trains to turn back at platforms 6 and 7, which cater for the Valley Line services, and at platforms 3 and 4 which cater for main line services. A new turnback platform should also be considered.

The Cardiff Area Signalling Renewal Project covers the area of the network where schemes in the strategy period are recommended for implementation at Cardiff Queen Street, Barry, Llandaf and Cogan Junction. There is also a need to provide at least passive provision for these aspirations in the Signalling Renewal plans, to minimise subsequent implementation costs. Ideally, the Signalling Renewal plan will take account of the likely improvements required over the next 30 years.

The Great Western Franchise process is ongoing and could include a reduction in the Cardiff – London service and / or an extension of services from Bristol to Rhoose Cardiff International Airport. The Sewta Rail Strategy and Cardiff Area Signalling Renewal options may need to be re-examined if these service decisions have an impact on the capacity assumptions.

Network Rail will be undertaking the Cardiff Area Signalling Renewal Project on a like for like basis so additional measures that improve performance and provide for increased services will need to be justified and associated funding agreed between Sewta, the Assembly and Network Rail. In the short term Network Rail require commitment from Sewta and the Assembly of their aspirations for increasing train frequencies – by April 2006. It is recommended that Sewta continues to work closely with Network Rail in modernising the rail network to meet the future needs of the region.

7.3 Implementation Programme

The development of the Implementation Programme needs to take account of the dependency between schemes and investment programmes and the development timescale for design and implementation. Interdependency issues are principally between re-signalling programmes and new services and capacity measures but also between new services and new stations, integrated land-use development and integrated transport measures such as Rail-link bus services, park and ride expansion and other station improvements.

The scheme development timescale needs to take account of Network Rail's GRIP¹⁷ Stages:

- Stage 1 – Output Definition
- Stage 2 – Pre-feasibility
- Stage 3 – Option Selection
- Stage 4 – Single Option Development
- Stage 5 – Detailed Design
- Stage 6 – Construction, Test and Commissioning
- Stage 7 – Scheme Handback
- Stage 8 – Project Close Out

Stages 1 to 4 can be combined and taken forward under the framework agreement between the Assembly and Network Rail. Projects should be taken through to GRIP Stage 3/4 to enable the risks to be identified and to develop the programme for delivery.

The development of schemes to level 4 is dependent on the availability of resources, interface with other projects and perceived risks. However, the minimum development timescale range between 28 weeks for a new station and 40 weeks for a line re-opening. At this stage the development lead times for schemes to be implemented between 2009 and 2018 are not considered critical to programming. However, it will be important to initiate projects with Transport and Works Act implications and land requirements that are required early in the strategy period within the next 4 years. This applies particularly for the remodelling of Cardiff Queen Street.

Table 10 shows a proposed implementation programme for the Rail Strategy. Several schemes require enhanced investment as part of the Newport Area Signalling Renewal projects in 2008 and 2011 and Cardiff Area Signalling Renewal Projects in 2010/11.

It is recommended that the programme is further developed through a detailed economic investigation before the successful schemes are developed through the GRIP stages towards implementation. The programme needs to be developed in more detail and reviewed in particular in relation to the land-use development changes within the new station catchments at Caerleon, Llanwern and Coedkernew. Also a more detailed programme would include phasing and integrating schemes within the strategy, such as improving station facilities, expanding parking capacity and / or integrating rail-link bus services when rail service levels are improved.

¹⁷ Guide to Railway Investment Project

Table 10 Proposed Sewta Rail Strategy Programme 2009 - 2018

Scheme	2009 - 2011	2012 - 2013	2014 - 2018
Rolling Stock (train lengthening)			
Station Improvement Schemes, Park and Ride and Rail-link Bus services			
Reliability Improvement Schemes, Barry, Cogan Junction, Llandaf			
Cardiff Queen Street and Additional Services to Pontypridd and Energlyn			
Vale of Glamorgan Half Hourly			
Abergavenny 1 additional train per hour (inc Caerleon Station)			
Abegavenny 2 nd additional train per hour			
Cardiff – Gloucester (inc Magor with Undy and St Mellons Stations)			
Cardiff – Chepstow (Inc Llanwern and Coedkernew stations)			
Ebbw Valley Phase 2			
Cardiff – Beddau			

7.4 Funding Implications

Rail services and infrastructure in the Sewta Region is funded through:

- Revenues from fares and parking charges;
- DfT Rail and the Assembly through the Rail Franchise and local agreements;
- Network Rail – in terms of maintenance and route modernisation programmes and their discretionary fund;
- Local authorities through local taxes;
- Welsh Assembly Transport Grant funding;
- EU Objective 1 funding – though the current programme finishes in 2008 and the budget and funding arrangements for 2009 – 2013 are not yet agreed; and
- Private sector – 3rd party – funding for transport improvements related to new development secured through the planning process.

In addition, some schemes have been funded through special funds such as the former Strategic Rail Authority's Rail Passenger Partnership (RPP) fund – which enabled the introduction of the Vale of Glamorgan scheme, and the Assembly's Corus Special Fund – which is enabling the restoration of passenger rail services in the Ebbw Valley.

Future funding for transport in the region could include the development of Road User Charging Schemes (RUC's) or a Congestion Charge. These would be focused on urban areas and seek to encourage sustainable travel choices and more reliable highway journey times. The impact on rail and therefore funding implications would need more detailed investigation.

Rail fares in the Sewta area are low – especially in the Valley Lines part of the network where average fares are currently around £1.50 per journey. These fares reflect the low income for the communities in the Valleys. This is untypical for urban and suburban rail services elsewhere in the UK where the more affluent population tends to live further away from the Centre and can afford to pay higher costs for greater travel distances and for the benefits of faster services. The growth in rail fares is prescribed by DfT Rail – currently rising at a rate of RPI +1% per annum. This limits the extent to which the benefits of service improvements can be realised through the fare box.

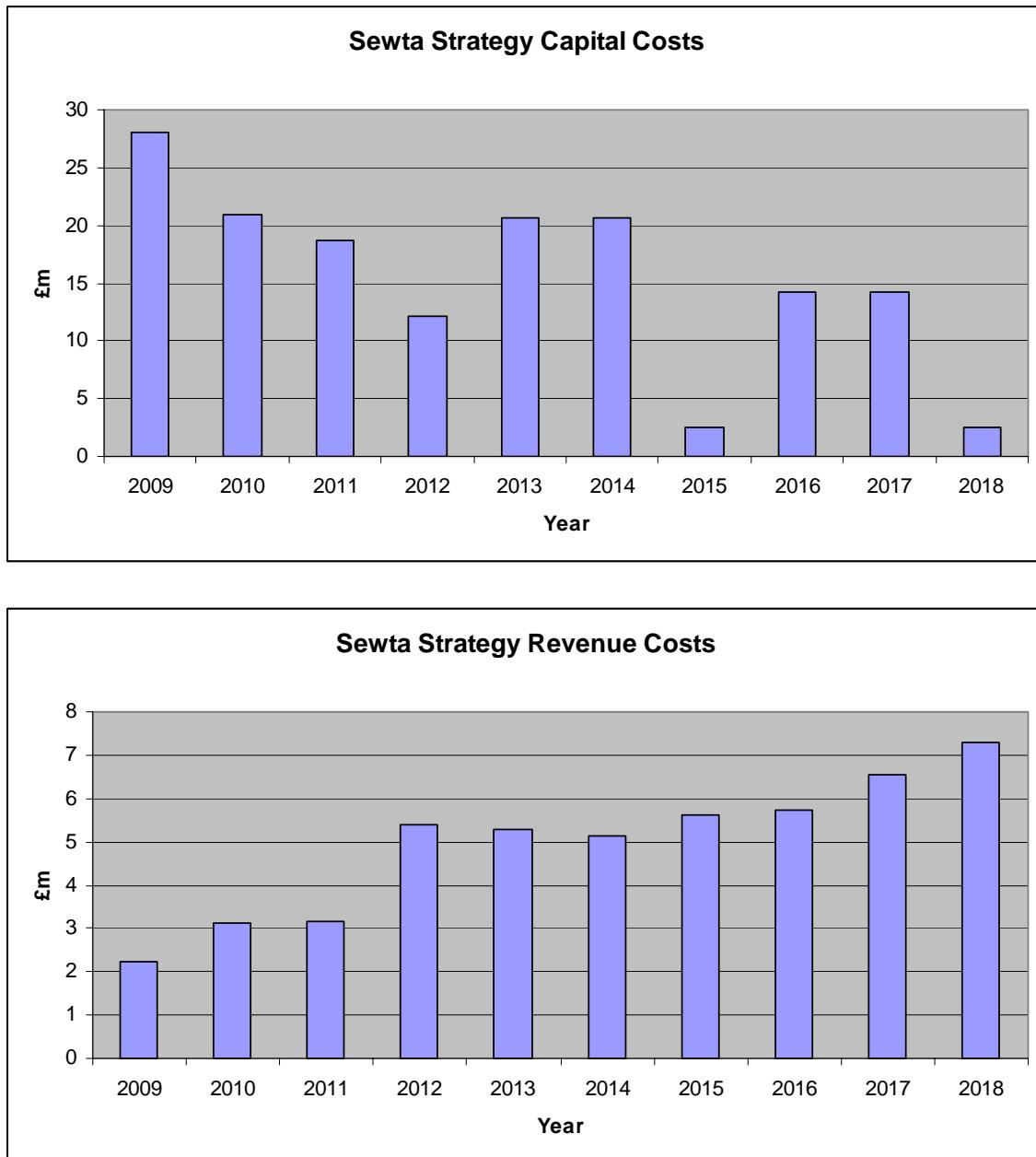
The Capital and revenue funding implications of the recommended strategy are shown in Table 11 and Figure 3. The funding assessment assumes that the Station Improvements Programme and Park and Ride expansion programme would require funding of around £2m and £0.5m per annum respectively. The programme assumes train lengthening and Rail-link bus service funding throughout. Table 11 highlights other specific schemes.

The capital cost of the recommended strategy is estimated as around £155m over the 10 years in 2005 prices. The funding profile needs to be developed in more detail as the construction timetables become known as each scheme progresses through the design stages. If annual funding is restricted some schemes may need to be reprogrammed / delayed to smooth the funding profile. If the overall level of funding is restricted, deferring the Beddau Scheme to beyond the strategy period and halving the annual investment in station improvements would reduce the overall capital cost to around £120m. However the programme is still relatively 'front loaded'.

Table 11 Capital and Revenue Costs (2005 prices)

Year	Capital Funding	Revenue (Subsidy) Requirement	Schemes
2009	£27.993m	£2.247m	Barry, Abergavenny, Gloucester line (Magor with Undy, St Mellons)
2010	£20.975m	£3.115m	Queen Street, Cogan
2011	£18.761m	£3.149m	Queen Street, Llandaf
2012	£12.134m	£5.386m	Chepstow, Llanwern, Coedkernew
2013	£20.606m	£5.287m	Ebbw Vale Phase 2
2014	£20.606m	£5.135m	Ebbw Vale Phase 2
2015	£2.500m	£5.632m	
2016	£14.237m	£5.719m	Beddau
2017	£14.237m	£6.562m	Beddau
2018	£2.500m	£7.298m	
Totals	£154.550m	£49.531m	

Figure 3 Capital and Revenue Funding Profiles



The additional revenue (subsidy) costs of the recommended strategy rise from just over £2m per annum to just over £7m per annum over the strategy period. This equates to an increase in the current ATW franchise costs of between 2% and 10%.

An assessment of the potential for EU funding of schemes within assisted areas in the region was undertaken. The replacement for EU Objective 1 funding is not yet confirmed, however it has been assumed that it would run between 2009 and 2013 inclusive. The assessment assumed an EU grant funding rate of 35% of the Capital costs and it was assumed that the Ebbw Vale, Beddau schemes and 50% of the Station Improvements and Park and Ride expansions would be eligible and that the Ystrad Mynach – Bedlinog Line extension scheme would also be brought forward as a result. This would lead to a capital programme of £142m (without the EU element). However, the majority of funding would be required in the first 5 years of the strategy period.

8 NEXT STEPS

8.1 Introduction

This study has reviewed the issues influencing the rail network for the period between 2009 and 2018, examined the aspirations of improvements to infrastructure and services and provided recommendations for the rail strategy for the Sewta Region. This now needs to be taken forward in parallel with other strategies, such as the Sewta Bus Strategy and Sewta Cycle Strategy, to form the Regional Transport Plan.

In addition, the development of the regional transport plan will need to take into account a number of other studies and programmes as it seeks to merge them into a coherent and fully integrated strategy. These include:

- The forthcoming Wales Regional (Rail) Planning Assessment - to be undertaken by the Assembly;
- Franchise replacement plans – in particular Great Western but also Central Trains (2007); and
- The strategies of neighbouring authorities and regions, including south west England and SWITCH.

8.2 Recommended Further Work

It is recommended that the schemes shortlisted for inclusion within the Sewta Strategy for 2009 – 2018 are examined in more detail and the following evaluation be undertaken as follows:

- The economic evaluation should move to a more detailed level – in line with Major Scheme Assessment Guidance upgrading the initial evaluations in line with the revised information from more detailed engineering, timetable and costs assessments. It is expected that the level of risk and optimism bias will reduce as the level of detailed engineering and cost estimation increases. Revised economic evaluations would take into account when each scheme is to be introduced, more detailed investigation of user and non-user benefits and calculation of market value and tax implications.
- More detailed demand and revenue forecasting, such as explicit consideration of mode choice at proposed new stations. The evaluations would benefit from the production of more information on the users of the new Vale of Glamorgan services and, in due course, the Ebbw Vale Service.
- The Appraisals should be taken to a more detailed level including assessment of the environment impacts and wider economic benefits.
- Further assessment of the performance benefits of Cogan Junction and Llandaf reliability schemes should be undertaken. Specifically assessment of train delay information to establish the incidence and scale of delays. Further assessment of Cogan Junction improvement options and phasing needs to be undertaken.

- More detailed timetable and operations assessment including the assessment of pathing constraints, the requirement and impact of new infrastructure and interworking with other services.
- More detailed engineering, design and costing. This would involve on-railway site assessments (including lookouts) to establish the existing infrastructure constraints in detail. Outline drawings of key infrastructure elements and more detailed costing would be prepared.
- A detailed review of Main Line Capacity is required between Severn Tunnel and Bridgend (and possibly beyond in partnership with SWITCH) – especially west of Cardiff to plan for the Sewta required passenger services and freight services, whilst ensuring a high level of reliability. This could include more detailed engineering assessments of the Beddau Line connection and St Mellons station location to confirm their practicality.
- It is recommended that the impact of rail services on parallel bus services is assessed (starting with the results of the Vale of Glamorgan scheme) and that further analysis of the implications of the Rail Strategy is undertaken including bus network change planning as schemes are evaluated and implemented.
- It is recommended that further work is undertaken in relation to the proposed new station at Magor with Undy and implications for services calling at Severn Tunnel Junction station.
- Further assessment of the impact of Cardiff Congestion Charge/ Road Pricing impacts on rail demand growth should be undertaken if / when that initiative progresses, to ensure that the rail network can continue to meet passengers' needs.

Whilst more detailed investigation of the costs and benefits of the Sewta Rail Strategy will refine the evaluations we would not expect the conclusions drawn within this study to differ widely.

In addition to a more detailed study of major infrastructure elements of the strategy – key elements need to be further developed and / or monitored over time. Specifically:

- The packages of **station improvement schemes** and the programme for investment in the accessibility and quality of the network infrastructure.
- The growth in rail patronage, the resultant increase in crowding and the programme for **rolling stock increases**. In particular a review of peak period loadings at Central Cardiff needs to be undertaken to establish any under-reporting of on-train counts.
- The growth in rolling stock provision and the capacity of the network – particularly **Cardiff Queen Street** and Cardiff Central and therefore the need for the development of this major scheme which is a key element of the Sewta rail network impacting on the reliability of all routes.

It is recommended that the current Sewta Rail Improvement Programme is further developed to include the further work which is required to develop the elements of the longer term programme identified in this report and that further stakeholder consultation is undertaken.

APPENDIX A - SEWTA RAIL STRATEGY SUMMARY APPRAISAL

Scheme	National Objectives				Sewta Regional Objectives					
	Environment	Safety	Economy	Integration with Spatial Strategy	Accessibility Valleys - Jobs	Centre - Centre Connectivity	Mode Shift	Making Best Use	Existing Passenger Impact	Deliverability
Rolling Stock										
Train Lengthening	+	+	+	+	+	+	+	++	++	++
Rolling Stock Renewal	++	+	++	++	0	0	+	++	++	+
General Measures										
Station Access (Ped/Cycle)	+ / -	0	+	+	+	0	+	++	++	++
Customer Information	+ / -	0	+	+	0	0	+	++	++	++
Security/CCTV	+ / -	++	+	+	0	0	+	++	++	++
Park and Ride	+ / -	+	+	++	++	0	++	++	+	++
Service Reliability Measures										
Barry Town	+	+	++	+	0	0	+	++	++	++
Cardiff Platforms turnbacks	+	+	++	+	0	0	+	++	++	Cardiff Re-signalling
Llandaff Signal	+	+	++	++	+	0	+	++	++	Cardiff Re-signalling
Cogan Junction	+	+	++	+	0	0	+	++	++	Cardiff Re-signalling
Cardiff Queen Street	+	+	++	++	++	++	++	++	++	Cardiff Re-signalling + TWA
Bus Connections										
Cymmer - Maesteg	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Blackwood frequency	0	0	0	+	+	+	0	+	0	Revenue Funding Availability
Penalty - Ystrad Mynach	0	0	0	+	+	+	0	+	0	Revenue Funding Availability
Blaenavon - Pontypool	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Ebbw Vale Town - EV Parkway	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Brynmawr - Abertillery - Llanhilleth	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Bedlinog - Treharris - Abercynon	0	0	0	++	+	+	0	+	0	Revenue Funding Availability
Additional Services										
Abergavenny + Caerleon	+ / -	+	++	+	+	+	++	+	+	+ (Depends on Cardiff turnback)
Abergavenny 2nd tph	+	+	++	+	+	+	++	+	+	+ (Depends on Cardiff turnback)
Gloucester + Magor + St Mellons	+	+	++	++	0	+	++	+	++	+ (Depends on Cardiff turnback)
Chepstow + Llanwern + Coedk'w	+ / -	+	++	++	0	+	++	+	++	+ (Depends on Cardiff turnback)
Ebbw Vale Town - Newport	+	+	+	++	++	+	++	+	++	+
Vale of Glamorgan Bridgend	+	+	+	++	+	+	++	+	+	+
Pontypridd - Cardiff 10 tph	+	+	+	+	+	++	++	0	+	Dependent on Queen St and Phasing
Energlyn - Caerphilly - Cardiff 6 tph	+	+	+	++	+	++	++	-	+	Dependent on Queen St and Phasing
New Stations										
St Mellons	-	0	+	+	0	-	++	0	0	+
Caerleon	-	+	++	++	0	-	++	+	0	+
Coedkernew	-	0	+	++	+	-	++	0	+	Depends on Main Line Upgrade + Development
Llanwern	-	0	+	++	+	-	++	0	+	Depends on Main Line Upgrade + Development
Magor/Undy	-	0	+	+	0	-	+	0	+ / -	Possible Relocation of Severn Tunnel J
Line Extensions										
Ebbw Vale North	+	+	+	++	++	++	+	+	+	+
Beddau	+ / -	+	++	++	+	+	++	0	-	Dependent on Main Line Capacity

APPENDIX B - SCHEME DECISION MATRIX

Scheme	National Objectives			Sewta Regional Objectives							Scheme progression		
	Environment	Safety	Economy	Integration with Spatial Strategy	Accessibility Valleys - Jobs	Centre - Centre Connectivity	Mode Shift	Making Best Use	Existing Passenger Impact	Deliverability	Part 1	Part 2	Final Strategy to 2018
Rolling Stock													
Train Lengthening	+	+	+	+	+	+	+	++	++	++	→	→	Yes
Rolling Stock Renewal	++	+	++	++	0	0	+	++	++	+	→	→	Yes
General Measures													
Station Facility Improvements	+	+	+	+	0	0	+	+	++	++	→	→	Yes
Station Access (Ped/Cycle)	+/-	0	+	+	+	0	+	++	++	++	→	→	Yes
Customer Information	+/-	0	+	+	0	+	+	++	++	++	→	→	Yes
Security/CCTV	+/-	++	+	+	0	0	+	++	++	++	→	→	Yes
Park and Ride	+/-	+	+	++	++	0	++	++	+	++	→	→	Yes
Service Reliability Measures													
Stormtown Loop	+	+	++	++	0	0	+	++	++	Short Term with Abercynon	→	→	pre 2010
Barry Town	+	+	++	+	0	0	+	++	++	+	→	→	Yes
Cadoxton	+	+	+	0	0	0	+	++	++	+	x	x	No
Cardiff Platform 6	+	+	++	+	0	0	+	++	++	Cardiff Re-signalling projects			Yes
Llandaff Signal	+	+	++	++	+	0	+	++	++	+	→	→	Yes
Cogan Junction	+	+	++	+	0	0	+	++	++	0	→	→	Yes
Cardiff Queen Street	+/-	+	++	++	++	++	++	++	++	0	→	→	Yes
Rail - Link Bus Connections													
Cymmer - Maesteg	0	0	0	++	+	+	0	+	0	+	→	→	Possible
Blackwood frequency	0	0	0	+	+	+	0	+	0	+	→	→	Possible
Penallta - Ystrad Mynach	0	0	0	+	+	+	0	+	0	+	→	→	Possible
Blaenavon - Pontypool	0	0	0	++	+	+	0	+	0	+	→	→	Possible
Ebbw Vale Town - EV Parkway	0	0	0	++	+	+	0	+	0	+	→	→	Possible
Brynmawr - Abertillery - Llanhillteth	0	0	0	++	+	+	0	+	0	+	→	→	Possible
Bedlinog - Treherriais - Abercynon	0	0	0	++	+	+	0	+	0	+	→	→	Possible
Faster Services													
Merthyr Tydfil	+	+	+	+	-	0	+	0	--	-	x	x	No
Vale of Glamorgan	+	+	+	+	-	0	+	0	--	-	x	x	No
Additional Services													
Abergavenny hourly	+	+	+	+	+	+	++	+	+	Dependent on Cardiff Capacity	→	→	Yes
Abergavenny half hourly	+	+	+	+	+	+	++	+	+	Dependent on Cardiff Capacity	→	→	Yes
Gloucester Hourly	+	+	+	+	0	+	++	+	++	Dependent on Cardiff Capacity	→	→	Yes
Chepstow half hourly	+	+	+	+	0	+	++	+	++	Dependent on Cardiff Capacity	→	→	Yes
Ebbw Vale - Newport	+	+	+	++	++	+	++	+	++	+	→	→	Yes
Rhoose - London	+	+	-	++	0	+	+	+	0	0	→	x	No
Rhoose - South West England	+	+	-	+	0	+	+	+	0	0	→	x	No
Vale of Glamorgan Bridgend	+	+	+	++	+	+	++	+	+	+	→	→	Yes
Vale of Glamorgan - Swan Line	+	+	-	++	+	+	++	+	+	+	→	x	No
Pontypridd - Cardiff 10 tph	+	+	++	+	+	++	++	-	+	dependent on Queen St	→	→	Yes
Porth - Cardiff 4 tph	+	+	++	+	++	+	++	-	+	dependent on Queen St	→	x	No
Pontypridd - Cardiff additional	+	+	++	+	++	+	++	-	+	dependent on Queen St	→	→	Yes
Swansea - Cardiff	+	+	-	++	0	+	++	-	+	dependent main line capacity	→	x	No
Caerphilly - Cardiff 6 tph	+	+	+	++	+	++	++	-	+	dependent on Queen St	→	→	Yes
Energlyn - Cardiff additional	+	+	+	++	+	++	++	-	+	dependent on Queen St	→	→	Yes
New Stations													
Cwm	-	0	-	++	++	-	+	-	-	-	→	x	No
Crumlin	-	0	-	++	++	-	+	-	-	-	→	x	No
Darran Rd/ Risca	-	0	--	+	+	-	+	-	-	-	→	x	No
Pye Corner	-	0	-	0	0	-	+	-	-	-	→	x	No
Upper Boat	-	0	-	+	+	-	++	0	--	-	→	x	No
Ynysboeth	-	0	-	++	++	-	0	0	-	-	x	x	No
Abercwmboi	-	0	-	++	++	-	0	0	-	-	x	x	No
Glyncoch	-	0	-	++	++	-	+	0	--	Timetable impact	x	x	No
Pontypridd North	-	0	-	+	+	-	+	0	0	Timetable impact	x	x	No
Hopkinstown	-	0	-	++	++	-	0	0	--	-	x	x	No
St Mellons	+	+	+	+	0	-	++	0	0	+	→	→	Yes
Llangynwyd	-	0	0	++	++	-	+	0	0	+	x	x	No
Bridgend College	-	0	0	+	0	-	+	0	0	+	→	x	No
St Fagans	-	+	0	++	0	-	++	0	-	Route Capacity	→	x	No
Gilston / St Athan	-	0	0	+	+	-	+	0	-	0	x	x	No
Ely Bridge	-	+	0	+	0	0	+	-	-	Timetable impact	x	x	No
Caerleon	+	+	++	++	0	-	++	+	0	+	→	→	Yes
Coedkernew	+	+	++	++	+	-	++	0	+	Depend on Main Line Upgrade + Dev't	→	→	Yes
Llanwern	+	+	++	++	+	-	++	0	+	Depend on Main Line Upgrade + Dev't	→	→	Yes
Magor/Undy	+	+	++	+	0	-	+	0	-	Possible Relocation of Severn Tunnel J	→	→	Yes
Sebastopol	0	+	0	+	0	-	+	0	-	When local services introduced	→	→	Longer term
Llantarnum	0	+	0	+	+	-	++	0	-	When local services introduced	→	→	Longer term
Line Extensions													
Ebbw Vale North	+/-	+	+	++	++	++	+	+	+	+	→	→	Yes
Abertillery	+/-	+	+	+	+	+	+	+	++	Timetable and route capacity	→	x	Longer term
Hirwaun	+/-	+	+	++	++	+	+	+	0	++	→	x	No
Bedlinog	+/-	+	0	++	++	+	++	+	0	+	→	→	Longer term
Beddau	+/-	+	++	+	+	+	++	0	-	Main Line Capacity	→	→	Yes
Creigiau/ Llantrisant	--	0	-	+	+	+	+	0	-	--	x	x	No
Caerphilly - Machen - Newport	--	0	-	+	+	+	+	0	-	--	x	x	No
Circle Line	--	0	-	0	0	0	+	+	+	-	x	x	No
Line Conversions (to LRT)													
Coryton Line	-	0	+	0	0	0	+	+	++	Rail line impact	x	x	No
City Line	0	0	0	0	0	0	+	0	+	Rail line impact	x	x	No
Bay Branch	+	0	-	-	--	-	0	0	--	-	x	x	No

Sewta Rail Strategy Study

Final Report – Technical Appendix



January 2006

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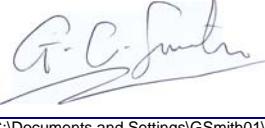
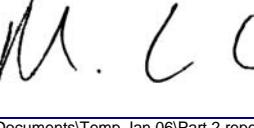
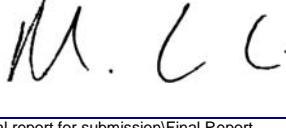
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1 INTRODUCTION

This technical appendix to the Final Report for the Sewta Rail Strategy presents the detail of the technical work undertaken on the options investigated. The report has a separate section for each package of schemes or route within the network and follows the format of an introduction, presentation of operating issues and costs, presentation of engineering issues and costs, presentation of demand and revenue forecasts and presentation of the economic evaluations.

1.1 Operations, Engineering and Costs

1.1.1 Operational feasibility

Delivery of the timetable is a complex combination of many elements that are managed separately by Network Rail and the TOCs. The practicality of proposed schemes depends on whether track layouts are available, and whether appropriate resources are proposed for rolling stock and staff diagrams. Local passenger services need to be accommodated on infrastructure, which is shared in part with significant high speed long distance, regional passenger and freight traffic.

Whilst it was not possible to undertake detailed timetable analysis for the wide range of schemes that needed to be assessed in the study within the resources available, we have taken account of network capacity issues and, where necessary, included initiatives to ensure that the performance of existing services is not compromised.

1.1.2 Operating costs

Operating cost estimates were based on the latest Jacobs Consultancy model developed over a wider range of projects including franchise replacement and past Strategic Rail Authority (SRA) Rail Passenger Partnership funding bids. We have adapted the model to reflect the Arriva Trains Wales operations. The model takes on board the length and proposed timetable of services, the assumed rolling stock and a range of other factors including fuel, maintenance, cleaning, staff costs, Network Rail charges, station running costs and overheads. The model produces estimates at Q1 2004.

With the forecast growth in passenger demand over time the capacity of service was checked and operating costs increased as appropriate. Also – since the current strategy involves train lengthening to cope with overcrowding – schemes were tested for 2-car and 4-car operations with no assumed allowance for increased staff costs. However, it was also assumed that longer trains would operate throughout the day rather than for just peak periods.

1.1.3 Infrastructure costs

An experienced rail engineer has estimated the infrastructure requirements for the various schemes through site visits and the use of in-house experience of rail scheme development and costing. We have liaised with Network Rail and included provision for a robust – first order – estimate of the costs, taking account of the Guide to Railway Investment Projects (GRIP) and a qualitative assessment of risks. Costs are produced at first quarter 2005 prices.

The Guide to Railway Investment Projects (GRIP) describes how Network Rail manages and controls projects that enhance or renew the national rail network throughout the project lifecycle from inception through to post-implementation realisation of benefits. It includes a staged approach to enable projects to be developed in a structured manner with reviews of the ongoing business case being undertaken at key stages. The intention is to manage projects in a manner that minimises and mitigates risk.

Deliverables are specified at each stage to facilitate logical development of the project and support the review process. The specific deliverables for a particular project are drawn from a matrix and agreed with the Network Rail Project Manager.

The investment stages within the lifecycle reflect the significant business and technical milestones in the project's development and delivery. The following description of the stages is taken from the GRIP Policy Manual published by Network Rail:

Stage 1 - Output Definition

- Establishes the scope of the investment in terms of the incremental network capability required by the investment's "client". This is described in terms such as journey time, capacity, loading gauge etc. It may also require the scoping of asset renewal.

Stage 2 - Pre-feasibility

- Ensures that asset condition, safety or standards requirements are identified and included in the scope of the investment.
- Ensures that investment is aligned with organisational strategy and contributes to targets.
- Identifies the constraints on the network that prevent the delivery of the client's outputs and defines the incremental capability that must be delivered by the investment.
- Provides confirmation that the outputs can be economically delivered by addressing the identified constraints.

Stage 3 - Option selection

- Develops options for addressing the identified constraints and delivering the required incremental network capability.
- Assesses the options and selects the most appropriate one, together with confirmation that the outputs can be economically delivered.

Stage 4 - Single Option Development

- Develops the selected single option to the point of engineering scope freeze and in sufficient detail to allow finalisation of the business case and scheduling of implementation resources.

Stage 5 - Detailed design

- Produces a complete and robust engineering design that allows risks, costs, timescales, resources and benefits to be fully understood prior to commitment to implement.

Stage 6 – Construction test and commissioning

- Delivers the asset change / renewal to the appropriate specification and provides confirmation that the asset and system work in accordance with their design and that they deliver the incremental network capability.

Stage 7 – Scheme Handback

- Introduces the asset into operational use and obtains acceptance of the Works. The key product from Scheme Handback is acceptance of the Project Works.

Stage 8 – Project Close Out

- Ensures that the project is closed out in an orderly manner with updated asset management information, capitalised assets, settled contractual accounts and any contingencies and warranties are put in place. Logging up and other funding arrangements finalised and assumed business benefits are captured in the Business Plan.

Certain development stages up to stage 4 may be combined. The Network Rail Sponsor makes this decision in consultation with the Project Manager and records it in the management plan prepared for financial authorisation at the end of stage 1.

1.2 Demand and Revenue Forecasts

The demand and revenue forecasts were based on the development and application of 2 models – a Moira¹ model which assessed the impact of changes to existing services and a trip rate model to predict the demand and revenues for new stations. Additional spreadsheet models were developed to examine other factors including the impact of service changes on stations which are new and therefore not contained within the Moira model and the calculation of growth and capacity benefits.

The Moira model was developed from a March 2005 base provided by Arriva Trains Wales. The 2009 base model was altered to include the standard pattern (off-peak) timetable proposed for introduction in December 2005 and the frequency increases programmed between 2005 and 2009 – on the Rhymney Line, Merthyr Line and Maesteg Line.

All figures extracted relate to total rail journeys and revenues – rather than for individual train operating companies. The model was used to predict passenger growth, new revenue and additional passenger miles, as well as benefits to existing users. The model price base is Q3 2004.

The Trip Rate model was developed through SPSS² analysis of the catchment and level of service characteristics of existing stations compared to their current demand. Catchment area analysis took account of overlapping catchments of adjacent stations. The work focused on the key destinations – Cardiff and Newport, and the resultant model forecasts are expanded to all flows / revenues. The detail of the development of the model is given in Appendix A.

Abstracted trips were estimated, based on plots of origin postcodes of people arriving by car at the main park and ride stations as derived from the SRA National Passenger Survey data and factored to take account of the sample size.

¹ An integrated elasticity based demand forecasting model for rail services, combining passenger journey, network, timetables and earnings allocation between train operators.

² Statistical Analysis Package for the Social Sciences, a data management and statistical analysis computer programme.

1.3 Economic Evaluations

The economic evaluations have been undertaken in line with the latest appraisal guidance of the DfT / SRA. The economic evaluation is undertaken over 60 years of operation to a base of 2002 and all prices are converted to 2002 values. The discount rate applied is 3.5% for the first 30 years of operation and 3.0% for the remaining years.

Capital costs are estimated at Q1 2005 and include a 50% risk and contingency factor. For most schemes capital costs have been assumed to be incurred in 2010 and revenues and benefits accrue from 2011. An optimism bias factor of 57% has been applied to capital cost estimates. No price inflation has been included and no market price adjustment factors have been included at this stage.

Operating costs are produced by the Jacobs Consultancy model which has a Q1 2004 price base. Demand forecasts were compared with the practical (peak) capacity of rolling stock and where necessary higher operating costs for later years were computed. Operating costs are held constant in real terms.

Demand, revenues and benefits are grown between the forecast model year to opening year at a rate of 2.25% per annum – the long term underlying GDP growth rate. No inflation is applied to revenues – keeping them in line with operating costs. The values of user and non user benefits are increased over time in line with the growth in the value of time as prescribed by the DfT in their Appraisal Guidance.

Existing and new user time savings benefits were derived from the Moira model. Crowding benefits were derived externally through an estimate of the number of additional seats provided, and application of an average factor of 10p per minute where these seats were used by passengers who would otherwise be standing, derived from PDFH.

Non user benefits were calculated based on the application of a proxy value per car kilometre reduced as a result of transfer to rail derived from the SRA Bidding Guidance. The average trip length was estimated for each scheme (using Moira outputs where available) and the following assumptions made throughout:

- 33% of new demand is assumed to have transferred from car;
- Car occupancy levels of 1.2 persons per vehicle;
- Benefit rate per car kilometre of 0.417p (inflated to 2005 prices from 0.3p 1992 value);
- Car transfer time savings were factored by 11.46% to represent accident benefits resulting from the reduction in highway traffic – based on the results of previous evaluations; and
- Air Quality benefits were computed using DMRB³ rates for average traffic pollutant emissions per km and DfT guidance on values.

The present value of costs is computed by subtracting revenues from operating costs and adding capital costs. The present value of benefits is the sum of the monetary values of the wider benefits and the benefit cost ratio is calculated by dividing the benefits by the net costs.

³ Design Manual for Roads and Bridges providing DfT guidance on the appraisal of road schemes.

To enable direct comparison the economic evaluations have been undertaken on the same basis – except for the Valley Lines North / Queen Street Scheme which assumes high growth. The economic evaluations don't take account of user benefits for those passengers using new stations nor the benefits to other passengers of reduced demand for parking at existing stations as a result of abstraction – which could also release some suppressed demand at a number of locations.

The economic evaluations do not take account of wider economic benefits resulting from the change in accessibility – nor the jobs created by investing in the infrastructure. Where appropriate, consideration of the scale of these wider benefits on the benefit cost ratio has been taken into account in deciding on the likelihood of securing government funding for projects.

DfT guidance on Value for Money⁴ decisions in relation to Benefit Cost Ratios (BCR) is summarised in Table 1.

Table 1 DfT Guidance on Value for Money

BCR	Value for Money	Funding Likelihood
Less than 1.0	Poor	None
1.0 to 1.5	Low	Few Schemes
1.5 to 2.0	Medium	Some Schemes
Over 2.0	High	Most Schemes

However, the guidance also states that if a project has a significant amount of unquantified wider benefits, such as economic regeneration within an assisted area, then the funding likelihood would rise by 1 category. Therefore, if a scheme has a monetised BCR of below 1.5, taking into account the wider benefits might lift it by up to between 1.5 and 2.0 and therefore raise the funding decision from few schemes to some schemes.

Appraisal Summary Tables of the recommended schemes are included at Appendix B.

⁴ Guidance on Value for Money, DfT, 15.12.2004

2 ABERDARE - HIRWAUN EXTENSION

2.1 Introduction

This scheme involves upgrading the existing freight line between Aberdare and Hirwaun where a new station would be provided. The scheme would enable the current half hourly service between Cardiff and Aberdare to be extended to Hirwaun. As well as generating new rail business through improved rail access to Hirwaun, some passengers currently using Aberdare would be abstracted which would have the benefit of releasing some car parking capacity at Aberdare but the scheme would also impact on the economics of the Rail-link bus service. The Rail-link bus service would probably be rerouted if the rail service was extended, potentially improving journey times from other places served by the bus.

2.2 Operations and Costs

The existing service between Cardiff and Aberdare is generally ½ hourly with additional trains at peak times and increased intervals mid-morning. Services pass at Mountain Ash.

It is assumed that the service frequency is unchanged and that the service maintains the existing timings south of Aberdare to tie into the existing Valley Line services. The running time between Aberdare and Hirwaun is estimated as 7 minutes. The scheme will therefore require an additional train and crew but would have the additional advantage of providing more recovery time for the existing service. The operating costs of the additional service are shown in Table 2 for a 2-car train and for a 4-car train which might be required at least in peak periods due to passenger demand growth on the line. No allowance has been made for increased staff costs on 4-car trains.

Table 2 Aberdare - Hirwaun Extension Operating Costs

Heading	2-car train £'000	4-car train £'000
Rosco Costs	£250	£500
Staff Costs	£173	£173
Other Costs	£253	£385
Total	£676k	£1,058

If the existing times are maintained at Cynon Junction an additional passing facility will be required at the north end of the line between Aberdare and Hirwaun. The existing eight-minute layover at Aberdare would be increased and additional trains and crew would be required. We have assumed that up and down trains pass at Mountain Ash and a new passing loop is provided between Aberdare and Hirwaun. The optimum position of the new loop is between stations. It is assumed that the existing freight services to Hirwaun Pond will continue.

2.3 Engineering and Costs

2.3.1 Background and Existing Infrastructure

The line between Aberdare and Hirwaun formed part of the Vale of Neath Line from Neath to Pontypool Road. There was an intermediate station at Trecynon. The line was constructed as double track although it was singled following the withdrawal of passenger services in June 1964 and subsequent rationalisation of the lines in the area.

This route description is based on a site visit to locations accessible to the public on 21st July 2005 together with information available from published sources.

The line extends beyond Aberdare to Hirwaun Pond, a distance of approximately 4 miles 60 chains. The site of the closed Hirwaun station is located approximately 3 miles and 50 chains from Aberdare. The line is maintained currently for coal traffic and the average gradient between Aberdare and Hirwaun has been assessed as 1 in 100.

Permanent Way

The track comprises generally bullhead rail on timber sleepers. There is extensive weed growth in the ballast that could be indicative of ballast contamination and drainage problems.

Signalling

Currently the route is controlled from Abercynon Signal Box using track circuit block to Aberdare and One Train Working with Staff between Aberdare and Hirwaun Pond.

Level crossings

There is a trainman operated (TMO) level crossing at Robertstown adjacent to the A 4059.

Structures

These have not been considered at this stage since the route is maintained for heavy freight traffic and is categorised as RA6 by Network Rail. Any works to structures will be consequent on other works.

Station site

Hirwaun station was located at the end of Station Road and parallel with Elm Grove. All the buildings and structures have been removed although the remains of the former platforms are still evident and the site remains undeveloped.

2.3.2 Scope of works

It has been assumed that the service will be provided by extending the existing service from Aberdare to Hirwaun. The timings at Abercynon will remain unchanged to fit the existing service pattern to and from Cardiff (Queen Street) and trains will continue to pass at Mountain Ash. This will require the provision of an additional passing loop between Aberdare and Hirwaun since the current layover period at Aberdare would be insufficient for a return working on to Hirwaun. It has been assumed that the line speed would be raised to 50 mph.

Permanent Way

A limited visual examination of the track from level crossings, overbridges and the Hirwaun station site suggests that the condition of the materials and the vertical alignment, while suitable for the existing freight traffic, would require extensive refurbishment for passenger services. It is therefore assumed that the line between Aberdare and Hirwaun station would be relaid and reballasted throughout. A more detailed examination could reduce the scope of relaying that has been assumed.

A review of the operation of the line demonstrated that a passing loop would be required between Aberdare and Hirwaun. It has been assumed that this would be 400m long, similar to the existing loops at Mountain Ash and Abercwmboi. The loop entrance and exit turnouts would be 40 mph.

Signalling

The existing track circuit block signalling on the branch would need to be extended to Hirwaun station including control of the passing loop. The existing section of One Train Working with Staff would be reduced in length to between Hirwaun station and Hirwaun Pond.

Level crossing

The existing level crossing at Robertstown (Wellington Street) is train man operated (TMO). This type of operation would be incompatible with the operation of a frequent passenger train service and has significant implications for journey time and safety. The selection of the type of replacement crossing would be dependent on a risk analysis of the type and frequency of both the rail and road traffic, the layout of the site and any specific features including the potential for road traffic to back up from a junction and block the level crossing. The final decision would be made by Network Rail in consultation with HMRI and other stakeholders.

Due to the proximity of the level crossing to the roundabout at the junction of the A4059 with Wellington Street, there is a risk that the level crossing could be blocked by queuing road traffic. This would generally preclude the use of Automatic Half Barrier or Automatic Half Barrier Locally Monitored crossings unless some method of managing the road junction to prevent this could be devised. It has been assumed, therefore, that the crossing would be converted to a controlled crossing with full barriers monitored by CCTV. This would require rail signals to protect the crossing. It has been assumed that the crossing could be monitored from the existing Abercynon Signal Box.

It has been assumed that no significant changes will be required to the existing TMO crossing between Hirwaun station and Hirwaun Pond.

Hirwaun station

The station would be located at the east end of the former station site at the end of Station Road. There is an extensive level area between the track and Elm Grove that would provide for car parking. It is assumed that the station would be unmanned and would comprise initially 99m long platforms, waiting shelter, train indicators and CCTV.

Other works

The whole route would require fencing.

2.3.3 Scope Risks

At this stage two areas of scope risk have been identified:

- Works to Hirwaun Level Crossing
- Abercynon Signal Box

It has been assumed that Hirwaun Level Crossing could remain as TMO, however this would need to be reviewed against both the operational requirements and the final signalling layout and in particular the interface between the Track Circuit Block and One Train Working sections.

It has been assumed that Abercynon Signal Box has sufficient space to enable the panel to be extended to cover the section on to Hirwaun and accommodate the CCTV monitor for Robertstown Level Crossing.

(a) Powers and Consents

Transport and Works Act Order

It is assumed that generally the land required permanently is within Network Rail ownership and the works would be covered under their Permitted Development Rights. As the railway is still open to traffic, albeit a limited freight service, it is considered unlikely that the reintroduction of a regular passenger trains would give rise to claims for nuisance. It is assumed therefore that an Order would not be required.

The changes to Robertstown Level Crossing would require a Level Crossing Order.

Her Majesty's Railway Inspectorate (HMRI)

The works would be notifiable to the HMRI under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994 [ROTS (AWPE) R]. There are three formal stages in this process:

- Obtain notification of non-objection to concept (GRIP 4)
- Obtain notification of non-objection to proposals (GRIP 5)
- Obtain full approval to the completed works (GRIP 7)

Major Project Notice

GRIP defines a major project as “any engineering, maintenance or renewal project which requires a possession or series of possessions of one or more sections of track extending over either a period of more than one year; or a period that contains two or more Passenger Change Dates”.

This is unlikely to be applicable to this project since the required possessions are unlikely to fall within the above definition.

Network Change

The works will affect the Train Operating Companies (TOC's) and Freight Operating Companies (FOC's) and thus would be subject to the Network Change process. The Network Change Notice is developed during GRIP 4 and agreed during the detail design phase, GRIP 5. The continuing involvement of representatives of these organisations during the early stages of development would assist the process.

Station Change

At this stage of project development, this is not considered to apply to this project.

(b) Programme

This project is not dependent on any capacity enhancement or resignalling schemes currently under development since it has been considered as an extension to an existing service operating within the same paths. It could therefore be developed at any time subject to resource availability.

2.3.4 Costs

The following assumptions have been made – leading to the estimated costs shown in Table 3:

Signalling

- Robertstown Level Crossing will be upgraded to CCTV
- Extension of existing TCB signalling to Hirwaun including new loop
- No changes to Hirwaun Level Crossing

Permanent Way

- Upgrade line for 50 mph line speed - relay and reballast throughout
- New loop between stations

Communications

- A nominal allowance for extending the system to provide lineside phones
- CCTV and CIS included with stations
- No DOO requirements

Station

- Platforms 100 metres long by 2.5m wide
- Basic shelter
- Security and lighting included
- Car parking for 50 cars

Bridges

- It has been assumed that no works will be required to bridges and structures as the line is maintained currently for freight traffic

General Civil Engineering

- Allowance for local improvements to drainage, cess pathways and fencing throughout line of route

E&P

- Included with station

Transport and Works Act

- No allowance has been made for the costs associated with obtaining an Order under the T&WA.

Land

- It is assumed that all land required for the works is within Network Rail or Local Authority ownership

Table 3 Capital Costs – Aberdare – Hirwaun Extension

Element	Cost £'000
Construction Works	
Signalling	1,685
Permanent Way	7,400
Telecoms	100
Stations	416
Bridges	0
General Civils incl Fencing	50
E&P	inc.
Sub Total	9,651
Other Costs	
Preliminaries and G. I.'s	2,400
Design	600
Testing and commissioning	150
Sub Total	3,150
Total Construction Costs	12,801
Network Rail Costs	
NW Project Management	1,536
Possession Management	50
Sub Total	1,586
Sub Total	14,387
Risk	
Unforeseen risk provision (50%)	7,194
Total (excluding Optimism Bias)	21,581

2.3.5 Conclusions

It is feasible to reinstate passenger services between Aberdare and Hirwaun as an extension to the existing services to Aberdare at an estimated spot cost of £14.3m (Q1 2005). The cost assumes that the track would need to be relaid completely between Aberdare and Hirwaun. It is possible that further development of the scheme would reduce the scope of relaying and hence the total cost. Technically the principle risks relate to any requirement to upgrade Hirwaun Level Crossing and the ability of Abercynon Signal Box to accommodate additional equipment.

2.4 Demand and Revenue Forecasts

Demand and revenue forecasts have been based on the new station trip rate model developed for the study. It assumes a half hourly service to Cardiff, that car parking is provided and takes account of the existing competing bus service of 4 buses per hour in the AM peak. The catchment population lies mainly to the south of the site and is relatively small – 1,623 within 800m of the new station site and 4,613 within 2km. By comparison over 4,500 people live within 800m of Aberdare station. The demands to Cardiff and Newport were factored to annual all station flows using the average factor for the region and for the Shadow Station group defined as Aberdare, Fernhill, Mountain Ash and Penrhycer to produce a demand range. (Information for Cwmbach station had been excluded from the calibrated models).

An abstraction factor was calculated based on analysis of the SRA National Passenger Survey data, suggesting an abstraction of 8% of Aberdare traffic – around 100 passenger journeys a day. The Rail-link Bus data suggests that 35 of the abstracted trips would come from this source.

The demand model includes a factor for terminus (heads of the valleys) stations which is significant in the forecast of Hirwaun demand – without this factor the level of generated demand would be similar to the level of abstracted demand. The attractiveness of the station to a wider catchment area is therefore a key issue and the poor highway access to the station through Hirwaun Village suggests that the new station demands might be at the low end of the range presented.

Table 4 shows the financial evaluation based on the forecast range.

Table 4 Aberdare – Hirwaun Financial Evaluation

	Annual Demand/ Revenue
Hirwaun Passengers	133,846 – 215,203
Aberdare Abstraction	-32,716
New Rail Demand	101,130 – 182,487
New Rail Revenue	£174,621 - £315,100
Operating Costs (2-car trains)	£675,974
Subsidy per passenger	£1.98 - £4.96

Note: 2005 values and prices.

2.5 Economic Evaluation

Economic benefits have been calculated related to the modal shift impact of the scheme, reducing car trips and resulting in a reduction in traffic congestion, assuming an average journey length of 30 miles. Air Quality benefits are also calculated. There could be additional user benefits relating to reduced travel time to access the rail network, additional car parking availability at Aberdare and improved reliability of the train service.

The economic evaluation presented in Table 5 is considered cautious and is presented as a range with the differing passenger generation and operating cost assumptions.

Table 5 Aberdare – Hirwaun Economic Evaluation

Scenario	High Passenger Forecast – 2-car trains £m	Low Passenger Forecast – 2-car trains £m	Low Passenger Forecast – 4-car trains £m
Present Value Costs	£25.4	£30.3	£37.3
Present Value Benefits	£45.2	£25.0	£25.0
Net Present Value	£19.8	£-5.3	£-12.3
Benefit Cost Ratio	1.78	0.83	0.67

The low end of the demand forecast is considered most realistic. Under both the assumed 2-car and 4-car operations the benefit cost ratio lies below 1.0. Inclusion of user benefits and wider economic benefits of providing improved rail access in the Cynon Valley, enhancing access to work in the valley and in Cardiff could raise the benefit cost ratio over 1.0. However, this does not present a strong case for investment.

2.6 Recommendation

It is therefore recommended that, instead of extending the rail line to Hirwaun, the rail strategy provides improved access to Aberdare station through maintenance of the Rail-link bus service and increased parking provision.

Figure 1 Aberdare Station: Looking to Hirwaun



Figure 2 Aberdare H.L.Station: Ground frame



Figure 3 Robertstown L.C. : Looking to Aberdare



Figure 4 Hirwaun L.C. : Looking to Hirwaun Station



3 RELIABILITY MEASURES

3.1 Introduction

Three relative small infrastructure schemes were identified to improve train service reliability within the Sewta region:

- Barry down platform turnback;
- Llandaf northbound additional signal; and
- Cogan Junction improvements.

The Barry scheme (before Cardiff Area Re-signalling) would involve the conversion of a shunt signal to a main aspect semaphore at the Cardiff end of the down platform to enable trains to start back from the down platform in the Cardiff direction. Currently trains cannot terminate at Barry without proceeding to Barry Island, to the Vale of Glamorgan line or turning short at Barry Dock. The first two options incur additional running time and turning back at Barry Dock (or Cardiff Central) affects a large number of passengers as Barry is the largest traffic generator on the route.

At Llandaf an intermediate signal section on the up line would allow northbound trains to proceed closer to the junction at Radyr. Northbound trains cannot proceed through the junction when the section is occupied by a preceding train or a southbound City Line train. Should either route be running slightly off timetable this measure would reduce overall delays.

Cogan junction is an additional network constraint where the Barry Lines reduce from four tracks to two, combined with a single lead junction directly onto the single-track Penarth branch. Greater practical capacity could be delivered by measures to allow southbound Penarth trains to operate independently through the junction and/or to allow trains for the branch to await entry clear of the main line, or by more extensive junction modification.

3.2 Operations and Costs

These schemes are designed to improve the operational performance of the existing network and no specific operating costs have been estimated. However, there would be some incremental maintenance requirements associated with the introduction of additional infrastructure.

3.3 Engineering and Costs

The Barry and Llandaf signal schemes have been estimated to have costs in the order of £0.5m. More detailed investigation of the Cogan Junction scheme was undertaken.

3.3.1 Existing infrastructure

This description is based on a site visit to locations accessible to the public on 18th August 2005, together with information available from published sources.

The existing up and down loops start on the Cogan side of the Ely River Viaduct and extend for 52 chains (1050m approx.) ending 8 chains north of Cogan Junction. From the condition of the rail heads it appears that all the tracks are currently in use. On the down side of the existing loop, there is redundant railway land used for lineside access within the Network Rail boundary. However, adjacent to Cogan Junction, the fence line comes to within a minimum 3m of the Penarth line before it increases to a guesstimated 5m. It appears that redevelopment of the site enclosed by this fence is underway. There is a signalling relay room on the down side at Cogan Junction and two location cabinets in the down cess on the Penarth Branch.

3.3.2 Scope of works

It has been assumed that the functionality of the existing loop would be maintained and this has been reflected in the scope of the track and signalling alterations. The maximum length of the extension has been assessed at 500m and the works would comprise the following:

- Extension of the existing down loop by 500m including s&c;
- Installation of associated signalling;
- Lighting and drainage; and
- Relocation of existing signalling equipment (dependent on phasing).

3.3.3 Issues and Constraints

It appears that the land adjacent to the Penarth Branch south of Cogan Junction has been sold and is being redeveloped currently. A strip of this land would need to be acquired for the loop extension.

The works would need to be undertaken in association with the Cardiff Area Signalling Renewal Scheme to avoid the costs of relocating the relay room and location cabinets.

3.3.4 Programme

These works would need to be integrated with the Cardiff Area Signalling Renewal Project.

3.3.5 Costs

Costing assumptions, leading to the estimated costs shown in Table 6, are as follows:

- The costs are associated with the extension of the loop only and do not allow for upgrading the existing loop to the same standards;
- The loop would be used in the down direction only i.e. no bi-directional signalling; and
- The functionality of the existing loop would be maintained i.e. existing connection to down main line and associated signal remain.

Signalling

- The signalling costs would be marginal on the Cardiff Area Signalling Renewal costs.

Permanent Way

- Total length of additional loop is 500m.

Electrification and Plant (E&P)

- Allowance has been made for point heating.

Possession management

- It is assumed that possessions to lay in the new track and connections would be included in the Cardiff Area Signalling Renewal Scheme.
- Significant length of the realigned track could be laid in under "Green Zone".

Land

- No allowance has been made for the costs associated with acquiring the necessary additional strip of land.

Consents

- No allowance has been made for powers or consents.

Staff access

- No allowance has been made for staff access.

Table 6 Cogan Junction Improvement Capital Costs

Element	£'000
Construction Works	
Signalling	250
Permanent Way	750
General Civil Engineering	60
E&P (points heating)	95
Sub Total	1,155
Other Costs	
Preliminaries and G. I.'s	289
Design	65
Testing and commissioning	50
Sub Total	404
Total Construction Costs	1,559
Network Rail Costs	
NW Project Management	150
Possession Management	100
Sub Total	250
Sub Total	1,809
Risk	
Unforeseen risk provision (50%)	905
Total (excluding Optimism Bias)	2,714

3.3.6 Conclusions

At this stage, extension of the Cogan down loop appears to be technically feasible at an estimated spot cost of £1.8m (Q1 2005). However, it will be necessary to acquire land on the down side that may already be under redevelopment and there is no direct staff access to the site. These issues will need to be addressed at an early stage of any future project development. If the land issue cannot be resolved Network Rail would need to examine options for improving performance at Cogan Junction, and possibly increasing capacity in both directions, through the Cardiff Signalling Renewal project.

3.4 Demand and Revenue Forecasts

For Barry Arriva Trains Wales have appraised the benefits of the scheme in terms of the values of passenger time savings but have not estimated the benefits in terms of demand and revenues. The scheme would protect the existing demand and revenues of the services.

In the absence of specific data on the average delay and frequency of delays at Cogan Junction and Llandaf we have assessed the potential benefits through application of the Moira model using an indicative time saving for passengers passing through the junctions of an average 0.5 minutes (for Llandaf northbound only). The results are summarised in Table 7.

Table 7 Reliability Measures Financial Evaluation

	Cogan Junction	Llandaff
New Passengers	13,202	3,034
Abstraction	0	0
New Rail Demand	13,202	3,034
New Rail Revenue	£15,433	£4,271

3.5 Economic Evaluation

The economic benefits relate to user and new user time savings. For the Barry scheme user benefits were provided by Arriva Trains Wales and for the Cogan and Llandaff schemes the benefits were taken from the Moira model. The economic evaluation is shown in Table 8.

Table 8 Reliability Measures Economic Evaluation

	Barry £k (2002 prices)	Cogan Junction £k (2002 prices)	Llandaff £k (2002 prices)
Present Value Costs	£551	£2,462	£404
Present Value Benefits	£14,329	£6,001	£1,632
Net Present Value	£13,778	£3,539	£1,227
Benefit Cost Ratio	26.0	4.4	4.0

This analysis suggests that all schemes would provide a high level of benefits if the indicative time savings can be achieved. For inclusion in the rail strategy an average time saving of at least 0.25 minutes each way at Cogan Junction and 0.25 minutes northbound at Llandaf would need to be achieved.

3.6 Recommendation

It is **recommended** that all three schemes are examined in detail in the Cardiff Area Signalling Renewal Project. Also, it is recommended that the Barry Turnback is provided sooner if funding is obtained as a result of a bid for performance related enhancements. The strategy may require additional capacity between Barry and Cardiff which should be taken into account in determining the appropriate scheme.

Figure 5 Cogan: Loops looking east for A4160



Figure 6 Cogan: Looking north to Cogan Junction from Penarth



Figure 7 Cogan: Looking north to Cogan Junction from Penarth



4 VALLEY LINES – NORTH

4.1 Introduction

The assessment of Train Capacity and passenger growth undertaken in Part 1 of the study suggested that, if passenger growth continues at the current rate (5% per annum), there may be a need for additional rolling stock provision beyond the capacity of some of the Valley Lines routes as currently planned. This situation would be exacerbated by the introduction of a Congestion Charge or Road Pricing in the Cardiff Area.

Whilst it may be possible to further extend platforms to enable longer trains to operate, there has been a long standing ambition to enhance the frequency of services running north from Queen Street Station. This evaluation examined 2 additional hourly services, between **Cardiff and Energlyn** (new station on the Rhymney Line north of Caerphilly proposed to open during 2009) and between **Cardiff and Pontypridd**, as well as the option of a further 2 additional hourly services leading to 10 tph between Cardiff and Pontypridd via Cathays and 6 tph between Cardiff and Energlyn via Caerphilly. The evaluations examined the phasing of these services.

Providing more services through **Cardiff Queen Street** would require remodelling of the station and approaches. The scheme developed in 2003 involved four through platforms, all bi-directionally signalled, with a third span across Newport Road to provide the necessary parallel movements to / from the Taff and Rhymney lines. As a contingency a fifth south-facing bay platform was identified to allow better recovery from delays. The scheme would enable train capacity to be increased from the current 12 tph per direction to 18 tph per direction and had a capital cost estimated as £30m.

The opening of the freight route between **Ystrad Mynach and Bedlinog** to passenger traffic before Queen Street is improved could only be achieved by diverting a service from the Bargoed Corridor. This would be considered unacceptable as the Rhymney corridor is more densely developed and the move would be in conflict with the Sewta Strategy for the corridor of securing clock-face turn-up-and-go services from all stations south of Bargoed. Therefore, ideally, a new service is required running from Cardiff i.e. forming an extension of the Cardiff – Energlyn service proposed above. The new Cardiff service for this scheme would also require additional capacity at Cardiff Queen Street and is considered as a sub-option of the Queen Street enhancement.

A new station at **Upper Boat** on the Cardiff – Pontypridd Line has also been examined. Upper Boat would be a new park and ride location, strategically positioned at the northern end of the proposed Church Village Bypass and would provide improved access to the Trefforest Industrial Estate. However, there would need to be significant additional demand generated to the station, as well as from the station through the provision of park and ride. From plans provided by Rhondda Cynon Taf it is estimated that the site might accommodate around 145 cars (without provision of a bus interchange within the site). The site lies between Trefforest station and Taffs Well station which are both well used park and ride locations and the new site could therefore be expected to be well used.

The evaluations undertaken are for Queen Street Station with additional hourly services to Pontypridd and to Energlyn, with and without a new station at Upper Boat, and Queen Street with Pontypridd and Bedlinog services without Upper Boat Station. In addition the provision of Upper Boat station before the Queen Street improvement scheme was examined.

4.2 Operations and Costs

The Cardiff Queen Street capacity improvement would enable provision of additional services on the Taff Vale and Rhymney lines. Short services, from Cardiff Queen Street to Energlyn and to Pontypridd would assist in providing capacity in the sections of the network most heavily used and require only one diagram in service on each route. However, there would be reduced operating reliability time margin from the norm at Pontypridd, and it would be difficult to stop at a new station at Upper Boat without impacting on reliability. Upper Boat station could be considered as an alternative to the existing, poorly used, Treforest Industrial Estate station as it would also serve the industrial estate but it would not serve the same destination. We have not considered the option of station closure.

Aspirations for higher frequency services running through to Porth and Ystrad Mynach would require an additional train in service doubling operating costs, unless they could integrate with services running from the south of Cardiff. Also, improved turn-back facilities would be required at both locations. The services would attract between 15% and 30% more demand than the shorter services. Therefore the further extension of the services is only recommended if the timetabling and infrastructure enables them to be operated efficiently.

The Queen Street to Bedlinog option requires one additional diagram over running to Energlyn and there would be 19 minutes spare time (over and above minimum turnaround time and performance allowance for the single track). This would be enough to reach Cardiff Bay, but if extended to Cardiff Central this would not allow the current standard allowance for reversal west of the station – and would thus have to assume that it could be attached to some other west side service.

A round trip on the Bedlinog Line would be slightly in excess of 30 minutes, assuming current stock and standard minimum turnaround time of 3 minutes. The round-trip time assumed in the point above could therefore be achieved, subject to suitable slots being available in the Rhymney main line. In the event of a half-hourly service, however, a passing facility on the Bedlinog line would be required, introducing additional timetabling options and the probability that the round trip time would be extended. This would erode the spare time at Queen Street significantly. We have assessed the Bedlinog route for an hourly service only.

The breakdown of the operating costs of the main Queen Street Enhancement options is shown in Table 9 assuming 2-car trains. However, with assumed passenger growth at 5% per annum there will be a need to lengthen the additional trains. The costs of operating the additional trains with 4-cars and 6-cars are also shown.

Table 9 Valley Lines North Operating Costs

Heading	Queen Street + Energlyn + Pontypridd £'000	Queen Street + Bedlinog + Pontypridd £'000
Rosco Costs	£500	£750
Staff Costs	£346	£519
Other Costs	£687	£1,029
Total – 2-car trains	£1,533	£2,298
Total – 4-car trains	£2,445	£3,636
Total – 6-car trains	£3,358	£4,974

Note 2004 prices.

4.3 Engineering and Costs

The engineering assessment has examined the Ystrad Mynach – Bedlinog Branch and the new stations associated with it, as well as a new station at Upper Boat. The capital costs of the Queen Street remodelling scheme have been included – at £30m in 2003 prices – based on the advice of Network Rail in respect of the shelved Queen Street Enhancement design work.

4.3.1 Ystrad Mynach to Bedlinog Branch

The line between Ystrad Mynach South Junction and Bedlinog formed part of a through route to Dowlais (Cae Harris). There were intermediate stations at Nelson and Llancaiah, Trelewis Platform, Bedlinog and Cwmargoed. The line was constructed as double track although the section north of Bedlinog was reduced to a single line in 1952 following a landslide at Taff Merthyr. Subsequently the line was singled throughout and cut back to a coal loading point at Cwmargoed. Passenger services operated generally as a shuttle between Ystrad Mynach and Dowlais and were withdrawn from 15th June 1964.

The scheme evaluated assumes operation of an hourly service between Bedlinog and Cardiff. It is assumed that any committed freight paths will need to be maintained, especially in view of the Cwmargoed reclamation scheme which, from July 2006, proposes the movement of 1 million tonnes of coal per annum between Cwmargoed and Aberthaw Power station, requiring 26 trains movements per week, for the next 12 years.

Three options have been considered as follows:

- (i) Retain the existing train staff and ticket signalling system on the branch.
- (ii) New signalling section between Ystrad Mynach to Bedlinog, remote token Bedlinog to Cwmargoed.
- (iii) As (ii) but reinstate disused up refuge siding at Ystrad Mynach as an up loop.

(a) Existing infrastructure

This description is based on a site visit to locations accessible to the public on 21st July and 5th August 2005 together with information available from published sources.

The total length of the line from Ystrad Mynach to Cwmargoed is 9m 74c. Former station sites were Ystrad Mynach (0m.20c.), Nelson and Llancaiah (2m.30c.), Trelewis Platform (3m. 38c.) and Bedlinog (6m. 01c.).

The average gradient between Ystrad Mynach and Bedlinog has been assessed as 1 in 75.

No activity was apparent at Cwmargoed and this was borne out both by the physical condition of the rails and the flangeways at the level crossing.

Permanent Way

From the observations the track comprises BS 113A rail on concrete, timber or steel sleepers, the ballast is clean with no evidence of formation failure or general drainage problems.

Signalling

Access to and egress from the branch is controlled by mechanical signals operated from Ystrad Mynach Signal Box. There is no other signalling on the branch and it is operated under Train Staff and Ticket arrangements with a single section from Ystrad Mynach South Junction to Cwmbargoed Level Crossing, which is located 38c before the end of the line.

Structures

These have not been considered at this stage since the route is maintained for heavy freight traffic and is categorised as RA8 by Network Rail. Any works to structures will be consequent on other works.

Former Station sites

Ystrad Mynach - separate platforms were provided for the branch on the west side of the Rhymney Line platforms on a gradient estimated to be in excess of 1 in 100. The land occupied by the platforms is within the Network Rail boundary.

Nelson and Llancaiach – the former station site is undeveloped and appears to be within the Network Rail boundary. It is situated adjacent to a residential area with good access from the local road network.

Trelewis Platform - the former station site was located in the centre of the village with limited access from the up (west) side and road access to the down side. A recently constructed footbridge serving the primary school now crosses the site.

Bedlinog – the site occupies a ledge approximately halfway up the town and is used currently by a local coach operator as his yard. Access to the site is directly from the principle road through the town (B 4255). Although the site is relatively central, it should be noted that the main road has a maximum gradient of 14% with numerous bends.

(b) Scope of works

Permanent Way

It is assumed that no significant renewals would be required. Works to increase the maximum permitted line speed from the current 20 mph to 50 mph would possibly require realignment and recanting of curves within the existing boundaries. The existing 15 mph speed restriction at Ystrad Mynach South Junction would have a minimal effect on running times due to its proximity to the station and by any ongoing requirement for train staff or ticket exchange. Consequently, no renewals or remodelling of the junction have been included although improvements should be considered when the junction is renewed in the future.

For option (ii), it would be necessary to install trap points at Bedlinog to protect the signalled section.

For option (iii), it would be necessary to relay the loop and the connection at the Ystrad Mynach end and provide a new connection into the up line at the Cardiff end.

Signalling

Changes to the signalling would be dependent on the capacity requirements of the branch and, in particular, the timing and frequency of any freight services.

(i) Retain existing train staff and ticket

Using the existing train staff and ticket arrangements it would be possible for a freight train to run up to Cwmbargoed and, after clearing the section, be followed up by the passenger train to Bedlinog. When the return working of the passenger train had cleared Ystrad Mynach a down freight could leave Cwmbargoed. However, the down freight would not clear Ystrad Mynach Junction before the next up passenger train would need to enter the branch to maintain the hourly service pattern. Therefore, although this option is feasible it would require a change to the proposed hourly fixed interval service either by retiming or missing one complete return passenger working.

(ii) Create additional section

If the line were operated in two sections, Ystrad Mynach to Bedlinog and Bedlinog to Cwmbargoed, it would be possible, with a modest increase in the permissible line speed for freight trains, to maintain an hourly passenger service with a sufficient margin for a freight path. The additional section between Ystrad Mynach and Bedlinog could be controlled in a number of ways, however, it has been assumed that signals would be provided at Bedlinog together with a remote token instrument for the section north of the passenger train terminus for the freight movements to Cwmbargoed.

(iii) Provide up loop at Ystrad Mynach

This option would require signals to control both the entry and exit to the loop and consequent alterations to the existing signalling.

Structures

The line is classified RA8 by Network Rail and it is assumed that no works will be required to existing structures to permit a passenger service.

Stations

All stations would be provided with 147m long (six-car) platforms, waiting shelters, lighting and long line train indicators.

Ystrad Mynach

The new platform would be located on the east side of the track on the site of the former down branch platform. It should be noted that this platform would be both on a curve and on a gradient estimated to be 1 in 100. This does not comply with the Railway Safety Principles and Guidance on stations that normally require platforms to be located on straight track and gradients no steeper than 1 in 500. Both the vertical and horizontal alignments appear to be tied by the junction at the south end of the site and an underbridge over the A472 road and therefore it is likely that derogation would be required from these requirements.

DDA compliant access can be provided from the existing station car park. It is assumed that no additional car parking would be required.

Nelson and Llancaiach (ST 112961)

The platform would be located on the southwest (up) side of the track and on the site of the former station. The track is curved through the site although future scheme development may enable the track to be realigned to provide a straight section for the platform.

The former station site remains undeveloped and it is assumed that the land remains within Network Rail ownership. There is space for car parking, a set down area and bus interchange if required. The car parking area has been assessed at a minimum of 50 vehicles. However this is subject to confirmation of the land ownership.

Trelewis

Three possible locations have been considered as follows:

- North end below Taff Merthyr Garden Village (ST 105978) - There appears to be land available adjacent to the railway, however the accessibility has not been investigated at this stage.
- Centre of village (ST 106973) – The original station site has possible pedestrian only access from Richards Terrace on the west side or limited vehicular access via a restricted underline bridge to the east side. An alternative would be a platform on the west side further north with pedestrian access from Field Street.
- South end of village (ST 108967) - There is space for a station with parking on either the north or south sides of the road bridge. Both sites would be on straight track. The south would be preferred since road access appears easier from a minor road on the west side of the railway. However, this site is only 800m north of the proposed Nelson and Llancaiach station.

Car parking would be very limited at the first two sites. However, parking for 20 vehicles or more should be achievable at the third site. The cost estimate has been developed based on the second option.

Bedlinog

Two possible sites have been considered as follows:

- The former station site (SO 095012) is located centrally with direct access onto the High Street. However, the site is used as a yard by a local coach company and the platform would be located on a curve.
- Northwest of and adjoining the former station site (SO 093013) there is land within the Network Rail boundary that would be adequate for a platform with access from Station Terrace. An earth bank, which separates this site from Station Terrace, would need to be removed to provide access but the site offers the advantage that it could avoid relocating the user of the former station site.

Car parking for up to 20 vehicles should be achievable in both cases.

(c) Scope Risks

At this stage two areas of scope risk have been identified:

- Additional infrastructure to maintain freight capacity; and
- Platform gradients and curvature.

The operating assumptions that have been made with reference to signalling on the branch could have significant reliability implications. As such, they may not be acceptable to Network Rail and the train operating company without the provision of additional infrastructure e.g. the provision of an up goods loop south of Ystrad Mynach or a passing loop on the branch.

The Railway Safety Principles and Guidance, published by Her Majesty's Railway Inspectorate, requires platforms to be located on straight track and with a gradient no steeper than 1 in 500. As the average gradient of the line has been assessed as 1 in 75 and, with the exception of Trelewis, all the station sites identified are on curves, it is likely that derogation from these requirements would have to be sought

(d) Powers and Consents

Transport and Works Act Order

It is assumed that generally the land required permanently, including that for the stations, is within Network Rail ownership and the works would be covered under their Permitted Development Rights. However, the status of the former Bedlinog station site is unknown and it may be necessary to obtain powers of compulsory purchase to acquire the site. This would favour siting the station to the northwest. As the railway is still open to traffic, albeit a limited freight service, it is considered unlikely that the reintroduction of a regular passenger trains would give rise to claims for nuisance, it is assumed therefore that an Order would not be required

Her Majesty's Railway Inspectorate (HMRI)

The proposed works would be notifiable to the HMRI under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994 [ROTS (AWPE) R]. There are three formal stages in this process:

- Obtain notification of non-objection to concept (GRIP 4);
- Obtain notification of non-objection to proposals (GRIP 5); and
- Obtain full approval to the completed works (GRIP 7).

Major Project Notice

GRIP defines a major project as "any engineering, maintenance or renewal project which requires a possession or series of possessions of one or more sections of track extending over either a period of more than one year; or a period that contains two or more Passenger Change Dates".

This is unlikely to be applicable to this project since the required possessions are unlikely to fall within the above definition.

Network Change

The works would affect the Train Operating Companies (TOC's) and Freight Operating Companies (FOC's) and thus would be subject to the Network Change process. The Network Change Notice is developed during GRIP 4 and agreed during the detail design phase, GRIP 5.

Station Change

This would be required due to the proposed works at Ystrad Mynach.

(e) Programme

The programme would be dependent on whether control of the routes passes from the local signal boxes to the Cardiff control area as part of the Cardiff Area Signalling Renewal Project. It is understood from Network Rail that the status of this element of the project is as follows:

- GRIP Stage 3 (Option Selection) January 2006
- GRIP Stage 4 (Single Option Development) August 2006.

(f) Cost

The cost estimate is dependent on whether provision is required for freight services to operate on the branch in the same periods as the proposed passenger service without affecting the hourly frequency of the latter. There are three options:

- **Option (i)** assumes that no provision is required and the passenger service operates under the existing arrangements.
- **Option (ii)** makes provision for splitting the branch into two sections, Ystrad Mynach to Bedlinog and Bedlinog to Cwm Bargoed.
- **Option (iii)** extends the existing disused up refuge siding at Ystrad Mynach into a loop to hold freight trains clear of the up Rhymney line.

The following assumptions apply to all three options unless noted otherwise;

Signalling

- No changes to the existing signals controlling access to the branch at Ystrad Mynach South Junction
- The existing train staff and ticket arrangements can be maintained (option (i) only)
- Upgrade existing Llancaiach Isaf Level Crossing from User Worked to ABCL

Permanent Way

- Upgrade line for 50 mph line speed as follows:
- Recant 2000 metres
- Quality tamp throughout Ystrad Mynach to Bedlinog
- Local shoulder ballast

Communications

- A nominal allowance for extending the system to provide lineside phones
- CCTV and CIS included with stations
- No DOO requirements

Stations

- Platforms 147 metres long by 2.5m wide at all stations
- Basic shelters
- Security and lighting included
- Car parking at Nelson and Llancaiaach (50 cars) and Bedlinog (20 cars) No parking at Trelewis or additional spaces at Ystrad Mynach

Bridges

- It has been assumed that no works would be required to bridges and structures as the line is maintained currently for freight traffic

General Civil Engineering

- Allowance for local improvements to drainage, cess pathways and fencing throughout line of route

E&P

- Included with station
- Points heaters at Ystrad Mynach South Junction

Possession management

- Any works at Ystrad Mynach South Junction would be integrated into the Cardiff area resignalling works

Land

- It is assumed that all land required for the works is within Network Rail or Local Authority ownership

Transport and Works Act

- No allowance has been made for the costs associated with obtaining an Order under the T&WA.

Option (ii) additional works

- Signals, remote token equipment and cabling at Bedlinog

Option (iii) additional works

- 600m long loop including turnouts and signalling alterations

The capital costs are shown in Table 10.

(g) Ystrad Mynach to Bedlinog Branch Conclusions

At this stage, it appears feasible to reinstate passenger services on the branch line between Ystrad Mynach and Bedlinog to facilitate through services to Cardiff at an estimated spot cost of £7.1m (Q1 2005) for option (ii). This assumes that provision for occasional freight paths needs to be maintained and that this can be achieved by the provision of an additional signalling section at Bedlinog. Technically the principle risks relate to the possible requirement for derogation from standards in respect of the siting of station platforms on gradients and curves and the scope of the infrastructure required to cater for freight services. There is a requirement to consult the HMRI and any costs of mitigation works are covered within the risk allowance included in the cost estimates.

Table 10 Capital Costs – Ystrad Mynach - Bedlinog Line

Element	Option (i) – no change £'000	Option (ii) – split branch line £'000	Option (iii) – freight loop £'000
Construction Works			
Signalling	250	2,100	3,100
Permanent Way	160	160	1,270
Telecoms	200	200	200
Stations	1,760	1,760	1,760
Bridges	0	0	0
General Civils incl Fencing	150	150	150
E&P	75	75	75
Sub Total	2,595	4,445	6,555
Other Costs			
Preliminaries and G. I.'s	650	1,150	1,650
Design	300	500	650
Testing and commissioning	100	150	250
Sub Total	1,050	1,800	2,550
Total Construction Costs	3,654	6,245	9,105
Network Rail Costs			
NW Project Management	450	750	1,100
Possession Management	100	100	100
Sub Total	550	850	1,200
Sub Total	4,195	7,095	10,305
Risk			
Unforeseen risk provision (50%)	2,098	3,550	5,200
Total (excluding Optimism Bias)	6,293	10,645	15,505

4.3.2 Upper Boat Station

(a) Existing infrastructure

This description is based on a site visit to locations accessible to the public on 21st July and 5th August 2005 together with information available from published sources. An additional station at Upper Boat would be provided adjacent to Tonteg Road bridge (Ynyswern) on the double track Cardiff and Merthyr Line. The station would be located (at 10m 30c) between Trefforest Estate (9m 53c) and Trefforest (12m 00c) stations.

The railway line runs along the hillside on the southwest side of Cwm Taf with open land on the up side and an electricity sub-station at the bottom of the bank on the down side. The railway is double track although the formation widens locally where redundant rail infrastructure has been removed. Adjacent to the southwest corner of Ynyswern bridge there is an authorised access point for railway staff and plant to the lineside. At this location, the railway is on a reverse curve, estimated to have a minimum radius of 460m. The gradient through the site is not known.

Road access is via a lane from Tonteg Road. At the location of the junction, Tonteg Road has three lanes, two for traffic travelling up the hill and one down.

(b) Scope of works

The station works would comprise the following:

- Two platforms 147m long to accommodate trains of six-car trains together with a 5m stopping tolerance as at Trefforest Estate and Trefforest stations

- Platform waiting shelters
- DDA compliant access to and between platforms
- Parking for 150 cars
- Customer Information Systems
- Security – CCTV
- Highway access works
- Lighting and drainage
- Station ancillaries e.g. signage

The railway maintenance staff access would be maintained.

(c) Constraints

The basic requirements for stations are set out in the Railway Safety Principles and Guidance (RSPG or Blue Book) part 2 section B published by Her Majesty's Railway Inspectorate (HMRI). Clause 23b states that platforms shall be constructed on straight track and on the level or with gradients no steeper than 1 in 500. However, minor stations can be constructed on steeper gradients subject to suitable safety arrangements and with the agreement of the Inspector.

From a practical point of view, 1000m radius curve is accepted by HMRI and Network Rail as being straight track, however 460m radius would require derogation from the requirements supported by a risk analysis and mitigation measures. The alignment is such that it does not appear feasible to realign to increase the radius at this location.

Therefore, we have considered two options for Upper Boat station, the site originally proposed (Option 1) and an alternative site, 240m towards Cardiff, that would be located on straight track (Option 2).

Option 1

Key features are:

- The north end of station platforms would be located 25m on the Cardiff side of Ynyswern bridge
- Cross platform access by ramped footbridge
- Car parking and station access on southwest side of station
- Acquisition of land (rough pasture?) bounded by railway, existing lineside access and land for car park
- Access from Tonteg Road with traffic light controls on the junction

The advantages are:

- Relative ease of construction
- Proximity to main road

The disadvantages are:

- Station platforms on a curve
- Access to and from Tonteg Road will require traffic control and significant highway remodelling

Option 2

Key features are:

- The north end of station platforms would be located 240m on the Cardiff side of Ynyswern bridge
- Cross platform access by subway with ramps to platform level
- Car parking and station access on northeast side of station
- Acquisition of land bounded by railway, electricity substation and industrial units for car park
- Access from Tonteg Road through land currently within the curtilage of the substation with traffic light controls on the junction adjacent to switching site

The advantages are:

- Station platforms on straight track
- Better access onto Tonteg Road

Disadvantages are:

- Subway and down platform construction
- Land acquisition for access

(d) Costs

The following cost assumptions apply to both options unless otherwise stated;

Signalling

- No impacts on existing signalling

Permanent Way

- No track realignments

Communications

- CCTV and CIS included with stations
- No DOO requirements

Station

- Platforms 147 metres long by 2.5m wide
- Basic shelters – 2 to each platform
- Security and lighting included
- Car parking for 150 vehicles
- Cross platform access by ramped footbridge (Option 1)
- Cross platform access by subway (Option 2)

General Civil Engineering

- An allowance has been made for site clearance and levelling within the station cost

E&P

- Included with station

Possession management

- Possessions would be required for construction of platform and footbridge foundations and face walls

Land

- It is assumed all land required for the car park would need to be acquired from a private owner at a market rate. All other works are within Network Rail or Local Authority ownership (Option 1)
- It is assumed all land required for both the car park and access road would need to be acquired from the LEC at a market rate. All other works are within Network Rail or Local Authority ownership (Option 2)

Consents

- No specific allowance has been made for the costs associated with obtaining necessary planning consents.

Capital costs for Upper Boat Station are summarised in Table 11.

Table 11 Capital Costs – Upper Boat Station

Element	Option 1 £'000	Option 2 £'000
Construction Works		
Station	2,330	2,695
Sub Total	2,330	2,695
Other Costs		
Preliminaries and G. I.'s	350	450
Design	150	215
Testing and commissioning	25	35
Sub Total	525	700
Total Construction Costs	2,855	3,395
Network Rail Costs		
NW Project Management	240	300
Possession Management	50	100
Land Purchase	25	250
Sub Total	315	650
Sub Total	3,170	4,045
Risk		
Unforeseen risk provision (50%)	1,585	2,023
Total (excluding Optimism Bias)	4,755	6,068

(e) Upper Boat Station Conclusions

At this stage, both Upper Boat Station options appear technically feasible at spot costs of £3.2m and £4.0m for Options 1 and 2 respectively. Apart from cost, Option 1 would be less disruptive to construct, however, due to the track curvature, the platforms would be non-compliant and the views of both Network Rail and HMRI should be sought at an early stage of any future development. The access onto Tonteg Road would also require careful consideration due to the volumes of traffic and road alignment.

Option 2 is both more expensive and more difficult to construct due to the subway access. However, the platforms can be located on straight track avoiding the need for derogation from the HMRI Safety Principles and Guidance and the access onto Tonteg Road would be easier.

Table 12 summarises the capital costs for the schemes appraised.

Table 12 Valley Lines North Summary Capital Costs

Item	Queen Street + Energlyn + Pontypridd	Queen Street + Bedlinog + Pontypridd
Queen Street Remodelling	£30m	£30m
Upper Boat Station	£4.8m	-
Bedlinog Line	-	£10.6m - £15.5m
Total (excluding Optimism Bias)	£34.8m	£40.6m – £45.5m

2005 prices except Queen Street remodelling 2003 prices

4.4 Demand and Revenue Forecasts

4.4.1 New Stations and Service Frequency Effects

The demand for new stations on the Valley Lines was estimated from the trip rate model and is shown in Table 13. The lower demand figure for Upper Boat station relates to application of an expansion factor using Taffs Well as the 'shadow' station. The higher demand figure for Upper Boat is related to Treforest as the 'shadow station'. As Treforest attracts significant demand to the University, the lower forecast based on Taffs Well may be more appropriate for Upper Boat station. The demand for stations on the Bedlinog Line are relatively low, especially if the terminus station factor is removed for Bedlinog dropping demand to around 20,000 journeys per year. The forecast for a station at Trelewis is particularly low.

Table 13 New Station Generated Demand

Station and service level	Generated Demand – Low (Journeys per annum)	Generated Demand – High (Journeys per annum)
Upper Boat 4tph	124,278	243,584
Nelson 1 tph	43,167	65,101
Trelewis 1 tph	16,026	24,169
Bedlinog 1 tph	145,039	218,737

The impacts of the additional frequency at existing stations and of slowing down existing trains through stopping at Upper Boat Station was forecast using the Moira model. The SRA NPS data was examined to estimate abstraction from existing stations. A summary of the combined demand and revenue forecasts for the model year is provided in Table 14. For the option of extending the network to Bedlinog, in addition to a high and low forecast produced by the 'shadow station' expansion factor range, a further low forecast was produced by removing the terminus station (Head of Valley Station) factor for Bedlinog. This is considered realistic as the wider catchment area of this station is sparse.

Table 14 Valley Lines North Demand and Revenue Forecasts (2004/05)

	Queen Street + 1 tph Energlyn + 1 tph Pontypridd	Queen Street + Energlyn + Pontypridd + Upper Boat Stn (high)	Queen Street + Bedlinog + Pontypridd (high)	Queen Street + Bedlinog + Pontypridd (low)	Queen Street + Bedlinog + Pontypridd (low with no terminus factor)
New Station Demand	-	243584	308,008	204,231	115,488
Existing Station Demand	37,833	37,833	40,446	40,446	40,446
Abstracted Trips	-	-123,648	-25,502	-25,502	-25,502
Total New Rail Demand	37,833	157,769	322,952	219,175	130,432
Revenues	£45,400	£189,323	£387,542	£263,010	£156,518

4.4.2 Service Capacity Effects

The provision of new capacity on the Valley Lines is designed to reduce overcrowding and enable rail demand to continue to grow. We have estimated the additional peak train and peak period trip growth that would be enabled by the schemes based on the analysis of AM and PM peak train capacity and growth.

We have taken account of the capacity released by the provision of the new trains and the continued growth of peak period demand at a rate of 5% per annum. However, this rate of growth means that the additional peak train capacity is used up within the evaluation period. We have therefore assumed that the length of the additional services would be increased as appropriate up to a maximum of 6-car trains after which demand is capped. We have assumed new services operate from 2012 and trains lengthened in 2017. We have also assessed the options of increasing the frequency to an additional 4 tph in 2017 and also the option of introducing the 4 tph from 2012.

Table 15 Valley Lines North Financial Evaluation 2012

	Queen Street + Energlyn + Pontypridd	Queen Street + Energlyn + Pontypridd + Upper Boat Stn	Queen Street + Bedlinog + Pontypridd (high)	Queen Street + Bedlinog + Pontypridd (low)	Queen Street + Bedlinog + Pontypridd (low with no terminus factor)
New Rail Demand	119,631	296,831	540,881	387,555	256,441
New Rail Revenue	£143,557	£356,198	£649,057	£465,066	£307,730
Operating Costs	£1,463,243	£1,463,243	£2,193,432	£2,193,432	£2,193,432
Subsidy per passenger	£11	£4	£3	£5	£7

4.5 Economic Evaluation

The economic evaluation is undertaken assuming that the investment is provided over two years prior to opening the new services in 2012. The length of the appraisal period has been extended to cover 60 years of operation in line with Government Appraisal Guidance.

The economic benefits of the scheme relate to user benefits derived from the increased frequency forecast by Moira, non-user decongestion benefits as a result of the modal switch to rail and crowding relief resulting from the new train capacity provided.

The crowding benefits were estimated for each year for the peak trains relieved by the new services. The calculation was based on the additional seats available assuming a 20 minute average journey time, 300 peak days per year and 10p per minute average crowding benefit rate.

The economic case of the Queen Street scheme with and without Upper Boat Station and with and without the Bedlinog extension of the Rhymney Line additional service is compared in Table 16.

Table 16 Economic Evaluation Valley Lines North Options

	Queen Street + Energlyn + Pontypridd (Phased – 2 tph 2012 + 2 tph 2017)	Queen Street + Energlyn + Pontypridd + Upper Boat Station	Queen Street + Bedlinog + Pontypridd (high)	Queen Street + Bedlinog + Pontypridd (low)	Queen Street + Bedlinog + Pontypridd (low with no terminus factor)
Present Value Costs	£50.7m	£53.2m	£67.2m	£74.1m	£80.0m
Present Value Benefits	£76.5m	£69.8m	£129.2m	£110.3m	£94.1m
Net Present Value	£25.8m	£16.6m	£62.0m	£36.1m	£14.1m
Benefit Cost Ratio	1.51	1.31	1.92	1.49	1.18

Without increasing the frequency of Pontypridd and Energlyn trains in 2017 – assuming train lengthening instead and an earlier curtailment of peak period demand growth – there is a resulting BCR of 1.60. Introducing all 4 additional trains per hour in 2012 produced a BCR of 1.43. The economic evaluation does not include the wider benefits of performance improvements that would be brought about by the additional Queen Street Station capacity nor the wider economic regeneration benefits to the communities in the Valleys to the North of Cardiff. Given that the areas benefiting are assisted areas it is likely that the Queen Street improvement scheme could receive Government funding support.

Even assuming the higher ‘shadow station’ forecast, Upper Boat Station has a significant negative impact on other rail users through the additional station stop and has a significantly reduced BCR.

The Bedlinog scheme adds significant additional cost and the benefit cost ratio varies significantly depending on the demand forecast assumption. There was concern at the inclusion of the terminus (Head of the Valley) station factor within the trip rate model when forecasting the demand for a new station at Bedlinog due to the sparse catchment area beyond the station. As a result it is concluded that the benefit cost range is likely to lie between 1.2 and 1.5. The ‘low’ scheme was also tested assuming the medium capital costs (instead of the high costs) and for the option of running the service only as far as Trelewis (with an associated 60% cost reduction) producing BCR’s of 1.60 and 1.54 respectively. It is concluded that the benefits of the scheme are unlikely to meet the costs of the scheme.

The economics of providing Upper Boat Station alone was examined under the High demand forecast (assuming location option 1) producing a high Benefit Cost Ratio. However, under the low demand forecast benefits of the new station are outweighed by the disbenefits to other passengers through slowing down existing trains resulting in a negative NPV.

Due to the sensitivity of the demand forecast, the lack of capacity in the existing timetables, the impact on other passengers and the practical difficulties associated with the scheme we do not recommend the new station at Upper Boat in the recommended strategy. This scheme could be considered as a long term option. Further assessment should take account of the timetable and implications on Treforest Industrial Estate station. In the meantime it is recommended that investigations are undertaken into increasing the capacity of Treforest and Taffs Well station car parks, making better use of the existing stations on this section of the network.

Whilst we have concluded that there is a relatively strong case for implementing the Cardiff Queen Street scheme and additional services on the Rhymney Line and Taff Vale Line, there is a weaker economic case for extending the train service beyond Energlyn on the Rhymney line and there would be a weaker economic case for extending the trains beyond Pontypridd to Porth, depending on timetable issues. This would, however, open up new rail access to one of the Valleys and therefore would contribute to the regional objectives. Further housing development in the corridor might alter the economics of this scheme over time and the extension to Bedlinog should be considered further at the time that the capacity of Queen Street station is improved.

4.6 Recommendations

It is recommended that expansion of Park and Ride capacity at Treforest and Taffs Well is provided, rather than constructing a station at Upper Boat. Depending on whether option of extending the rail network to Beddau is implemented, the case for the station should be reviewed again in the longer term.

It is recommended that a Rail-link bus service to either Abercynon Station or Ystrad Mynach station is provided from the Bedlinog corridor during this strategy period to 2018, rather than extending the passenger rail network. It is recommended that the potential for development of the rail service in the future is protected by safeguarding the station sites including land for the platforms, accesses and parking. It is also recommended that Caerphilly and Merthyr Tydfil Councils consider future land use allocations in the station catchment areas to provide an opportunity to review the business case in the future. The councils should also seek private sector contributions towards the infrastructure to improve the affordability of the scheme and thereby improve the business case.

It is recommended that the Cardiff Queen Street remodelling be developed to provide capacity for additional services on the Rhymney and Taff Vale Lines to enable peak period passenger growth during the strategy period. Critical success factors are:

- Developing a practical and deliverable project at Queen Street and securing land through a Transport and Works Act process;
- At least passive provision for increased capacity through Cardiff Queen Street and Cardiff Central in the Cardiff Area Signalling Renewal Project;
- Timetable planning and capacity analysis on the Lines to the North of Queen Street to ensure that there is enough capacity without affecting performance; and
- Provision of additional capacity on the Vale of Glamorgan Line or alternative turnback arrangements for the additional services from the Valley Lines to the North.

At the next stage the infrastructure requirements should be looked at either within, or in parallel to, the Cardiff Area Signalling Renewal Project's optioneering stages.

Figure 8 Trelewis: Overbridge at ST 107967 looking north

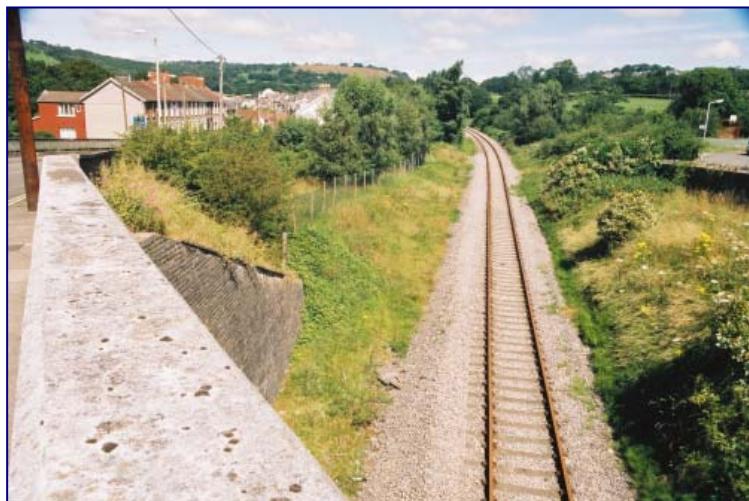


Figure 9 Nelson: Former station looking to island platform



Figure 10 Ystrad Mynach South Junction Cwmbargoed line on right



Figure 11 Bedlinog: Looking north from overbridge at 17m 14c



5 VALE OF GLAMORGAN LINE

5.1 Introduction

The Vale of Glamorgan hourly passenger service began operations in June 2005 running from a refurbished bay platform at Bridgend and calling at new stations at Llantwit Major and Rhoose Cardiff International Airport and all stations from Barry. Several varying aspirations were expressed for increasing the level of service on this route:

- An additional Cardiff – Bridgend service on the Valley Lines network – either as a new service from Cardiff or an extension of an existing Barry service;
- Extension of the services beyond Bridgend to Swansea;
- Extension of the existing London – Cardiff service to Rhoose Cardiff International Airport station; and
- Extension of the existing Bristol – Cardiff service to Rhoose Cardiff International Airport Station.

In addition the option of calling at an additional station at Bridgend College –south of Bridgend station was also examined.

5.2 Operations and Costs

The operating costs of the various options are shown in Table 17.

Table 17 Operating Costs- Vale of Glamorgan Options

Option	Additional Cardiff - Bridgend	Barry - Bridgend	Cardiff - Swansea	Rhoose – Cardiff (London)	Rhoose – Cardiff (Bristol)
Rosco Costs	500	250	1,000	750	375
Staff Costs	346	173	691	173	173
Other Costs	730	304	1,179	489	489
Total	1,576	727	2,870	1,412	1,037

Due to platform lengths and timetabling complexity, the most realistic option for improving the level of service on the Vale of Glamorgan Line west of Barry is the extension of a second tph (half-hour offset) from the current service, to Bridgend instead of Barry Island. This requires only one additional diagram in service, which with a one-way additional journey time of only 26 minutes produces a slight improvement in timetable robustness. However there would be a disbenefit for trips to / from Barry Island and the extra passengers generated would adversely impact on the peak train capacity north of Barry.

The journey time slack could be used to allow a stop at Bridgend College new station in each direction, although the timetable would then become tight.

An alternative would be extension to Rhoose Cardiff International Airport of the hourly service from Exeter via Bristol, requiring 1 extra diagram (Class 158). Unfortunately there is too little time for this train to continue to Bridgend, other than by its acceleration by omitting intermediate stops between Cardiff and Barry, which would not be robust if there was a late incoming arrival. Reversal would be at the Aberthaw Down Passenger Loop. A significant disadvantage of this is that Llantwit Major generates more than twice the passenger demand of Rhoose Cardiff International Airport station.

The issues relating to the extension of an ex-London 'Adelante' 5-car unit to Rhoose Cardiff International Airport station would be similar to the extension of the Exeter service, except that ROSCO costs for this stock are approximately three times those for the standard Class 150. Also, the extra train length would incur costs of platform lengthening at any intermediate stations served. The London service is currently using longer HST rolling stock which would have even higher leasing costs and be even less practical to extend in terms of platform lengths and viability.

The Vale of Glamorgan service is designed to turn back at the refurbished bay platform at Bridgend. The layout at Bridgend prevents an extension of the service further west without significant performance disadvantages through the need for the east bound service to run on the westbound lines to access the route. It would not be possible to reconnect the double junction at Bridgend without losing the advantages of track alignment and cant that were gained by introducing the current junction arrangement.

5.3 Engineering and Costs

5.3.1 Bridgend College (Vale of Glamorgan) Proposed Station

(a) Background

A new station on the Vale of Glamorgan line in the vicinity of the bridge over Cowbridge Road at 18m 35c would meet perceived demand to and from retail developments east of Cowbridge Road, nearby residential areas, Bridgend College and the Police HQ.

(b) Existing infrastructure

This description is based on a site visit to locations accessible to the public on 5th August 2005 together with information available from published sources.

The railway line runs south then southwest on an embankment estimated at 6m high on the southeast side (Tesco's) and 3-4m on the northwest side behind the residential properties in Fairfield Road. The railway is double track and curves to the right in the direction of Barry to a point 150m southwest of the bridge where it becomes straight. The estimated radius of the curve is 800m. No gradient information has been obtained at this stage.

The line is controlled from Cowbridge Road Signal Box located between the bridge and Bridgend station.

(c) Scope of works

The station works would comprise the following:

- Two platforms 100m long to accommodate trains of four-car trains with a 5m stopping tolerance
- Platform waiting shelters
- DDA compliant access to and between platforms

- Customer Information Systems
- Security – CCTV
- Lighting and drainage
- Station ancillaries e.g. signage

No dedicated parking could be provided.

(d) Constraints

The basic requirements for stations are set out in the Railway Safety Principles and Guidance (RSPG or Blue Book) part 2 section B published by Her Majesty's Railway Inspectorate (HMRI). Clause 23b states that platforms shall be constructed on straight track and on the level or with gradients no steeper than 1 in 500. However, minor stations can be constructed on steeper gradients subject to suitable safety arrangements and with the agreement of the Inspector.

From a practical point of view, 1000m radius curve is accepted by HMRI and Network Rail as being straight track, however 800m could require derogation from the requirements supported by a risk analysis and mitigation measures.

Therefore, the project would require locating the platforms 160m southwest of the bridge on straight track which has the additional advantage that the down platform would be further away from the residential properties in Fairfield Road.

The key features of the station at this location are:

- The north east end of the station platforms would be located 160m on the Barry side of Cowbridge Road bridge;
- Cross platform access by steel ramps and subway; and
- Station access from Tesco Car Park.

(e) Programme

The station site is in the Cowbridge Road Signal Box control area and would not be directly affected by the current Port Talbot East Signalling Renewal project. However the route is used for diversions when the South Wales Main Line is blocked between Bridgend and Cardiff for engineering work.

(f) Costs

Cost assumptions:

Stations

- Platforms 100 metres long by 2.5m wide
- Basic shelters
- Security and lighting included
- No provision for dedicated car parking
- Undertrack subway
- External ramps to platforms

Possession management

- It is assumed that subway construction could be undertaken during a 52-hour blockade followed by a speed restriction
- Possessions would be required for platform construction and ramp installation

Land

- It is assumed that all land required for the works is within Network Rail or Local Authority ownership

Consents

- It is assumed that the construction of the station can be made under Network Rail's Permitted Development Rights.
- No allowance has been made for consultation with adjacent landowners or Formal Agreements with Tesco or their agents.

Table 18 Capital Costs – Bridgend College New Station

Element	£'000
Construction Works	
Station	1,736
Sub Total	1,736
Other Costs	
Preliminaries and G. I.'s	450
Design	150
Testing and commissioning	25
Sub Total	625
Total Construction Costs	2,361
Network Rail Costs	
NW Project Management	290
Possession Management	50
Sub Total	340
Sub Total	2,701
Risk	
Unforeseen risk provision (50%)	1,351
Total (excluding Optimism Bias)	4,052

(g) Conclusions

At this stage, construction of a small station at this site appears technically feasible at an estimated spot cost of £2.7m (Q1 2005). Key issues that would need to be resolved during project development include constructability and site access together with formal agreement with Tesco's or their agents for permanent access from their land.

5.4 Demand and Revenue Forecasts

Demand forecasts and economic evaluations have been undertaken for the main options of a new or extended Valley Lines hourly service to Bridgend with and without the new station at Bridgend College. The demand and revenue forecasts were produced from:

- Existing stations - Moira model;
- 'new stations' Llantwit Major and Rhoose Cardiff International Airport – spreadsheet model using ATW data for first 2 weeks of operation and applying PDFH procedures;
- Demand for Bridgend College new station – trip rate model; and
- Impact of Bridgend College on journey times for other trips – spreadsheet PDFH models.

In addition, due to the overlap of the new station catchment with Bridgend Station an assumption was made regarding the level of abstraction of trips from Bridgend. Whilst Bridgend main station would be chosen for most trips, it was assumed that 25% of the demand for the new station at Bridgend College would be abstracted from Bridgend.

Table 19 shows the financial evaluation. The estimated subsidy per passenger of these options is relatively high with the least, the option of extending a current Barry service with the new station at Bridgend College, significantly higher than the average subsidy levels for the network.

Table 19 Financial Evaluation Vale of Glamorgan Options, 2004/05

Option	Cardiff – Bridgend with New Station	Cardiff - Bridgend	Barry – Bridgend with New Station	Barry – Bridgend	Cardiff – Swansea via VOG
New Station Passengers	37,521	-	37,521	-	-
Abstraction	-9,380	-	-9,380	-	-
Existing Station Demand	39,439	43,543	38,259	42,354	54,266
New Rail Demand	67,580	43,543	66,400	42,354	54,266
New Rail Revenue	£154,758	£99,693	£152,055	£96,991	£124,269
Operating Costs	£1,576,000	£1,526,000	£727,000	£677,000	£2,870,000
Subsidy per passenger	£21.03	£32.76	£8.66	£13.69	£50.60

5.5 Economic Evaluation

The economic evaluation includes time savings for existing passengers (including extended journey times for passengers resulting from the additional station) and non-user benefits resulting from car transfer to the improved services. It should be noted that relatively high benefits relate to the application of PDFH procedures to the generalised costs of travel for the demands to/from the new stations at Rhoose Cardiff International Airport and Llantwit Major – based on the initial 2 weeks of data provided by Arriva Trains Wales. Each passenger at the new stations receives a high time saving benefit related to doubling the relatively low frequency service. The evaluation is therefore sensitive to this calculation and should be reviewed when more data is available.

The results of the evaluation are shown in Table 20 which reveals that the extension of the Barry – Cardiff service to Bridgend is the most economic compared with the provision of a new Cardiff – Bridgend service or extension beyond Bridgend to Swansea. The extension beyond Bridgend would incur costs associated with remodelling Bridgend Station or performance disbenefits to other passengers and would therefore have a Benefit Cost Ratio below 1.0.

Table 20 Economic Evaluation Vale of Glamorgan Options

Option	Cardiff – Bridgend with New Station	Cardiff - Bridgend	Barry – Bridgend with New Station	Barry – Bridgend	Cardiff – Swansea via VOG
Present Value Costs	£28.2m	£24.7m	£12.6m	£9.2m	£48.7m
Present Value Benefits	£44.9m	£43.3m	£51.0m	£46.8m	£49.0m
Net Present Value	£16.7m	£18.6m	£37.9m	£37.6m	£0.4m
Benefit Cost Ratio	1.59	1.75	4.00	5.11	1.01

The capital costs of the new station are not covered by the overall net additional economic benefits, reducing the Benefit Cost Ratio. However, the Benefit Cost Ratio is significant with or without the additional station and the decision on whether to include the station in the scheme needs to take account of the wider impact of improved accessibility compared to the journey time and service performance impacts.

Operation of the additional services on the Vale of Glamorgan Line is likely to involve through running from the Valley Lines to the North of Cardiff or the lines to the East. Given the high demands for services on the Barry Line it is likely that at least a 4 car train would be operated (especially for the extension of the current Barry service). The benefit cost ratios are lowered by the higher operating costs to around 1.0 for the Cardiff – Bridgend option and to around 2.5 for the Barry – Bridgend option. However the latter option would result in increased peak crowding between Barry and Cardiff and a more detailed evaluation of this factor at the next stage would reduce the BCR.

The economic evaluation is highly dependent on the benefits to Llantwit Major and Rhoose Cardiff International Airport stations which were based on only 2 weeks of data. It is understood that since then passenger numbers have continued to grow, however, the scheme should be examined more closely when the demand for the new service/stations has stabilised.

5.6 Recommendation

It is recommended to undertake further assessment of the scheme to increase the level of service between Bridgend and Cardiff via Llantwit Major and Rhoose Cardiff International Airport to half-hourly. The critical success factors for this project are:

- Capacity of the routes, including the freight requirements;
- Capacity between Barry and Cardiff; and
- Further growth in the demand for rail travel from Llantwit Major and Rhoose Cardiff International Airport and capacity to further growth resulting from the scheme, including car parking supply to meet demand.

It is recommended that further analysis of the timetable options on the Barry and Penarth lines is undertaken to identify the most efficient scheme whilst maintaining the benefits of a standard pattern timetable. Also, that further capacity analysis of the route is undertaken to ensure that the scheme can be introduced without additional measures to preserve performance.

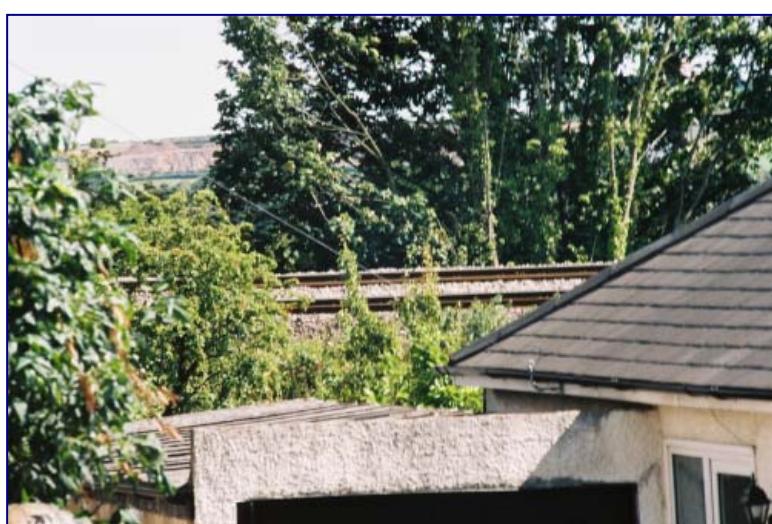
Figure 12 Bridgend College Station Site Cowbridge Road Bridge



Figure 13 Railway embankment from Tesco car park Bridgend



Figure 14 Proposed station site – Looking south from Fairfield Road



6 CARDIFF – BRIDGEND LINE

6.1 Introduction

The South Wales Main Line between Cardiff and Bridgend / Swansea was examined in the Great Western Main Line Route Utilisation Strategy (RUS)⁵. It identified that because of the volume and mix of freight and of long distance and local passenger services, coupled with junction and crossing movements at Cardiff Central, the capacity utilisation on this predominately two track route, particularly between Cardiff and Bridgend is high (at 90%). However, performance is reasonable and it was concluded that the service is appropriate to demand. The report rejected aspirations for more through services between London and Swansea and beyond to West Wales stating that the business case was poor. However, in December 2005 Arriva Trains Wales will introduce a regular hourly service between West Wales and northwest England by linking together existing services to meet an identified through market.

The RUS also identified that freight traffic is significant on this route but has declined over recent years. Even so metal flows between Margam and Llanwern are expected to increase again but there are sufficient spare freight paths to accommodate growth.

Whilst the report recognised aspirations for additional local services and stations, the RUS did not investigate the options to provide additional capacity on this section of the network. However it identified that the Cardiff Area Signalling Renewal Project provides an opportunity to alter configurations to allow more trains to turn back in the platforms at Cardiff Central to avoid shunting and crossing movements currently required at Cardiff West. This could provide performance and capacity enhancements. It is not possible to undertake a detailed capacity examination at this stage, though the assessment of initiatives paid attention to preserving capacity to maintain performance levels.

Three options were assessed for the development of the rail service on the South Wales Main Line between Cardiff and Bridgend and beyond to Swansea and Maesteg:

- An additional Swan Line Service – raising the level of service from 0.5 tph to 1.0 tph;
- Provision of a new Station at St Fagans; and,
- Reopening Pontyclun – Beddau Line with 4 new stations on the branch.

6.2 Operations and Costs

The timetable constraints on this 2-track route between Bridgend and Cardiff make it difficult to introduce additional services and stations without additional measures to improve performance. Measures have been included for the schemes for St Fagans and Beddau. However, provision of new services to the West of Cardiff allows for through running of services at Cardiff Central with benefits in terms of reversing times and the capacity of reversal facilities.

The operating costs of the main options are shown in Table 21.

⁵ Great Western Main Line Route Utilisation Strategy, SRA, June 2005

Table 21 Operating Costs Cardiff – Bridgend Line Options

Heading	Swan Line Service Improvement £'000	Beddau Line Hourly Service £'000	Beddau Line Half Hourly Service £'000
Rosco Costs	250	250	500
Staff Costs	271	173	346
Other Costs	631	663	1,021
Total	1,152	1,086	1,867

6.3 Engineering and Costs

The engineering and costs assessment has focused on reopening the Pontyclun – Beddau Line to passenger trains with the provision of 4 new stations at Talbot Green, Llantrisant, Gwaun Meisgyn and Beddau (Tynant) and the provision of a further new station at St Fagans. It is assumed that increasing the frequency of the Swan Line service throughout the day could be achieved within the current infrastructure.

6.3.1 Reopening Pontyclun – Beddau Line

The line between Llantrisant (since reopened and renamed Pontyclun) and Beddau originally formed part of a through route to Pontypridd. There were intermediate stations at Cross Inn, Beddau Halt, Llantwit Fardre, Church Village, Tonteg Halt and Treforest. The line was constructed generally as single track with passing loops at Llantwit and Common Branch Junction. The ruling gradient on the line was 1 in 40.

Passenger services operated generally as a shuttle between Llantrisant (Pontyclun) and Pontypridd and were withdrawn from 31st March 1952. Freight services were withdrawn in stages the final closure between Llantrisant and Cwm Llantwit taking place on 2nd March 1987.

This strategy option involves reopening the line between Pontyclun and Beddau with stations at Talbot Green, Llantrisant, Gwaun Meisgyn and Beddau. It has been assumed that the infrastructure needs to allow for a half-hourly service between Beddau and Cardiff via Pontyclun. It has been assumed that the running times allow a train to leave Pontyclun, run to Beddau and return to Pontyclun in under 30 minutes.

(a) Existing infrastructure

This description is based on site visits to locations accessible to the public on 21st July and 5th August 2005 and information available from published sources. The line was abandoned and partially recovered in 1987 and this is reflected in the condition that is generally overgrown to the point of impenetrability.

The branch leaves the South Wales Main Line at Ely Valley Junction at the west end of Pontyclun station and curves through 1,800m to cross the Cowbridge Road by a Level Crossing and continue east through Talbot Green before turning generally north-east at Cross Inn and north at Gwaun Meisgyn. The proposed terminus would be at Beddau. The whole route would require fencing to both sides.

Pontyclun – Cowbridge Road Level Crossing

At Pontyclun Station, there is a facing crossover located in the middle of the platforms between the down and up main lines and a turnout from the up main into the former branch and yard area. Movements to and from the branch are controlled by subsidiary signals operated from Cardiff Signal Box. Adjacent to the station, the alignment of the branch has been enclosed by a security fence and signs indicate that it is used as a training area by Network Rail.

Track is in place at Ely River bridge and at Cowbridge Road Level Crossing (113lb. F.B. rail on timber and concrete sleepers respectively). It is reasonable to assume that the track is in place throughout although this cannot be confirmed due to vegetation. At Cowbridge Road Level Crossing, 63 chains from Pontyclun, the track and barriers remain in place. Network Rail proposes to remove the turnout onto the branch and the results of this study are critical to this decision.

The principle structure on the line is the four-span bridge across the River Ely that comprises two central spans over the river and two side spans over public footpaths. The metallic (early steel or wrought iron) superstructure is supported by masonry abutments and piers. The Beddau end span has two riveted plate main girders with a trough deck. The abutments appear to have carried spans for additional tracks that have subsequently been removed. Superficially, the condition of the Beddau end span appears to be sound.

Cowbridge Road Level Crossing – Cross Inn Station Site

The track remains in place for several hundred metres to the east of the level crossing, at the proposed Talbot Green station site and at the former Cross Inn station. It is reasonable to assume that the track is in place throughout, although this cannot be confirmed due to vegetation. The track is 113lb. F.B. rail on concrete sleepers although there is a section near Talbot Green of bullhead rail on timber sleepers. Adjacent to the Cardiff Road overbridge at ST 050826 (Maesraul Junction), the proposed Llantrisant station site, housing is being built adjacent to the formation towards Cross Inn.

The only structure identified on this stretch is the 7m estimated span metallic underbridge over Cross Inn Road. It is a railbearer type structure of welded and bolted construction with the rails supported by longitudinal timbers. It has a timber deck and angle iron and gas barrel handrail. Superficially, it appears to be and in good condition. It is plated at 12'-3".

At Cross Inn station, the former station building and platform remain in commercial use.

Cross Inn Station Site - Beddau

Beyond Cross Inn station, there is no evidence of any permanent way remaining for the remainder of the route. The alignment is heavily overgrown in the cuttings adjacent to the A473 bridges at ST 062838 and ST 067845 (Gwaun Meisgyn). At Tynant (Beddau) between Gwaun Meisgyn cutting and the B4595 there is a former yard site at the proposed end of the line.

The only structure identified on this stretch is the 6m estimated span metallic underbridge at 2m 49c (LTR), ST 067841. This bridge comprises riveted plate main girders, cross girders and railbearers with steel plate parapets. Superficially, this appears to be in fair condition although there is some significant corrosion to the railbearers. It is plated at 13'-3".

(b) Scope of works

Pontyclun station

It is assumed that the scheme would provide for through trains between Cardiff and Beddau. The crossover providing access to the branch in the down direction is located in the centre of the platforms and down trains would have to stop between the signal controlling the junction and the crossover to serve the down platform. This would block both the up and the down lines with a consequent effect on capacity and operational reliability on this heavily used route.

To minimise the operational effects of a diverging move, the ideal solution would be to relocate the crossover west of the station with the controlling signal on the end of the down platform. The turnout into the branch would also need to move westwards and the main line signalling in the up direction would be affected.

If there is insufficient space to the west of the station an alternative would be to relocate the crossover at the east end of the station and use the existing up platform bi-directionally for all Beddau branch services. The capacity implications of this would need to be assessed.

It should be noted that the existing crossover and signalling should be acceptable for empty passenger train movements to and from the branch. If through passenger trains to Cardiff were not required, a shuttle service could operate on the branch from a reinstated bay platform which would avoid the costs associated with moving and resignalling the crossover.

Ely Valley Junction - Beddau

Permanent Way

The route has been considered as three distinct sections with respect to reinstatement of the infrastructure as follows:

- Scrub clearance, local formation and track renewal between Pontyclun station and the A4119 overbridge at ST 048826;
- A complete new formation with natural drainage from the A4119 overbridge to a nominal 400m south of the bridge carrying the A473 over the alignment at ST 062838; and
- A complete new formation including drainage for the remainder of the route to the proposed Beddau station.

Structures

It has been assumed that bridges carrying roads over the railway alignment have been maintained since closure and no remedial works would be required to reopen the branch. Three underbridges have been identified on the route:

- River Ely is a four span single-track metallic bridge on masonry abutments. As noted above, the Beddau end span appears to be in good condition superficially although it is apparent that vegetation has taken hold on the deck at track level. Pending a full structural assessment, it has been assumed that minimal steelwork repairs, cleaning, waterproofing and painting would be required.

- Cross Inn Road is a single span metallic bridge on masonry abutments. Although the basic structure appears to be in good condition it is assumed that works would be required to the parapets and handrails to bring them up to current safety standards and that the timber deck and bearers would need to be replaced.
- The underbridge at 2m 49c (LTR) is a single span metallic structure on masonry abutments. Due to the form of construction and its location it is assumed that steelwork repairs, waterproofing, and painting would be required together with works to the parapets to bring them up to current safety standards. The extent of the works would need to be confirmed following a full structural assessment.

Signalling

Signalling on and off the main line at Pontyclun is discussed above. Signalling on the branch would depend on two factors; the type of level crossing at Cowbridge Road and; validation of the operating assumption that a train can go out and back in 30 minutes.

Level crossing

The existing level crossing across Cowbridge Road is train crew operated (TMO). This type of operation would be incompatible with the operation of a frequent passenger train service and have significant implications for journey time and safety. The selection of the type of replacement crossing would be dependent on a risk analysis of the type and frequency of both rail and road traffic, the layout of the site and any specific features including the potential for road traffic to back up from a junction and block the level crossing. The final decision would be made by Network Rail in consultation with HMRI and other stakeholders.

Due to the proximity of the traffic light controlled junction between the A473 and A4222, there is a risk that the level crossing might be blocked by queuing road traffic. This would generally preclude the use of Automatic Half Barrier (AHB) or Automatic Half Barrier Locally Monitored (ABCL) crossings unless some method of managing the road junction to prevent this could be devised. It has been assumed, therefore, that the crossing would be converted to a controlled crossing with full barriers monitored by CCTV (as at Llantrisant West on the main line). This would require rail signals to protect the crossing.

Operation/ Performance requirements

It has been assumed that a train can complete a return journey on and off the branch in less than 30 minutes. Given the nature of the line in terms of curvature, gradients and number of station stops this assumption would need to be validated at the next of stage scheme development. If an up train is delayed leaving the branch, the following down train would be held on the Main Line blocking it in the down direction and potentially causing delay. Such a risk is unacceptable to Network Rail.

The solution would be to provide a loop, on the branch, immediately west of the junction so that trains in either direction could be regulated clear of the Main Line. This would reduce the risk of delay to main line services in the event of a problem on the branch. It would be necessary to provide an additional signal to control the exit from the loop onto the single line towards Beddau. Consideration would need to be given to the interface between operation of the loop and the nearby Cowbridge Road Level Crossing.

The remainder of the branch would be operated on a one-train basis with bi-directional axle counters located on the single line at the Beddau end of the loop.

Stations

It is assumed that the stations would be unmanned and provided with 100m long (four-car) platforms, waiting shelters, lighting and long line train indicators and CCTV. Car parks would be provided where appropriate.

Talbot Green station would be located at ST 044825 on the south side of the railway adjacent to the existing retail park. Road access would be from the existing roundabout and there is sufficient space to provide a car park with a near level route to the platform. However, if the platform is located on this side it is remote from residential areas that lie north of the railway. It is recommended that either a footbridge or a second platform face (to access the other side of the train) is provided.

Llantrisant station would be located at ST 050826 adjacent to the Cardiff Road overbridge. This is the site of the former Maesraul Junction and a small estate of residential housing is being developed currently on the east side along the formation of the branch and in the fork of the two lines. Due to the building work, there are no boundaries to determine the available space for a station on this side of the bridge. However, to the west of the bridge there appears to be a suitable site bounded by Cardiff Road, the A 473, the A4119 and the railway which would give space for car parking with access from Cardiff Road. If parking is not a consideration, a platform could be provided on the north side of the railway with ramped access from Burgess Crescent.

The proposed site of **Gwaun Meisgyn** station is at ST 067845. At this point, the railway alignment is in a cutting crossed by the A473. A station could be provided in the cutting with the platform on the west side and pedestrian access only by ramp from the end of Carswell Place or Chalfont Close. If parking is required, an alternative location could be in the cutting south of the A473 with access by a ramp to a platform on the east side of the alignment. At this stage, we have assumed that no car parking would be available.

Beddau (Tynant) station would be located at ST 068851. This area was previously used for sidings and there is an extensive level area for both the station and car parking. It is assumed that there is effectively no limitation on car parking capacity. Access could be through land currently owned by Welsh Water from Parish Road/Woodlands, alongside the site operated by Tynant Garage or from Fairview.

(c) Scope risks

At this stage four areas of scope risk have been identified:

- Condition of Ely River bridge
- Feasibility of junction remodelling
- Acceptability of level crossing proposals
- Feasibility of branch loop

The condition of the steelwork of the Ely River bridge is unknown. The base construction cost of a replacement superstructure would be of the order of £0.5m if required.

It has been assumed that there is sufficient space to relocate the junction to the west of Pontyclun station. The alternative would be to relocate it to the east of the station and use the existing up platform bi-directionally. The operational consequences are unlikely to be acceptable to Network Rail.

It is proposed to provide a CCTV controlled crossing at Cowbridge Road. Depending on the risk assessment this may not be acceptable to either Network Rail or HMRI and there is insufficient space for a bridge option. In addition, a CCTV crossing requires monitoring with consequent staff and accommodation requirements. It is noted that the crossing on the existing SWML west of Pontyclun is monitored from St Fagans. The staffing level and hence operating cost would be dependent on whether the additional monitors drive the requirement for additional staff or whether it could be incorporated within the existing workload. If additional staff are required £150,000 per annum should be included within the evaluation, assuming two shifts per day plus rest day cover.

To maintain operational reliability on the main line provision has been made for a loop on the branch between the junction and Ely River bridge for the operation of a half hourly service. Further development would be required to determine the feasibility of this loop and the associated signalling.

(d) Powers and Consents

Transport and Works Act Order

Following closure of the branch to freight traffic in 1987 and its apparent abandonment, it could be construed that the powers, granted by the original enabling Act in the 1860's, to construct and operate a railway over this route will have lapsed. These powers would need to be renewed by the granting of an Order under the Transport and Works Act.

An Order would provide the Promoter, usually Network Rail, with powers to acquire or use land for the permanent and temporary works compulsorily together with outline planning consent. It would also protect against claims for nuisance from the operation of the line. The latter would be important due to the residential developments that have taken place adjacent to the line since closure.

Her Majesty's Railway Inspectorate (HMRI)

The proposed works would be notifiable to the HMRI under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994 [ROTS (AWPE) R]. There are three formal stages in this process:

- Obtain notification of non-objection to concept (GRIP 4)
- Obtain notification of non-objection to proposals (GRIP 5)
- Obtain full approval to the completed works (GRIP 7)

Major Project Notice

GRIP defines a major project as "any engineering, maintenance or renewal project which requires a possession or series of possessions of one or more sections of track extending over either a period of more than one year; or a period that contains two or more Passenger Change Dates".

This is unlikely to apply to this project since the branch is currently out of use and the changes to the layout at Pontyclun are unlikely to fall within the above definition.

Network Change

The works on the main line at Pontyclun would affect the Train Operating Companies (TOC's) and Freight Operating Companies (FOC's) and thus would be subject to the Network Change process. The Network Change Notice is developed during GRIP 4 and agreed during the detail design phase, GRIP 5.

Station Change

At this stage of project development this is not considered to be applicable.

(e) Programme

The signalling alterations at Pontyclun come under the Cardiff control area and it would be appropriate to integrate this scheme into the Cardiff Area Signalling Renewal Project that is due to be completed by 2010. It is understood from Network Rail that the status of this element of the project is as follows:

- | | |
|--|---------------|
| • GRIP Stage 3 (Option Selection) | January 2006. |
| • GRIP Stage 4 (Single Option Development) | August 2006. |

The works to the junction at Pontyclun required for reopening the branch would need to be included within the overall scope of the Cardiff Area Signalling Renewal Project being developed currently so that they can be considered in the ongoing development of the project to GRIP Stage 4.

(f) Cost and Risk

The following assumptions have been made – leading to the estimated costs shown in Table 22.

Signalling

- Cowbridge Road Level Crossing would be converted to CCTV
- Signalling controlling entry to the branch at Ely Valley Junction would be upgraded for use by service passenger trains

Permanent Way

- Remodel Ely Valley Junction by moving the facing crossover and branch connection west of their present location on the main line
- The track/formation would be treated as follows:
 - Scrub clearance throughout
 - Where track remains local formation, ballast and track renewal
 - Where track has been removed complete renewal
 - As above, in cuttings, complete removal and drainage

Communications

- A nominal allowance for extending the system to provide lineside phones
- CCTV and CIS included with stations
- No DOO requirements

Stations

- Platforms 100m long by 2.5m wide at all stations
- Basic shelters
- Security and lighting included

- Car parking at Talbot Green (25 cars), Llantrisant (25 cars) and Beddau (50 cars)
- No footbridge at Talbot Green

Bridges

- Allowance for repairs and complying with current safety requirements only

General Civil Engineering

- Allowance for fencing throughout line of route

E&P

- Included with station
- Points heaters to main line crossover and junction included

Possession management

- Works on the branch would be done under the existing total closure
- Works on the main line at Pontyclun would be included with Cardiff Area Signalling Renewal works

Branch loop at Pontyclun

- The base construction cost of the loop, for a half hourly service, is estimated at an £1.59m to give a total point estimate of £2.43m.

Table 22 Capital Costs – Pontyclun – Beddau Line

Element	£'000
Construction Works	
Signalling	1,250
Permanent Way	5,599
Telecoms	200
Stations	1,480
Bridges	150
General Civils incl Fencing	40
E&P	Incl.
Sub Total	8,719
Other Costs	
Preliminaries and G. I.'s	2,100
Design	800
Testing and commissioning	150
Sub Total	3,050
Total Construction Costs	11,769
Network Rail Costs	
NW Project Management	1,400
Possession Management	50
Sub Total	1,450
Sub Total	13,219
Risk	
Unforeseen risk provision (50%)	6,610
Total	19,829
Branch Loop at Pontyclun	2,430
Additional Risk	1,215
Sub-total	3,645
Total (excluding Optimism Bias)	23,474

* Note the capital costs exclude T&WA costs and Land costs which are difficult to estimate at this stage. However, it is believed that most of the land is within Network Rail or local authority ownership.

(g) Conclusions

At this stage, it appears feasible to reinstate the branch line between Pontyclun and Beddau to facilitate through services to Cardiff at an estimated spot cost of £15.6m (Q1 2005) including allowance for the new crossover and associated signalling. It is assumed that the works would be integrated with Cardiff Area Signalling Renewal Project to minimise possession and compensation costs. Technically the principle risks relate to the condition of the existing structures and the acceptability of the junction layout at Pontyclun to Network Rail. Confirmation of the requirement for an Order under the Transport and Works Act should be sought as soon as possible due to the implications for project cost and programme.

6.3.2 St. Fagans Proposed Station

(a) Background

To meet perceived demand from the adjacent Museum of Welsh Life and the adjacent residential areas it was considered that a new station in the St. Fagans area could be provided, on the double track Cardiff to Bridgend Line South Wales Main Line (SWM).

(b) Existing infrastructure

This description is based on a site visit to locations accessible to the public on 18th August 2005 together with information available from published sources.

The railway runs along the valley of the River Ely, generally on the south side at this location. The road between the village of St. Fagans and Michaelston-super-Ely crosses the railway by a CCTV controlled level crossing and the former station was located on the curve to the east of the crossing. Although the existing railway is double-track, west of the level crossing there was a loop on the down (south) side and a branch line to Pontypridd on the north. The land occupied by these former facilities appears to remain within the Network Rail boundary.

(c) Proposed station location

It is understood that Network Rail has requested that the platforms are located on loops to minimise operational risk arising from the restricted capacity of this route. This has been a significant consideration in determining the best site for the station.

The former station location, east of the level crossing, was located on a curve and was perceived to have insufficient width within the existing boundaries to accommodate the works without land acquisition on both sides.

Therefore, on the basis of our current knowledge, the best site for the station would be on the west side of the level crossing where there is a length of approximately 800m before the road overbridge restricts the alignment. Along this length, the site of the former down loop should limit the need for permanent land acquisition for the new down loop and platform, while on the north side, the former branch alignment should provide adequate space for the up loop, platform and car parking. It should be noted that the former branch climbs away from the main line and so some earthworks could be necessary to level the space between.

(d) Scope of works

The station works would comprise the following:

- Up and down platform loops
- Two platforms 100m long to accommodate four-car trains
- Platform waiting shelters
- DDA compliant access to and between platforms
- Parking for 50 cars
- Customer Information Systems
- Security – CCTV
- Highway access works
- Lighting and drainage
- Station ancillaries e.g. signage.

(e) Issues and Constraints

The length of the loops would be driven by both operational and signalling requirements and would be determined in association with the Cardiff Area Signalling Renewal Project. For the purpose of this study it has been assumed that the loops can start west of the level crossing and finish before the bridge over the River Ely, approximately 500m to the west.

If the loops need to be extended beyond these limits then it could be necessary either to extend the level crossing, construct additional spans to the river bridge or both with a consequent impact on estimated cost.

(f) Programme

These works should be integrated with the Cardiff Area Signalling Renewal Project.

(g) Costs

Costing assumptions:

Signalling

- The signalling costs associated with the loops are marginal on Cardiff Area Signalling Renewal
- Costs allow for junction heads on loop access signals and loop starters together with associated control systems

Permanent Way

- The loops would be 500m long with 40mph turnouts

Communications

- CCTV and CIS included with stations
- No DOO requirements

Station

- Platforms 100m long by 2.5m wide
- Basic shelters
- Security and lighting included
- Car parking for 50 vehicles
- DDA compliant footbridge

Network Rail

- Network Rail project management costs would be marginal to Cardiff Area Signalling Renewal Project

Possession management

- It is assumed that possessions to construct the loops and associated signalling would be integrated into Cardiff Area Signalling Renewal Project
- Possessions would be required for footbridge erection
- Platforms would be constructed “Green Zone”

Land

- It is assumed that all land required for the works is within Network Rail or Local Authority ownership and no allowance has been made for land acquisition

Consents

- It is assumed that the construction of the station can be made under Network Rail's Permitted Development Rights
- No allowance has been made for consultation with adjacent landowners

Table 23 Capital Costs – St Fagans Station

Element	£'000
Construction Works	
Station	1,375
Loops: Track and signalling	3,335
Sub Total	4,710
Other Costs	
Preliminaries and G. I.'s	1,160
Design	300
Testing and commissioning	25
Sub Total	1,485
Total Construction Costs	6,195
Network Rail Costs	
NW Project Management	150
Possession Management	50
Sub Total	200
Sub Total	6,395
Risk	
Unforeseen risk provision (50%)	3,198
Total (excluding Optimism Bias)	9,593

(h) Conclusions

At this stage construction of a station at St. Fagans, on a site to the west of the level crossing, appears technically feasible at an estimated spot cost of £6.4m (Q1 2005). The requirement for the loops and their length would need to be determined with Network Rail at early stage since this would have a major impact on the project cost.

6.4 Demand and Revenue Forecasts

The demand/ revenue forecasts have included:

- Forecasting demand for improved services at existing stations on the Main Line using the Moira model for the assessment of the Swan Line service improvement and at Pontycun for the Beddau Line scheme;
- Forecasting demand for new stations with the trip rate model; and
- Estimating abstraction from existing stations based on the SRA NPS data for park and ride origins for Pontyclun, Treforrest, Taffs Well and Radyr.

The demand for the new stations is shown in Table 24. The low demand forecast is provided by expanding the forecast demand to Cardiff and Newport by the average factor for the region. For the Beddau Line the low forecast excludes the terminus (head of the valley) station factor and both hourly and half hourly levels of service have been tested. The high forecast for St Fagans relates to the shadow station, Pontyclun and the high forecast for the Beddau line used the average station uplift factor and half of the terminus station factor.

Table 24 Cardiff – Bridgend Line New Station Options Demand

Station	Generated Demand – Low 1 tph (Journeys per annum)	Generated Demand - Low 2 tph (Journeys per annum)	Generated Demand – High 1 tph (Journeys per annum)	Generated Demand – High 2 tph (Journeys per annum)
St Fagans	20,200	52,333	39,087	101,262
Talbot Green	42,509	93,174	42,509	93,174
Llantrisant	110,079	235,789	110,079	235,786
Gwaun Miesgyn	74,223	155,406	74,223	155,406
Beddau	54,723	111,960	157,818	323,172

The forecast demand for St Fagans is relatively low at around 70 boarding passenger per day at most. This results from the model focusing on the 800m catchment area. Many more people live within 2,000m of the station but these people have relatively high frequency bus services to Cardiff and would face a relatively long walk to the station. Bearing in mind the relatively high capital cost of this station and low passenger generation it was decided not to include a new station at St Fagans within the economic evaluations. To take this scheme forward 2 aspects need to be investigated (a) the potential generation of demand to the Museum of Welsh Life and (b) the likelihood of residents of Michaelston-super-Ely using the station.

The demand forecast for Beddau is heavily influenced by the terminus (head of the valley) station factor. The stations' wider catchment area would include Llantwit Fardre and possibly Church Village but beyond that the communities have access to existing rail services in the Taff/Rhondda Valleys.

The financial evaluation is shown in Table 25 based on the forecast range shown above for the Beddau Line. For the Beddau Line the operating costs include £150,000 for level crossing staffing. The average fare for the new trips on the Swan Line improved service is much higher than for the Valley Lines but the subsidy per passenger is high.

Table 25 Financial Evaluation Cardiff – Bridgend Line Options

	Swan Line Improved Service	Beddau Line Hourly	Beddau Line Half Hourly
New Stations Passengers	-	281,534 – 384,629	596,327 – 807,538
Abstraction	-	-80,765	-80,765
New Demand from Existing Stations	10,221	4,168	8,476
New Rail Demand	10,221	204,937 – 308,032	524,038 – 735,249
New Rail Revenue	£59,849	£338,146 - £508,253	£864,663 - £1,213,161
Operating Costs	£1,152,000	£1,236,000	£2,017,000
Subsidy per passenger	£106.85	£2.36 - £4.38	£1.09 - £2.20

6.5 Economic Evaluation

The economic benefits were estimated by Moira for existing stations/passengers and non-user benefits were estimated for new rail demands. The demand forecast range has been applied to the Beddau Line. Table 26 shows the economic evaluations of the schemes.

Table 26 Economic Evaluation Cardiff – Bridgend Line Options

	Swan Line	Beddau Hourly Low	Beddau Hourly High	Beddau Half Hourly Low	Beddau Half Hourly High
Present Value Costs	£19.2m	£33.0m	£27.2m	£36.6m	£28.4m
Present Value Benefits	£13.7m	£33.4m	£49.6m	£85.1m	£118.9m
Net Present Value	£-5.5m	£0.3m	£22.4m	£48.5m	£90.5m
Benefit Cost Ratio	0.71	1.01	1.82	2.33	4.19

The Swan Line scheme has a negative Net Present Value and Benefit Cost Ratio below 1.0. This scheme is unlikely to secure funding support and is therefore not recommended.

The Beddau Line Benefit Cost Ratios are higher and even greater for the half hourly service option. Whilst the hourly service could be considered marginal the benefit cost ratios for the half hourly service are significant.

The figures presented assume a 2-car train is provided. However, through running with other services east of Cardiff Central is likely and, given the planned investment in rolling stock, it is possible that 4-car trains would need to be justified. The increased operating costs involved reduce the benefit cost ratios for the Beddau line hourly service to 0.8 – 1.4 and for the half hourly service to 1.6 – 2.6.

6.6 Recommendations

It is concluded that the Beddau Line scheme should be taken forward within the Sewta Rail Strategy. Coupled with the significant improvement to accessibility to communities in Rhondda Cynon Taf, this scheme also presents the opportunity for through running services from the east of Cardiff, where there are significantly more services planned that would otherwise need to reverse at Cardiff Central.

The critical success factors for this scheme relate to;

- The practicality of relocating the junction to the West of Pontyclun;

- Available main line capacity and/or additional measures to provide capacity for the additional services.
- The condition of structures and assumed costs;
- The feasibility of the proposed loop and associated signalling; and
- The assumed demand for the services – given that the line runs to the southwest before turning back towards Cardiff affecting comparative journey times. Household surveys would be required to check the modelling assumptions.

It is recommended that further assessment of the critical factors is undertaken on this route in the near future given the urgency of a decision on plain-lining the route through Pontyclun and the need to integrate the project with the Cardiff Area Signalling Renewal Project.

Figure 15 Talbot Green: Footbridge at ST 037825 looking to Pontyclun



Figure 16 Talbot Green: Footbridge at ST 037825 looking to Beddau



Figure 17 Pontyclun Station: Looking to Bridgend



Figure 18 Talbot Green: Cowbridge Road looking to Beddau



7

NEWPORT – ABERGAVENNY/CHEPSTOW LINES

7.1 Introduction

The former TIGER strategy reviewed in Part 1 of the study proposed the phased introduction of new local services on the Abergavenny and Chepstow/ Gloucester Lines and new stations – ultimately leading to a minimum half hourly service at all stations. New stations are proposed on the Cardiff – Newport section of the network at Coedkernew; on the Main Line east of Newport at Llanwern and Undy / Magor and on the Newport – Abergavenny Line at Caerleon. In the longer term new stations are recommended at Sepastopol and Llantarnam north and south of Cwmbran respectively.

This strategy has been examined in Part 2 measuring it against other Sewta projects using the same assumptions. The potential for a new station to be served by these new services at St Mellons on the South Wales Main Line (SWML) between Cardiff and Newport and west of the proposed Coedkernew station was also tested. This station is proposed to serve an expanding community to the north of the railway and provide an opportunity to park and ride by rail into Cardiff and Newport.

The strategy has been tested by drawing together the information from the published reports and assuming a phased introduction of the elements commencing in 2010. Three options to the strategy have been examined:

- Without Sebastopol and Llantarnam Stations;
- Without upgrade of the South Wales Main Line relief lines and without the new stations on that line; and
- Without the Stations at Coedkernew and Llanwern which rely on development/regeneration within the catchment areas which could delay the introduction of one or both stations.

7.2 Operations and Costs

The operating costs of the strategy are £5,173,000 per annum in 2002 prices and vary little between the options as most of the operating costs relate to the additional services on each line. Specifically:

- An extra train every other hour between Cardiff and Gloucester;
- An extra hourly service between Cardiff and Chepstow; and
- An extra two trains per hour between Cardiff and Abergavenny.

7.3 Engineering and Costs

This section concentrates on the new proposed St Mellons Station and the capital costs of this and the other proposed schemes are summarised later. The description of other measures and the derivation of their costs is documented in the TIGER Strategy reports.⁶

⁶ TIGER Rail Strategy Study Final Report 2001, Updated TIGER Rail Strategy Final Report September 2005

7.3.1 St Mellons Station

This description is based on a site visit to locations accessible to the public on 18th August 2005 together with information available from published sources.

Between Newport and Cardiff the South Wales Main Line comprises four tracks with the main lines to the north and the relief lines on the south. The alignment is straight and generally on a low embankment across the Wentloog Level. A rail connected freight terminal has recently been constructed on the south side of the railway. The relief lines are used only by freight trains on a regular basis with speed restricted to 40mph. Upgrading these lines for regular use by passenger trains with an increase in the permitted maximum speed is currently being considered by Network Rail.

(a) Proposed station location

It is understood that Network Rail has requested that the platforms are located on the relief lines due to capacity constraints on the main lines. This can be achieved by providing a single island platform 8m wide connected to both sides of the line by a DDA compliant footbridge. As a result, the down relief line would need to be slued to the south by a maximum of 7.5m to accommodate the platform. The total length of slue has been estimated at 1200 metres.

Ideally the station site would be located to avoid any costs associated with the widening of the overbridges due to the track slue. This appears to be achievable between the bridges at ST255809 and ST243800 respectively, but the location needs to take account of the east connection to the freight terminal which may force the station to be located further east. The location of the east and west connections to the freight terminal are likely to prevent a practical location for the station further south. Road access could be provided by extending the road serving the lakeside car park at ST247806.

(b) Scope of works

The station works would comprise the following:

- Track slue of the down relief line, maximum slue 7.5m, total length 1200m, including embankment widening;
- Single island platform 147m long x 8m wide to accommodate six-car trains with a 5m stopping tolerance;
- Platform waiting shelters;
- DDA compliant access to the platform from both the north and the south sides of the railway;
- Parking for 50 cars on the north side;
- Customer Information Systems;
- Security – CCTV;
- Lighting and drainage;
- Station ancillaries e.g. signage; and

- Highway access works.

(c) Issues and Constraints

The scheme would be dependent on the completion of the proposed upgrading of the relief lines between Newport and Cardiff for regular use by passenger trains with a target line speed of 75mph.

A key issue would be the ground conditions on the south side of the railway for the formation widening to accommodate the track slue that could have a significant impact on the cost of the works.

The extent of the Network Rail's land ownership adjacent to the existing railway is unknown currently and powers under the T&WA may be required to acquire the necessary strip.

If the total length of track slue is increased beyond 1500m or the station site moved significantly towards Newport or Cardiff then it could become necessary to reconstruct one of the overbridges to increase its span.

(d) Programme

These works should be integrated with the Cardiff Area Signalling Renewal Project.

(e) Cost assumptions

Generally

- The Relief Lines between Severn Tunnel Junction, Newport and Cardiff would be upgraded to passenger status with an increased linespeed as a separate project.

Signalling

- Any signalling costs associated with the works would be trivial and absorbed within the Signalling Renewal Projects.

Permanent Way

- The maximum track slue on the down relief line would be 7.5m.
- Total length of slue 1200m.

Communications

- CCTV and CIS included with station.
- No DOO requirements.

Station

- Island platform 147m long by 8m wide.
- Basic shelters.
- Security and lighting included.
- Car parking for 50 vehicles on north side.
- DDA compliant footbridge including third ramp to south side.

Possession management

- It is assumed that possessions to slue the down relief line would be included in the Cardiff / Newport Area Signalling Renewal Schemes.
- A blockade of all four tracks would be required for footbridge erection.

- Significant length of the realigned track would be laid in under "Green Zone".
- Land
- It is assumed that all land required for the works is within Network Rail or Local Authority ownership and no allowance has been made for land acquisition.

Consents

- It is assumed that the construction of the station can be made under Network Rail's Permitted Development Rights.
- No allowance has been made for consultation with adjacent landowners.

Highway access works

- Access road from the lakeside car park.

Table 27 Capital Costs – St Mellons Station

Element	£'000
Construction Works	
Station	1,847
Track slue	890
Sub Total	2,737
Other Costs	
Preliminaries and G. I.'s	680
Design	200
Testing and commissioning	25
Sub Total	875
Total Construction Costs	3,612
Network Rail Costs	
NW Project Management	150
Possession Management	100
Sub Total	250
Sub Total	3,862
Risk	
Unforeseen risk provision (50%)	1,931
Total (excluding Optimism Bias)	5,793

(f) Conclusions

At this stage the construction of a station at St. Mellons, on a site between the two overbridges at ST255809 and ST243800, appears technically feasible at an estimated spot cost of £3.9m (Q1 2005). However there are a number of issues that would need to be addressed at an early stage of any future project development in particular the location of the east connection to the freight terminal and the nature and extent of any land acquisition and earthworks on the south side of the existing railway line.

(g) Summary of infrastructure requirements and costs.

Table 28 shows the infrastructure schemes required to enable the introduction of the new services and the costs associated with the new services and with the proposed new stations. The costs have been drawn from the Tiger Strategy reports.

Table 28 Summary of Infrastructure schemes and Capital Costs

Item	Cost 2002 prices
Abergavenny Turnback	£258k
Caerleon Station	£2,201k
Chepstow Turnback	£2,064k
Undy / Magor Station	£2,813k
Coedkernew Station	£4,102k
Llanwern Station	£2,745k
Sebastopol Station	£2,850k
Llantarnam Station	£2,100k
St Mellons Station	£5,358k
Relief Lines Upgrade	£9,719k
Total (excluding Optimism Bias)	£34,210k

7.4 Demand and Revenue Forecasts

The demand and revenue forecast for St Mellons station is determined from the trip rate model. The demand and revenue forecasts for the other stations and new services are drawn from the previous evaluation report. The demand and revenue figures take into account abstraction from other stations and the impact of slowing down existing services. Table 29 shows that the full strategy has the lowest subsidy per passenger. The various options tested remove proposed stations which generate demand and revenue – leading to higher passenger subsidies. Removing the stations on the main line has the most impact on the subsidy per passenger.

Table 29 Financial Evaluation Newport – Abergavenny/ Chepstow Lines

	Full Strategy	Without Sebastopol and Llantarnam Stations	Without relief lines upgrade and new stations	Without Llanwern and Coedkernew Stations
New Stations Passengers	581,235	494,235	238,000	411,435
Demand from existing stations	402,200	402,200	402,200	402,200
New Rail Demand	983,435	896,435	640,200	813,635
New Rail Revenue	£3,056k	£2,912k	£2,344k	£2,647k
Operating Costs	£5,173k	£5,048k	£5,173k	£5,173k
Subsidy per passenger	£2.33	£2.58	£4.78	£3.36

7.5 Economic Evaluation

The economic benefits of the strategy have been drawn from the previous reports in terms of user benefits. Non-user benefits have been calculated using the same assumptions as applied to other corridors. Table 30 shows the results for the tests undertaken.

Table 30 Economic Evaluation Newport – Abergavenny/ Chepstow Lines

	Full Strategy	Without Sebastopol and Llantarnam Stations	Without relief lines upgrade and new stations	Without Llanwern and Coedkernew Stations
Present Value Costs	£41.3m	£37.7m	£35.0m	£46.5m
Present Value Benefits	£197.5m	£108.3m	£130.1m	£164.0m
Net Present Value	£156.2m	£142.6m	£95.1m	£117.6m
Benefit Cost Ratio	4.78	4.79	3.72	3.53

Removal of Sebastopol and Llantarnam Stations from the strategy has no significant impact on the benefit cost ratio. The demand assumptions are taken from the TIGER strategy but are in line with the results of the trip rate model developed for this study. The trip rate modelling assumes a general level of parking supply at stations that is in line with that provided elsewhere in the region. However, Cwmbran station car park is at capacity and any increase in capacity is likely to be taken up quickly. If significant parking capacity were provided at the new stations their demand forecasts could increase further. Also Cwmbran station's access arrangements are primarily for local traffic to park and ride, whereas Llantarnam and Sebastopol stations would have good links to the main A4042 route and would assist in modal shift in the future. This would be worth further investigation in the development of the improved services.

Removal of St Mellons Station, assuming demand/ revenue for a half hourly service, reduced the full strategy benefit cost ratio to 4.33 suggesting that this station should be included within the strategy. Also, the benefits for St Mellons Station would be higher if more trains called at the station which could be provided by both the Abergavenny and Chepstow services if the timetables could accommodate the additional calls.

Removal of the new stations on the main line, and the associated upgrading of the relief lines, reduces the benefit cost ratio showing that the benefits of the new stations (with the new development assumptions) cover the assumed upgrade costs (£10m). A doubling of the costs of the relief line upgrade would reduce the benefit cost ratio to 3.8.

It should be noted that the timetable for the Abergavenny line has recently changed – increasing the number of trains per day. This may alter the potential benefits of the additional Abergavenny – Cardiff services as some frequency benefits at main stations will reduce. This will also be affected by the timing of the services which should be examined through more detailed Moira modelling. However, although these changes will affect the evaluation results the changes are unlikely to remove the scheme from the strategy.

A separate parallel assessment of the recommended location of a new station at Magor with Undy as a possible relocation of Severn Tunnel Junction station has been undertaken to assist Network Rail in developing options for the Newport Area Signalling Renewal Project. That study confirmed the business case for that project.

7.6 Recommendations

It is recommended that the implementation strategy for the new services to Abergavenny and Gloucester/Chepstow with the new stations at Caerleon, Magor with Undy (possibly as a relocation of Severn Tunnel Junction Station), Llanwern, Coedkernew and St Mellons be further investigated.

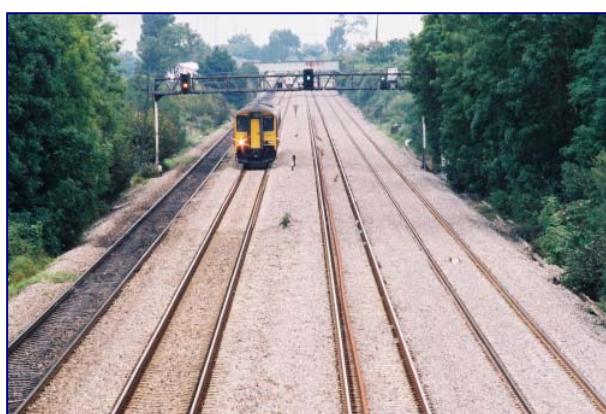
Torfaen Council should consider the future of land allocations in the catchment areas of the proposed stations at Sebastopol and Llantarnam and consider protecting the station sites including land for car parking and access routes. This would enable the business case for these stations to be reassessed in the future. Opportunities for securing private sector finance should be sought in line with new developments to reduce the call on Government funding and the impact of the stations on the affordability criteria.

The critical success factors for this element of the rail strategy are:

- Relief Line Upgrade;
- Turnback provision at Abergavenny and Chepstow – which should be allowed for in the Newport Area Signalling Renewal Projects;
- Provision for the new stations within the Newport Area Signalling Renewal Projects;
- Development in the station catchment areas at Caerleon, Llanwern and Coedkernew that would provide the additional demand for the new stations;
- Practicality of providing St Mellons Station in relation to the Wentloog Freight Terminal East connection; and
- Ability to turn back new services at Cardiff Central or the integration of the timetable with a service on the West side.

Further investigation of these critical success factors should be undertaken at the next stage, including more detailed (Moira) modelling of the new service options and the validation of the development trip assumptions and to validate the business cases. Revised economic evaluations should be undertaken as the projects develop.

Figure 19 St Mellons (West): Looking to Newport



8 EBBW VALE LINE

8.1 Introduction

It is proposed to introduce an hourly passenger service between Cardiff and Ebbw Vale Parkway on the Ebbw Valley Line in 2007, calling at intermediate stations, namely Rogerstone, Risca/Pontymister, Cross Keys, Newbridge and Llanhilleth. The Phase 2 aspiration for the development of passenger services on the Line includes an hourly Ebbw Vale Parkway to Newport service. In addition there are aspirations to extend the services to Ebbw Vale Town – where there is a Masterplan for the redevelopment of the Corus Site which will integrate the station with surrounding land-uses. Other aspirations for the Line include operating a service along the abandoned branch between Aberbeeg and Abertillery, also the stakeholder consultation revealed aspirations for additional stations at Pye Corner, Darran Road Risca, Crumlin and Cwm.

Most of these options have been examined to a greater or lesser extent in the past and this analysis has concentrated on the key issues / questions for development of the passenger services on the line. Engineering assessment has focused on the practicality of reopening the Abertillery Branch. Information for the Ebbw Vale Town extension has been taken from the Masterplan.

8.2 Operations and Costs

Table 32 shows the proposed timetable for the Ebbw Vale Phase 2 scheme – including the Phase 1 Ebbw Vale Parkway to Cardiff and Phase 2 Ebbw Vale Parkway to Newport hourly services. Key facts are that the journey time from Ebbw Vale Parkway to Cardiff is between 51 and 53 minutes, journey time to Newport is around 44 minutes and the time between Ebbw Vale Parkway and Aberbeeg junction is 7 / 9 minutes (down / up the valley).

Table 31 Proposed Timetable for Ebbw Vale Phase 2

	Newport Service	Cardiff Service
Ebbw Vale Parkway	XX:11	XX:41
Newport	XX:55	
Cardiff		XX:35
Cardiff		XX:39
Newport	XX:17	
Ebbw Vale Parkway	XX:05	XX:35

Source: SDG Ebbw Valley Railway RPP Formal Bid

The limit of double track under the original scheme was Aberbeeg junction at 14m 20 ch. With a half-hourly service (alternating between Cardiff and Newport) there is an ample interval between occupations of the upper section of line of around 7 minutes, twice per hour. Trains do, however, pass immediately south of Llanhilleth station, and again immediately south of Cross Keys station (7m 5ch) on the redoubled section of line.

As currently planned only the latter of these crossing points will be provided in Phase I. The half-hourly service will, most rationally, require the reinstatement of plans for double track to Aberbeeg (an additional 7 miles) with two-platform stations at Newbridge and Llanhilfeth. The extent of double-track provided gives some protection against delay imported from the main line being re-exported, possibly in magnified form.

The proposed Cardiff Service requires 2 train diagrams and assumes that the service is integrated with a service to the south / west of Cardiff to avoid the 20 minute turn round penalty. There is no flexibility to extend this service to Ebbw Vale Town or to stop at additional stations without provision of an additional train diagram.

The proposed Phase 2 service from Ebbw Vale Parkway to Newport requires two train diagrams. The journey time is 44 minutes, thus allowing 13 minutes per hour margin, and minimum 3-minute turnrounds. Under ideal conditions possibly two extra stations could be considered, reducing the spare time to a maximum of 9 minutes per hour (18 minutes per round trip). However, the primary objective of serving Ebbw Vale Town would require an additional 6 minutes running time (assuming 3 minutes each way) and would reduce the ability for this service to stop at additional stations without having a detrimental impact on the performance of the service.

With the proposed extension of the railway to Ebbw Vale Town passing locations will migrate northwards along the line by about 2 miles, confirming the benefit of constructing the proposed upper valley redoubling as a double track rather than as a short loop. The extension of the double track could be kept to around a mile long as turnround time of 3 minutes is considered acceptable. Alternatively, full double-tracking would allow the additional rolling stock and crew diagram (potentially available as a result of Cardiff layover issues) to provide increased turnaround at Ebbw Vale Town for both the Cardiff and Newport services. This would potentially allow for some additional station calls. The additional stations could be either along the Ebbw Valley or on the approach to Cardiff (Coedkernew and St Mellons).

The further option is the re-opening of the branch to Abertillery, 1.5 miles from Aberbeeg Junction. The running time would be five minutes less than to Ebbw Vale Parkway. An additional service could operate to either Newport or Cardiff – however it appears likely that the best option would be to use this service to allow the Ebbw Vale – Cardiff performance to be improved or to allow the reserve of time in the Abertillery service to provide for calls at new stations.

Table 32 shows the operating costs of the main Phase 2 options assuming the operation of the Phase 1 Ebbw Vale Parkway to Cardiff service with 3 diagrams. The first option is to overlay an Ebbw Vale Parkway to Newport service. The second option is to extend both services to Ebbw Vale Town and the third option is to provide a Abertillery to Cardiff service and Ebbw Vale Town to Newport service.

Table 32 Ebbw Vale Phase 2 Options Additional Operating Costs

Heading	Ebbw Vale Parkway – Newport £'000	Ebbw Vale Town to Newport and Cardiff £'000	Ebbw Vale Town to Newport and Abertillery to Cardiff £'000
Rosco Costs	£500	£500	£500
Staff Costs	£346	£346	£346
Other Costs	£461	£654	£299
Total	£1,307	£1,500	£1,145

8.3 Engineering and Costs

8.3.1 New Stations along the Ebbw Valley

Aspirations were expressed for several new stations along the Ebbw Valley (in addition to termini at Ebbw Vale Town and Abertillery) – Pye Corner, Darran Road Risca, Crumlin and Cwm. Pye Corner, Crumlin and Cwm have been examined in previous studies⁷ and identified as practical, although the site at Cwm is problematic as the bypass restricts the station to a single platform adjacent to Station Terrace.

The aspiration for a station at Darran Road, Risca is related to a potential leisure development at the nearby Quarry. The station site would be less than 2km north of the proposed Risca/Pontymister station to the south and less than 2km south of the proposed Cross Keys station to the North.

8.3.2 Ebbw Vale Phase 2

The TIGER strategy proposes the development of the Ebbw Vale Phase 2 scheme, involving an additional hourly service between Ebbw Vale Parkway and Newport. The Ebbw Vale Phase 1 scheme is proceeding on the basis of only providing the infrastructure necessary for the initial hourly service from Ebbw Vale Parkway to Cardiff. Table 33 shows the anticipated costs of the additional infrastructure based on the savings from the original full scheme and an allowance for the extra costs associated with introducing it on what would then be a live railway. These costs include a 40% risk and contingency factor but exclude optimism bias and equate to around £27.3m in 2002/03 prices (£28.6m in 2005 prices).

Table 33 Ebbw Vale Phase 2 Infrastructure and Costs

Element	Cost
Permanent Way (8 Miles)	£18.0m
Intermediate Signalling	£2.7m
Ebbw Vale Parkway Layout and Signalling	£4.0m
Newbridge Station	£0.9m
Llanhilleth Station	£0.9m
Ebbw Vale Parkway Station	£0.8m
Total (2002/03 prices)	£27.3m

8.3.3 Ebbw Vale Town

The Masterplan for Ebbw Vale states that the Rail-link will be twin track and will run from the southern extremity of the redevelopment site to a new station adjacent to the west of the General Office building (proposed). The Masterplan estimates that the extension of the rail route to Ebbw Vale will cost in the order of £7.6m, including double track, signalling and station.

8.3.4 Aberbeeg to Abertillery Reopening

In connection with the proposed reopening of the line to Ebbw Vale to passenger services and, in particular, the phase 2 works, the feasibility of reinstating a rail connection to Abertillery was examined.

⁷ Ebbw Valley Rail Study, Halcrow / Gwent Consultancy, June 1999

The line from Aberbeeg to Abertillery closed to passenger services in 1962 and subsequently to freight in 1987 following closure of the last colliery. The track signalling and other lineside infrastructure was recovered after closure.

(a) Existing infrastructure

This description is based on site visits to locations accessible to the public on 5th and 18th August 2005 together with information available from published sources.

The total length of the line from Aberbeeg to Abertillery is approximately 2.5km (1.5miles). There was one intermediate station at Six Bells, 500m from Abertillery.

The track and signalling were recovered after closure and the original station site at Abertillery redeveloped. In general the alignment has been invaded by scrub and saplings. The underbridge and adjacent pedestrian subway at Six Bells remain. Subsequently the retail development built on the formation at Abertillery has been abandoned and the site is currently available for redevelopment

(b) Scope of works

It has been assumed that the junction at Aberbeeg and the signals controlling the entry and exit to the branch would be provided as part of the Ebbw Vale phase 2 project.

(c) Permanent Way

After clearance of the scrub, a complete new formation including drainage would be provided for the whole route. Recovered rails and sleepers would be appropriate if available.

(d) Signalling

The Ebbw Vale Phase 2 project will signal the junction at Aberbeeg. Additional signals would be required to protect the junction onto the main line from the branch.

(e) Structures

There are no significant structures on the route. The underbridge at Six Bells is a metallic structure on masonry abutments of approximately 3m span that formerly supported multiple tracks. Re-use would be subject to a detailed examination and assessment, however the cost of replacement, if required, is not considered significant.

(f) Station

The new station at Abertillery would be provided with 100m long (four-car) platforms, waiting shelters, lighting and long line train indicators. It would be provided on or adjacent to the abandoned retail site. This site has good road access and the potential for car parking in excess of 50 vehicles.

(g) Risks

The principle risk identified at this stage is the requirement for an Order under the T&WA.

(h) Powers and Consents

Transport and Works Act Order

Due to the complete closure of the line to all traffic and the removal of the infrastructure it should be assumed that the reopening of this route would require an Order under the Transport and Works Act irrespective of land ownership issues.

Her Majesty's Railway Inspectorate (HMRI)

The proposed works would be notifiable to the HMRI under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994 [ROTS (AWPE) R]. There are three formal stages in this process:

- Obtain notification of non-objection to concept (GRIP 4)
- Obtain notification of non-objection to proposals (GRIP 5)
- Obtain full approval to the completed works (GRIP 7)

Major Project Notice

This is unlikely to be applicable to this scheme since the required possessions for making the connection to the Ebbw Vale line at Aberbeeg are unlikely to fall within the above definition.

Network Change

The works on the line would affect the Train Operating Companies (TOC's) and Freight Operating Companies (FOC's) and thus would be subject to the Network Change process. The Network Change Notice is developed during GRIP 4 and agreed during the detail design phase, GRIP 5.

Station Change

This would be required only if there was a station at Aberbeeg prior to the reopening of the Abertillery branch (not proposed).

(i) Programme

It is assumed that the work would be undertaken after or in association with the Ebbw Vale Phase 2 proposals.

(j) Abertillery cost assumptions

Signalling

- Capita Symonds suggest that phase 2 costs include 4 signals to protect the new Aberbeeg Junction. It is assumed that these are on the "main line".
- The only controlled signals on the branch protect the junction onto the main line and an allowance has been made for two signals.
- Passive provision for the branch signals is made as part of the Ebbw Vale Phase 2 project.

Permanent Way

- Scrub clearance and complete formation renewal.
- Single lead connection would be acceptable (one crossover and one turnout).

Communications

- CCTV and CIS included with stations
- No DOO requirements
- It is assumed that lineside phones would be required

Stations

- Platforms 100m long by 2.5m wide
- Basic shelters
- Security and lighting included
- Car parking for 50 vehicles at Abertillery only
- No intermediate stations at Six Bells or Aberbeeg

Possession management

- It is assumed that possessions would only be required to install and commission the junction at Aberbeeg

Land

- It is assumed that all land required for the works is within Network Rail or Local Authority ownership and no allowance has been made for land acquisition

Consents

- No allowance has been made for obtaining an Order under the Transport and Works Act.

Table 34 Capital Costs – Aberbeeg to Abertillery

Element	£'000
Construction Works	
Signalling	250
Permanent Way	3,088
Telecoms	150
Stations	469
Bridges	250
General Civils incl Fencing	175
E&P	Incl.
Sub Total	4,382
Other Costs	
Preliminaries and G. I.'s	1,100
Design	300
Testing and commissioning	100
Sub Total	1,500
Total Construction Costs	5,882
Network Rail Costs	
NW Project Management	590
Possession Management	20
Sub Total	610
Sub Total	6,492
Risk	
Unforeseen risk provision (50%)	3,246
Total (excluding Optimism Bias)	9,738

(k) Conclusions

At this stage it appears feasible to reinstate the branch line between Aberbeeg and Abertillery at an estimated spot cost of £6.5m (Q1 2005). This assumes that the scheme would be implemented within the Ebbw Vale Phase 2 works. It should be noted that it is probable that an Order under the Transport and Works Act would be required with a consequent effect on cost and programme.

8.4 Demand and Revenue Forecasts

Table 35 shows the catchment populations and demand forecasts for the new stations along the line.

Table 35 New Stations Demand Forecasts

Station	Catchment Population 800m	Catchment Population 2km	Demand Forecast Journeys per annum for 1tph
Pye Corner	4,312	19,040	135,000
Risca/Pontymister	6,477	12,488	104,000
Darran Road Risca	1,706	10,170	47,000
Crumlin	3,306	9,980	60,000
Cwm	2,252	4,694	54,000
Abertillery @	5,198	10,997	434,000
Ebbw Vale Town @	1,520	10,541	192,000
Ebbw Vale Town @ including redevelopment#	2,770	11,791	329,000

@ note includes terminus (head of valley) station factors.

note includes additional 28,000 inbound trips (source: SDG Ebbw Vale RPP Bid)

Abertillery and Ebbw Vale are the largest communities with similar sized 2km station catchment areas. More people live within 800m of Abertillery which is important in terms of the demand for rail in the region. Cwm has the smallest catchment population but is one of the furthest away from Newport/ Cardiff in an area where improving access to jobs may be a major concern. Crumlin has a larger catchment population and resultant forecast demand. It is also a significant distance from Newport/Cardiff.

The Darran Road, Risca site has a significantly smaller catchment population compared to the proposed Risca/ Pontymister site, especially within 800m of the station. The proposed leisure development is not forecast to generate significant demand compared to the catchment population as the majority of people visiting the site would be family groups where car travel has an advantage over public transport. The Darran Road site is therefore not recommended.

The Pye Corner site has a reasonable catchment population but would be relatively close to Newport. Demand to Newport could be subject to significant bus competition. The generated rail trips would be short – compared to the other Ebbw Valley station options – and would generate less revenue per passenger and smaller wider benefits such as traffic decongestion.

The net financial impacts of the Cwm, Crumlin and Pye Corner station options could be similar. However, rail is better suited to providing for longer distance journeys and where there is a greater time advantage over car. Coupled with the regional objective to increase accessibility to jobs in Newport and Cardiff from the Valleys to the north, our recommendation is that if the services can call at additional stations on the line the priorities should be Crumlin and Cwm.

Table 36 shows the Financial Evaluation of the main Ebbw Vale Phase 2 options. The demand and revenue forecasts for the Ebbw Vale Parkway – Newport service are derived from the RPP Bid report and demand for new stations are taken from the trip rate model. Allowances have been made for the level of abstracted demand from Ebbw Vale Parkway station as a result of extending the service to Ebbw Vale Town at either half hourly or hourly frequencies implied by the options. The evaluation assumes that the initial Cardiff – Ebbw Vale Parkway service is already provided and therefore the estimated operating costs are net additional operating costs. The trip rate model forecasts – which put a relatively high factor on Heads of the Valley stations suggests that operating hourly services to both Ebbw Vale Town and Abertillery provides greater access to rail generating more demand than operating half hourly to Ebbw Vale.

Table 36 Financial Evaluation Ebbw Vale Phase 2 Options

	Ebbw Vale Parkway – Newport	Ebbw Vale Town to Newport and Cardiff	Ebbw Vale Town to Newport and Abertillery to Cardiff
New Stations Passengers	-	341,053	574,150
Abstraction	-	-75,000	-50,000
New Rail Demand existing stations	298,057	298,057	298,057
Total New Rail Demand	298,057	564,110	822,207
New Rail Revenue	£473,911	£896,935	£1,307,309
Operating Costs	£1,307,000	£1,500,000	£1,145,000
Subsidy per passenger	£2.80	£1.07	£-0.20

8.5 Economic Evaluation

Table 37 shows the comparative economic evaluation of the Ebbw Vale Phase 2 options. This evaluation is relatively cautious as the passengers at the 'existing' stations on the line – to be opening in 2007, will experience significant journey time savings as a result of the increased frequency. The impact would be the same for all three sub-options.

Table 37 Economic Evaluation Ebbw Vale Phase 2 Options

	Ebbw Vale Parkway – Newport	Ebbw Vale Town to Newport and Cardiff	Ebbw Vale Town to Newport and Abertillery to Cardiff
Present Value Costs	£39.4m	£49.3m	£43.8m
Present Value Benefits	£54.2m	£103.2m	£151.4m
Net Present Value	£14.9m	£53.9m	£107.6m
Benefit Cost Ratio	1.38	2.09	3.45

Whilst the Ebbw Vale Parkway – Newport scheme would have the lowest capital cost the Ebbw Vale Town and Abertillery options have lower net costs due to the high contribution of revenues against operating costs. The Abertillery option has the highest NPV and BCR as a result of more efficient use of resources and higher demand forecasts and resultant benefits.

However, the Abertillery option results in only an hourly service to Ebbw Vale Town and to Ebbw Vale Parkway stations. The increased rail access needs to be set against the objective of securing minimum half hourly services to all stations in the Valley.

In addition, the base evaluations have assumed 2-car trains operating the services. However, it is likely that the services would run through Cardiff to Maesteg, which is proposed to operate with some 4-car trains by 2009. The impact of higher operating costs to run the services with 4-car trains is to lower Cost Benefit Ratios for the Ebbw Vale Town and Abertillery options to around 1.32 and 2.41.

8.6 Recommendations

Bearing in mind the spatial economic strategies for the region which have a strong emphasis on regeneration of areas of economic transition and the need to provide access to new job opportunities, coupled with the Sewta objective to provide half hourly train services, it is recommended that the strategy includes the Ebbw Vale Phase 2 scheme extended to Ebbw Vale Town. The proposed Rail-link bus service between Abertillery and Llanhilleth station should be integrated with the train services and ticketing system and financially supported through a partnership between the train operator and local authorities funded by the Assembly.

In light of the recommendation to extend the Ebbw Vale Service to Ebbw Vale Town there will be no opportunity to serve additional stations on the Cardiff bound service and it is therefore not recommended to provide any additional intermediate stations along the line.

Critical success factors for this scheme are:

- The demand forecast assumptions from the original TIGER strategy for the increase in demand for new stations along the line;
- The exact timetable and resulting location and scale of further infrastructure required;
- Provision for the operation of the service into Newport in the Newport Area Signalling Renewal Project; and
- Provision for the service to be extended into Ebbw Vale Town.

It is recommended that the scheme is developed in parallel to the implementation of the Phase 1 scheme but that the economic evaluation is checked when the initial Phase 1 demand is known. Ideally the implementation of the scheme should be integrated with the Masterplan for Ebbw Vale. The Council should protect the alignment to Abertillery and seek to secure a station location at the town through the local planning process to enable that scheme to be developed in the longer term. In the interim consideration could be given to developing a cycle route on the formation to increase access to the train services.

Figure 20 Abertillery: Former track bed towards Aberbeeg



Figure 21 Abertillery: Proposed station site



Figure 22 Aberbeeg: Looking south to site of former junction



Figure 23 Six Bells: Formation looking to Aberbeeg



9

PASSENGER GROWTH AND ROLLING STOCK NEEDS

9.1 Introduction

There has been considerable passenger growth on Valley Lines services within the Sewta region over the last few years – leading to peak period overcrowding and investment in additional rolling stock to lengthen trains to accommodate demands.

The current Sewta investment plan to 2009 includes for considerable investment in longer platforms throughout the region to enable further train lengthening to meet further demand growth. However, additional rolling stock leasing costs will be incurred through the strategy period.

Rolling stock needs were examined by the application of growth factors to observed peak train counts and assessment of the future demand against the planned maximum line capacities.

9.2 Passenger Growth Forecasts

Table 38 shows the growth in patronage on Valley Lines services between 1998 and 2004 and between 2001 and 2004 by line. There was little growth in 2001/2002 probably as a result of the network disruption following the Hatfield accident. The table shows that there was an average growth of 10% per annum between 1998 and 2004 with all lines growing by at least 5% per annum on average and most lines growing between 7% and 10% per year.

Table 38 Average Growth per Annum, Valley Lines

Line	1998 - 2004	2001 - 2004
Bay	28%	15%
City	6%	5%
Aberdare	17%	11%
Barry	8%	0%
Penarth	10%	5%
Coryton	5%	5%
Merthyr	8%	-1%
Treherbert	7%	1%
Rhymney	7%	3%
Maesteg	-	11%
All Lines	10%	5%

The table also shows that between 2001 and 2004 there was significantly less growth – 5% per annum on average across all lines. The Aberdare line frequency was increased from hourly to half hourly (throughout most of the day) in September 2003 and this line grew at 3% per annum before this change. Some lines might be capacity constrained – affecting the potential for demand to grow – particularly the Barry, Merthyr, Treherbert and Rhymney Lines. Other lines have some spare capacity and potential to grow – such as the Cardiff Bay, Penarth, Coryton and City Lines, though individual peak trains are also busy.

Table 39 shows the recent change in demand at other stations in the Sewta Region. Demand growth on the lines as a whole is similar to the Valley Lines growth though the growth on the Marches Line was less – possibly as a result of the low service frequency currently provided failing to meet passengers' needs.

Train count and rolling stock data supplied by Arriva Trains Wales⁸ revealed that there was 64% - 80% spare capacity (standing/seating) on Chepstow Line peak trains. All Marches Line services will be operated using class 175 trains in December 2005 and there will be between 32% and 47% spare seating capacity. There is significant scope for lengthening trains on these services with the only constraint to 4-car length trains at the down platform at Caldicot (3-car).

Table 39 Other Sewta Stations Patronage Change

Line	Average Annual Growth 2003 – 2005
Marches Line (Abergavenny, Pontypool&New Inn, Cwmbran)	2%
Chepstow Line (Chepstow, Severn Tunnel Junction, Caldicot)	8%
Average	5%

To estimate the potential impact of passenger growth on the Valley Lines throughout the evaluation period the 2004 peak train counts provided by Arriva Trains Wales were summed for the 2 hour AM peak (0730 – 0930 arrivals at Cardiff) and for the 2 hour PM peak (1630 – 1830 departures from Cardiff) for the most heavily used lines.

Two demand forecasts were applied;

- Central Demand based on GDP Growth; and
- High Demand – using the average Valley Lines Growth between 2001 and 2004 (5% per annum).

The Central GDP based forecast is the approach recommended in the Rail Passenger Demand Forecasting Handbook (PDFH) used in the rail industry. The Forecast GDP growth was derived from the Royal Bank of Scotland Quarterly Economic Update (5th April 2005) for the period between 2004 and 2007 and the long term GDP growth forecast was taken from the Treasury Budget March 2005 report. The GDP rates applied were 2.6% to 2005, 2.7% to 2006, 2.5% to 2007 and 2.25% between 2008 and 2018.

The impact of planned frequency increases between 2005 and 2010 were also taken into account on the Rhymney Line, Merthyr Line and Maesteg Line.

Cardiff Council are considering the introduction of a congestion charge for the Capital – to improve traffic flows and generate income to invest in transport projects. Such a scheme would probably be integrated with the current Severn Bridge Tolls and possible tolls on an M4 relief road planned to be constructed around Newport. A congestion charge would alter the relative generalised costs of travel between road and rail in the region and would be expected to have a significant impact on the demand for rail services.

⁸ Spring 2005 data, figures subject to change as a result of the introduction of the SPT December 2005

The estimated impact of a Congestion Charge on rail demand used the procedures recommended within the Rail Passenger Demand Forecasting Handbook (PDFH) assuming a flat rate congestion charge of £2.50 per day introduced in 2013. The impact was estimated for a typical trip (Pontypridd – Cardiff) by assessing the scale of impact on the total journey costs for car users, and applying a cross elasticity of rail demand to car cost of 0.40. The resultant factor was an 18% increase in rail demand.

9.3 Capacity Analysis, Operating Costs and Evaluation

The increase in rail demand was compared with the base (seating and standing) capacity for each line and also the planned capacity taking account of the maximum train length and frequency for each line, assuming all peak period trains are lengthened as far as possible. In addition, the impact on the ‘peak train’ on each line was examined through analysis of the difference between the peak train count and the average peak count for each line.

The analysis suggests that there will be a requirement for additional rolling stock if peak period demand increases are to be accommodated without there being overcrowding or demand suppression. We have estimated the additional rolling stock requirements over and above 2008. This assumes that rolling stock increases are funded between now and 2008 to meet the needs of demand growth in the short term. The analysis concentrated on the period between 2009 and 2018, and assumes an average vehicle capacity over a full peak period of 150 passengers, assuming Class 150 rolling stock, SRA loading factors and 50% bounce-back factor. This is considered realistic as a significant proportion of Valley Lines services operate through Cardiff, principally to Barry and Penarth. The results are summarised in Table 40 below.

Performance and operational constraints at Cardiff Central and Queen Street Stations limit the opportunity to couple / decouple trains to reduce off-peak operating costs. As a result the evaluation has assumed an average operating cost of £250,000 per vehicle. The revenue forecasts assume the benefits of additional peak period demands that would otherwise be constrained by capacity, multiplied by 250 weekdays per year and an average network revenue rate of £1.60 per journey. Decongestion benefits are estimated for the additional passengers assuming a third of new rail demand is transferred from car.

Table 40 Rolling Stock Requirements, Subsidy and Benefits 2009 – 2018

Year	Additional Rolling stock (Vehicles) ⁹ (High Forecast)	Subsidy Required £k	Decongestion Benefits £k
2009	2	£327	£261
2010	3	£468	£429
2011	4	£590	£621
2012	5	£706	£822
2013	7	£1,066	£1,034
2014	8	£1,169	£1,256
2015	10	£1,504	£1,507
2016	12	£1,814	£1,794
2017	14	£2,101	£2,117
2018	17	£2,589	£2,513
Totals		£12,332	£12,353

⁹ Many trains in the region are operated with 2- car (vehicle) sets

The economic evaluation results are shown in Table 40. The analysis was constrained to the period 2009 to 2018 and included decongestion benefits, accident benefits and air quality benefits but excluded crowding benefits (since the costs and revenues assume that extra capacity is provided only as and when additional passengers are expected to need it). Providing the capacity for further Valley Lines patronage growth, particularly to the North of Cardiff will provide support to the Spatial Strategy and enable people to access jobs in Cardiff in greater numbers over time.

The cost benefit ratio of 1.2 without wider economic benefits and the potential for additional crowding benefits suggest that this core element of the Sewta Rail Strategy could be supported.

9.4 New Build

Recent increases in rolling stock have been brought about by cascading stock from elsewhere. Arriva Trains Wales have advised that there is unlikely to be enough Class 150 rolling stock available for meeting their future fleet needs and conversion of other rolling stock such as increasing the number of doors is not considered a viable approach to the problem.

Most of the existing rolling stock will be at least 30 years old by the end of the strategy period being investigated and in addition to passenger perceptions of the quality of service the vehicles are likely to become increasingly less reliable. Coupled with the need for significant investment in rolling stock to allow for passenger growth, there is an opportunity, if not a requirement, to secure new rolling stock for the Sewta services.

There would be a number of possible advantages of rolling stock renewal:

- Positive image impact for the region;
- Specification of Valley Lines stock;
- Faster acceleration for journey time savings/ performance benefits;
- Large number of doors for faster access/ egress;
- 3-car sets design for improved capacity/ lower operating costs / revenue protection (conductors); and
- Possible link with technological development, such as Fuel Cells to provide the benefits of regenerative braking.

The lease costs of new rolling stock are likely to be higher than for cascaded rolling stock but this could be balanced from increased revenue as a result of the change in passenger perception.

9.5 Recommendation

It is recommended that additional rolling stock is funded for lengthening the Valley Lines services over the strategy period to meet the rising demand for peak rail travel.

As the Class 14x rolling stock will need replacing in the period 2010 – 2018 it is strongly recommended that the opportunity to secure new rolling stock rather than cascaded rolling stock is evaluated in detail in the negotiations for the second half of the Arriva Trains Wales franchise.

The critical success factors in this part of the strategy are:

- Demand for rail travel continuing at 5% per annum or above and the locations and therefore routes where this growth occurs;
- The accuracy of peak period train counts and possible underestimation of congestion levels which would limit the potential for growth;
- The availability of suitable rolling stock cascaded from other regions of the UK in the short/medium term;
- Securing a new build of rolling stock for delivery in the second half of the Arriva Trains Wales Franchise; and
- Delivering platform lengthening on the Valley Lines Network in time for train lengthening and considering the need for operational flexibility. The platforms at Eastbrook Station (90m up and down) and Barry Island (99m single) cannot accommodate 6-car trains and therefore peak trains from the Rhymney and Treherbert Lines. Barry services are forecast to be over capacity in the Strategy Period and, subject to providing additional capacity through additional Vale of Glamorgan services, consideration should be given to lengthening these platforms.

It is recommended that investigation of the Fleet Strategy, new build and further platform lengthening is taken forward in the short term to develop plans for delivering these measures in the Period 2009 to 2018.

It is recommended to undertake independent on-platform train counts at Cardiff Central and Cardiff Queen Street Stations to validate the train guard counts used in this assessment.

It is recommended to investigate the potential to encourage peak spreading to make best use of peak period train capacity.

10 INTEGRATED BUS SERVICES

10.1 Operations and Costs

There are 4 Rail-link bus services feeding the rail network from non-rail served communities in the region. The subsidy level for these services is high compared to other socially necessary bus services supported by the local authorities (between £2 and £4 per passenger journey).

Table 41 Current Rail-link Buses

Bus Service	Patronage	Operating Cost	Income	Subsidy
RL2 Ystrad Rhondda - Maerdy	23.5k p.a.	£60k p.a.	£61k p.a.	£110k p.a.
RL3 Aberdare - Rhigos	29.5k p.a.	£111k p.a.	combined	combined
RL4 Maesteg - Caerau	26.2k p.a.	102k p.a.	£36.5k p.a.	£65.5k p.a.
RL5 Ystrad Mynach - Blackwood	19.7k p.a.	£75k p.a.	£11.8k p.a.*	£75k p.a.

* revenue estimated from 60p add on fare – retained by Arriva Trains Wales.

In addition the Tredegar to Rhymney service 20 allows passengers to purchase through bus/rail tickets. However, take up is low (around 5 per week). One possible reason is that concessionary pass holders would use their pass for the bus journey and purchase a separate rail ticket at the station.

The Rail-link bus services are often supported as existing bus services in the same corridors do not call directly at the rail station – due to the physical location of stations compared to other demand generators – particularly shopping centres. Some services are supported as the request for reinstatement of a direct rail service was prohibitively expensive. The Tredegar experience suggests that some potential Raillink bus demand may be lost as a result of the concessionary travel policy in the Wales – which supports free bus travel only.

There were 4 suggested new rail-link bus services/ changes requested:

- **Extending the current Maesteg service from Caerau to Cymmer.** This would require an additional bus to maintain the service. The frequency of the Maesteg – Cardiff service is to be increased to half hourly by 2009 and the operation of the current Rail-Link bus service could be examined at that time to establish the most efficient operation linking to the revised service and whether the Cymmer extension could be incorporated.
- **Increasing the frequency of the Ystrad Mynach - Blackwood service.** This service connects hourly to a half hourly train service, which is planned to be increased to 4 trains per hour before 2009, so there would be advantages in increasing the frequency of the bus service to extend the benefits of the relatively high frequency train service. However, this is the most heavily subsidised Rail-link service in the region and the application of additional subsidy for a higher frequency should therefore be compared with extending the operating hours of the current service.

- **Ystrad Mynach – Gelligaer.** This would be a new service from Ystrad Mynach to a new housing development at Penallta and on to Gelligaer. The service would be made possible by the proposed new road link to the housing development from the A472. The rail-link bus service would have significant subsidy costs and it is recommended that the scheme is discussed with bus operators as there could be opportunities for new/revised bus services created by the development and change to the road network. In the first instance a commercial service providing the rail-link should be sought. In addition, contribution to the operating costs of the bus service should be sought from the housing developer through a planning agreement.
- **Blaenavon via Abersychan to Pontypool and New Inn station.** This would be a new service extending the catchment area of the railway and providing access to Blaenavon – a town with World Heritage Status through its early industrial history. The catchment area would contain over 45,000 people in North Torfaen and West Monmouthshire. However, providing a specific Rail-link bus would be expensive and duplicate a current bus service to Pontypool and New Inn (though 380m from the station) and there is a frequent service from Newport station which has a higher number of services per day. In the first instance, options of extending the bus service to Pontypool and New Inn station should be examined – especially when the station improvement scheme is implemented and when the new local service (improving the frequency of train service to the station) is introduced.

Within this study we have identified a number of other potential Rail-link bus services to integrate with rail services where rail network extension options are not supported, Specifically:

- **Bedlinog – Trelewis / Treharris – Abercynon**, or via Nelson to Ystrad Mynach. By 2009 there will be 4 trains per hour to Abercynon station and the remodelled station will provide the opportunity to provide the Rail-link service. This would help to develop the market for rail in the Bedlinog Corridor and extend the reach of the rail network. The second interchange point option at Ystrad Mynach should also be investigated in more detail to decide on the best routeing of the service.
- **Ebbw Vale Town – Ebbw Vale Parkway**, to be introduced when the services between Cardiff and Ebbw Vale Parkway are introduced. This would be replaced or modified when Ebbw Vale Phase 2 is introduced and extended to Ebbw Vale Town.
- **Brynmawr - Abertillery – Aberbeeg – Llanhilleth**, to connect with services to Cardiff in the short term and with services to Cardiff and Newport in the period to 2018.
- **Beddau – Llantrisant – Talbot Green – Pontyclun**, to provide a pre-rail service before reopening the rail line and provision of new stations, to improve access to rail into Cardiff from the corridor in the short term and to relieve parking at Pontyclun.

The subsidy levels for Rail-link bus services are high. The additional rail revenues will make a small contribution to the train operators' income. It would seem sensible to seek their continued operation, and extension to other locations, through the franchise process, possibly by means of a partnership between the train operator and the local authorities, with dedicated funding from the Assembly.

10.2 Recommendations

Rail-link bus services provide a valuable role in extending the reach of the rail network and, though expensive, are cheaper means to provide improved accessibility than providing rail network / service extensions in many places. The critical success factors for continuing and extending these services are:

- Sufficient revenue budgets available to local authorities to continue to support existing services;
- Sufficient resources available to support new Rail-link buses;
- Increasing the awareness of the services through increased / integrated marketing of them; and
- Full integration suggests that the Rail-link buses should be seen as an integral part of the rail network and delivered through the rail franchise process to ensure integration, through the partnership between the train operator and local authorities, supported financially by the Assembly.

There is a need to undertake passenger research to establish the contribution the services make to the Sewta objectives, including both the economic and social benefits the services bring. This would aid the justification for improving and extending the Rail-link network. In particular, the evaluation could assess the contribution to providing access to jobs and to the income of the railway.

The high revenue cost implications of the bus services, which could be around £400k - £500k p.a., needs to be compared with other forms of investment to determine the best ways in which to serve the same objectives. Each new initiative needs to be developed in partnership with the bus industry to determine the most cost-effective approach. The local authorities should seek developer contributions to secure access for Rail-link bus services and, where possible, revenue support for developing and improving services. The implementation of sustainable travel plans for new developments and major employers could help to create opportunities. The option of securing the services through the partnership process which would fully integrate them with the rail services should be investigated.

APPENDIX A - TRIP RATE MODEL DEVELOPMENT

Variables

Demographic Data

2001 Census data was analysed using GIS to provide the demographic data for each station catchment in the region in 3 bands, within 400m of the station, within 800m of the station and within 2000m of the station, taking account of overlapping catchments between adjacent stations. The following data was input to the model both logged and in a natural state:

- Population;
- Households; and
- Car ownership.

Car ownership was included as a proxy measure of income, which was not available in sufficient detail. However, all forms of the household car ownership data failed to provide a significant variable in the model calibration process.

Service Data

Data was collated for both rail and bus journeys to Cardiff and Newport from the stations on the region.

(a) Rail Data

The following data was developed into variables and then tested during the creation of the model:

- Fare data for journeys to Cardiff/Newport;
- Rail vehicles per hour to Cardiff/Newport in the AM Peak;
- Rail vehicles per hour to Cardiff/Newport in the Off Peak;
- Rail headway to Cardiff/Newport in the AM Peak;
- Rail headway to Cardiff/Newport in the Off Peak;
- In vehicle time to Cardiff/Newport in the AM Peak; and
- In vehicle time to Cardiff/Newport in the Off Peak.

(b) Bus Data

The following data was developed into variables and then tested during the creation of the model:

- Fare data for journeys to Cardiff/Newport;
- Bus vehicles per hour to Cardiff/Newport in the AM Peak;
- Bus vehicles per hour to Cardiff/Newport in the Off Peak;
- Bus headway to Cardiff/Newport in the AM Peak;
- Bus headway to Cardiff/Newport in the Off Peak;
- In vehicle time to Cardiff/Newport in the AM Peak; and
- In vehicle time to Cardiff/Newport in the Off Peak.

(c) Generalised Cost Data

Both bus and rail variables were developed into generalised cost variables (with varying values of time) for each time period, mode and destination using the following equations:

$$GC = (\text{fare} + 2(\text{IVT+Headway}))$$

$$GC = (\text{fare} + 3(\text{IVT+Headway}))$$

$$GC = (\text{fare} + 4(\text{IVT+Headway}))$$

These variables were tested both in their natural state and logged. The difference between bus and rail generalised cost was also tested in each time period.

Other Variables

Dummy variables were tested to reflect a range of other factors including differences between individual lines:

- Stations on the Treherbert line;
- Stations on the Aberdare line;
- Stations on the Merthyr line;
- Stations on the Pontypridd line;
- Stations on the Coryton line;
- Stations on the Rhymney line;
- Stations on the Newport line;
- Stations on the Maesteg line;
- Stations on the Barry line;
- Stations on the Cardiff Bay line;
- Stations on the Penarth line; and
- Stations on the City line.

Other variables were:

- Is the station a terminus (Head of the Valley);
- Does the station have parking;
- Does the station have a direct service to Newport;
- Distance to Newport/Cardiff;
- Is there a bus link to the station; and
- Does the station have a direct service to London.

Cardiff Model

Using SPSS, the variables were tested against both demand and logged demand in order to see which would offer the best fit. Various model forms were tested and appraised on the basis of:

- The direction of the sign of the coefficient;
- The overall model fit (adjusted r squared factor);
- The significance of each variable (t-test); and
- Application back to the base data to assess any regional or other bias.

The recommended model is shown in Table 42. This model predicts logged demand to central Cardiff. The adjusted r squared is 0.641.

This model excluded flows between Cardiff (Queen Street and Central) and the flowing stations (mainly due to very low or high flow to the city):

- Cathays;
- Pyle;
- Maesteg Eweny Road;
- Ynyswen;
- Gilfach Fargoed;
- Pentre Bach; and
- Cwmbach.

NB Stations excluded from the Cardiff Model were excluded from the combined model.

Table 42 Cardiff Model Variables

Variable	Co – efficient	T-test
Constant	14.232	7.990
City Route	-0.949	-1.959
Penarth/Barry Route	-0.821	-2.418
Maesteg route	-0.783	-2.266
Bus vehicles per hour off peak	-0.205	-4.571
Parking provided	0.569	2.656
Terminus Station	2.128	6.896
Log Population within 800m	0.695	4.571
Log Rail Generalised Cost AM peak (In_Rail_4GC_AM)	-1.666	-6.761

Newport Model

The same process was undertaken for the development of the model to predict Newport flows. The recommended model is shown in table 2 and again forecasts logged demand based on logged population and generalised cost variable with other factors. The adjusted r squared for this model is 0.613.

This model excluded flows between Newport and the flowing stations (mainly due to very low or high flow to the city):

- Cardiff Central Stations;
- Cardiff Bay;
- Barry Island;
- Pencoed;
- Maesteg Eweny Road;
- Birthdir;
- Cwmbach;
- Fernhill;
- Garth;
- Gilfach Fargoed;
- Pontlottyn;
- Pyle;
- Sarn;
- Tir Phil;
- Tondu;
- Whitchurch;
- Wildmill; and

- Ynyswen.

Table 43 Newport Model Variables

Variable	Co - efficient	T-test
(Constant)	9.66475	2.57651
Terminus Station	1.25303	3.53331
Parking Provided	0.78401	2.84168
Direct service to Newport	2.09124	4.39591
Log Rail Generalised Cost AM Peak (ln_rail_4gc_am)	-1.68171	-3.72779
Log Population within 2000m	0.63288	2.74782

Uplift of Flows

Application of the trip rate models forecasts trips to/from Cardiff and Newport. Factors need to be applied to estimate all station flows to all destinations.

From the average model fit for the existing stations in the Sewta Area and average Cardiff/ Newport to all trips factor 2.46 was derived. Some of the proposed new stations have similar features to existing stations so alternative factors were derived using an individual uplift from a nearby 'shadow' station or group of stations along a section of the existing network. This takes account of the ability of the trip rate model to predict demand for the shadow station(s).

APPENDIX B - APPRAISAL SUMMARY TABLES

Description: Train Lengthening and Rolling Stock Renewal		Problems: Overcrowding of peak period trains if growth occurs around 5% p.a.	PVC Cost: £4.8m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2018)	ASSESSMENT
ENVIRONMENT	Noise	No significant impact	N/A	No Impact
	Local Air Quality	Improvements due to Modal Shift	8.3 NO _x tonnes/year 0.37 PM ₁₀ tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	1334 CO ₂ tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
	Journey Ambience	Slight Increase due to reduced overcrowding	N/A	Slight Positive
SAFETY	Accidents	Road accidents reduced	4 p.a.	Slight Positive
	Security	No Impact	N/A	No Impact
ECONOMY	Transport Economic Efficiency	Return on investment	NPV = £3.5m	BCR = 1.75
	Reliability	No Impact	N/A	No Impact
	Wider Economics Impacts	Supporting growth in the Valleys regeneration area and access to jobs and supporting modal shift in M4 corridor	N/A	Slight Positive
ACCESSIBILITY	Option Values	No impact	N/A	No impact
	Severance	No Impact	N/A	No Impact
	Access to the Transport System	No impact	N/A	No Impact
INTEGRATION	Transport Interchange	No impact	N/A	No Impact
	Land-Use Policy	No Impact	N/A	No Impact
	Other Government Policies	Improve Peak Period access to Cardiff City Centre	N/A	Slight Positive

Description: Queen Street Station Remodelling and additional hourly services from Cardiff to Pontypridd and Energlyn		Problems: Overcrowding of peak trains to/ from Cardiff and lack of capacity for increased rail levels of service at Cardiff Queen Street and Junction to the north	PVC Cost: £39.8m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2012)	ASSESSMENT
ENVIRONMENT	Noise	Slight increase in number of trains passing sites that already experience rail noise	N/A	Slight Negative
	Local Air Quality	Improvements due to Modal Shift	0.8 NO _x tonnes/year 0.04 PM ₁₀ : tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	130 CO ₂ : tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Significant Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
	Journey Ambience	Reduced delays accessing Queen Street Station, reduced overcrowding of peak trains	N/A	Significant Positive
SAFETY	Accidents	Road accidents reduced through modal shift	0.5 p.a.	Slight Positive
	Security	No Impact	N/A	No Impact
ECONOMY	Transport Economic Efficiency	Return on investment	NPV = £22.7m	BCR = 1.57
	Reliability	Reduced conflicts between services north of Cardiff Queen Street	N/A	Significant Positive
	Wider Economics Impacts	Improving access to jobs in Cardiff from Valleys to North of Cardiff	N/A	Significant Positive
ACCESSIBILITY	Option Values	No Impact	N/A	No Impact
	Severance	No Impact	N/A	No Impact
	Access to the Transport System	No Impact	N/A	No Impact
INTEGRATION	Transport Interchange	Improved interchange at Pontypridd and Caerphilly stations	N/A	Slight Positive
	Land-Use Policy	Supports sustainable development in Cardiff	N/A	Slight Positive
	Other Government Policies	Contributes to objectives to encourage modal split to sustainable travel modes to Cardiff and improved performance of train services to Rhymney, Treherbert, Aberdare and Merthyr Tydfil	N/A	Significant Positive

Description: Llandaff Signal		Problems: Service reliability – time penalty through service conflicts.	PVC Cost: £0.4m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	No significant impact	N/A	No Impact
	Local Air Quality	Improvements due to Modal Shift	0.02 NO _x tonnes/year 0.00 PM ₁₀ : tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	3.90 CO ₂ : tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
SAFETY	Journey Ambience	Slight Increase due to reduced delays northbound	N/A	Slight Positive
	Accidents	Road accidents reduced through modal shift	N/A	Slight Positive
ECONOMY	Security	No Impact	N/A	No Impact
	Transport Economic Efficiency	Return on investment	NPV = £1.2m	BCR = 4.03
	Reliability	Reduction of delays through junction conflicts	£0.02m p.a. time saving	Slight Positive
ACCESSIBILITY	Wider Economics Impacts	Supporting growth in the Valleys regeneration area and access to jobs	N/A	Slight Positive
	Option Values	No impact	N/A	No impact
	Severance	No Impact	N/A	No Impact
INTEGRATION	Access to the Transport System	No impact	N/A	No Impact
	Transport Interchange	No impact	N/A	No Impact
	Land-Use Policy	No Impact	N/A	No Impact
	Other Government Policies	Contributes to primary objectives of Network Rail and Train Operating companies - Performance.	N/A	Slight Positive

Description: Extension of Cardiff – Ebbw Vale Parkway service to Ebbw Vale Town and additional hourly service Ebbw Vale Town - Newport		Problems: No direct rail access to Ebbw Vale and poor level of service to stations in the Ebbw Valley and no direct rail access to Newport from the Valley.	PVC Cost: £78.3m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	Slight increase in number of trains passing sites that already experience rail noise and slight increase for properties surrounding the route extensions to Ebbw Vale Town and Newport.	N/A	Slight Negative
	Local Air Quality	Improvements due to Modal Shift	5.32 NO _x tonnes/year 0.23 PM ₁₀ : tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	839 CO ₂ : tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact	N/A	No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
SAFETY	Journey Ambience	No Impact	N/A	No Impact
	Accidents	Road accidents reduced through modal shift	2 p.a.	Slight Positive
ECONOMY	Security	No Impact	N/A	No Impact
	Transport Economic Efficiency	Return on investment	NPV = £24.9m	BCR = 1.32
	Reliability	No significant impact	N/A	No Impact
ACCESSIBILITY	Wider Economics Impacts	Improving access to jobs in Cardiff and Newport from the Ebbw Valley	N/A	Slight Positive
	Option Values	Greater rail access at Ebbw Vale and from all stations to newport	N/A	Significant Positive
	Severance	No Impact	N/A	No Impact
INTEGRATION	Access to the Transport System	New Station at Ebbw Vale and new opportunities from Newport	N/A	Slight Positive
	Transport Interchange	New interchange opportunities at Ebbw Vale and Newport	N/A	Slight Positive
	Land-Use Policy	Ebbw Vale Station serves redevelopment zone and Service to Newport serves regeneration zone	N/A	Significant Positive
	Other Government Policies	Contributes to objectives to encourage modal split to sustainable travel modes to Cardiff and Newport	N/A	Significant Positive

Description: Cogan Junction Remodelling		Problems: Service reliability – time penalty through service conflicts.	PVC Cost: £0.25m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	No significant impact	N/A	No Impact
	Local Air Quality	Improvements due to Modal Shift	0.14 NO _x tonnes/year 0.01 PM ₁₀ tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	22.3 CO ₂ tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
	Journey Ambience	Slight Increase due to reduced delays	N/A	Slight Positive
SAFETY	Accidents	Road accidents reduced through modal shift	N/A	Slight Positive
	Security	No Impact	N/A	No Impact
ECONOMY	Transport Economic Efficiency	Return on investment	NPV = £3.5m	BCR = 2.44
	Reliability	Reduction of delays through junction conflicts	£0.05m p.a. time saving	Slight Positive
	Wider Economics Impacts	Supporting growth in the Valleys regeneration area and access to jobs and supporting modal shift from Barry and Penarth	N/A	Slight Positive
ACCESSIBILITY	Option Values	No impact	N/A	No impact
	Severance	No Impact	N/A	No Impact
	Access to the Transport System	No impact	N/A	No Impact
INTEGRATION	Transport Interchange	No impact	N/A	No Impact
	Land-Use Policy	No Impact	N/A	No Impact
	Other Government Policies	Contributes to primary objectives of Network Rail and Train Operating companies - Performance.	N/A	Slight Positive

Description: Half Hourly Service Beddau – Pontyclun - Cardiff and new stations at Beddau, Gwaun Meisgyn, Llantrisant and Talbot Green		Problems: No direct rail access to Llantrisant/ Beddau, poor alternatives to car use.	PVC Cost: £36.6m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	Slight increase in number of trains passing sites that already experience rail noise and slight increase for properties surrounding the route extension to Beddau.	N/A	Slight Negative
	Local Air Quality	Improvements due to Modal Shift	4.20 NO _x tonnes/year 0.19 PM ₁₀ : tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	673 CO ₂ : tonnes/year	Slight Positive
	Landscape	Impact of new stations	N/A	Slight Negative
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
SAFETY	Journey Ambience	New opportunity of rail travel	N/A	Slight Positive
	Accidents	Road accidents reduced through modal shift	2 p.a.	Slight Positive
ECONOMY	Security	No Impact	N/A	No Impact
	Transport Economic Efficiency	Return on investment	NPV = £48.5m	BCR = 2.33
	Reliability	Slight impact on Main Line and through reopening level crossing	N/A	Slight Negative
ACCESSIBILITY	Wider Economics Impacts	Improving access to jobs in Cardiff from Llantrisant/ Beddau corridor and Pontyclun	N/A	Significant Positive
	Option Values	New rail travel options from 4 stations and improved frequency at Pontyclun	N/A	Significant Positive
	Severance	No Impact	N/A	No Impact
INTEGRATION	Access to the Transport System	Four new stations providing access to the rail network	N/A	Significant Positive
	Transport Interchange	New interchange opportunities at new stations and at Pontyclun for access to Bridgend/ West Wales	N/A	Slight Positive
	Land-Use Policy	New stations serve housing expansion zones in Rhondda Cynon Taf Borough	N/A	Significant Positive
	Other Government Policies	Contributes to objectives to encourage modal split to sustainable travel modes to Cardiff. Improved efficiency of Cardiff Central by providing opportunities for through running from East of Cardiff.	N/A	Significant Positive

Description: Barry Station Turnback		Problems: Service reliability – time penalty through lack of turnback facility.	PVC Cost: £0./55m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	No significant impact	N/A	No Impact
	Local Air Quality	Improvements due to Modal Shift	N/A NO _x tonnes/year N/A PM ₁₀ : tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	N/A CO ₂ : tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
SAFETY	Journey Ambience	No impact	N/A	No Impact
	Accidents	Road accidents reduced through modal shift	N/A	Slight Positive
ECONOMY	Security	No Impact	N/A	No Impact
	Transport Economic Efficiency	Return on investment	NPV = £13.8m	BCR = 26.0
	Reliability	Ability to recover from perturbations of services	£0.23m p.a. time saving	Slight Positive
ACCESSIBILITY	Wider Economics Impacts	Supporting growth in the Valleys regeneration area and access to jobs and supporting modal shift from Barry	N/A	Slight Positive
	Option Values	No impact	N/A	No impact
	Severance	No Impact	N/A	No Impact
INTEGRATION	Access to the Transport System	No impact	N/A	No Impact
	Transport Interchange	No impact	N/A	No Impact
	Land-Use Policy	No Impact	N/A	No Impact
	Other Government Policies	Contributes to primary objectives of Network Rail and Train Operating companies - Performance.	N/A	Slight Positive

Description: Abergavenny Line and Chepstow Line half hourly services and new stations at Caeleon, Seabstopol, Llantarnam, Magor with Undy, Llanwern, Coedkernew and St Mellons.		Problems: Poor rail access and poor rail service levels.	PVC Cost: £41.3m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	Slight increase in number of trains passing sites that already experience rail noise.	N/A	Slight Negative
	Local Air Quality	Improvements due to Modal Shift	9.53 NO _x tonnes/year 0.43 PM ₁₀ tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	1529 CO ₂ tonnes/year	Slight Positive
	Landscape	Slight Impact of new station infrastructure	N/A	Slight Negative
	Townscape	Slight Impact of new station infrastructure		Slight Negative
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing new stations and improved services by walking and cycle	N/A	Slight Positive
	Journey Ambience	No significant difference	N/A	No Impact
SAFETY	Accidents	Road accidents reduced through modal shift	4 p.a.	Slight Positive
	Security	No Impact	N/A	No Impact
ECONOMY	Transport Economic Efficiency	Return on investment	NPV = £156m	BCR = 4.78
	Reliability	No significant impact – measures to retain capacity included	N/A	No Impact
	Wider Economics Impacts	Improving access to jobs in Newport and Cardiff from expanding journey to work area. New stations support sustainable development at key development/ redevelopment areas.	N/A	Significant Positive
ACCESSIBILITY	Option Values	Significant improvement in access to rail services	Up to 7 new stations	Significant Positive
	Severance	No Impact	N/A	No Impact
	Access to the Transport System	New stations to be compliant with SRA Accessibility requirements	Up to 7 new stations	Significant Positive
INTEGRATION	Transport Interchange	New interchange opportunities created at new stations including maximising Park and Ride	N/A	Significant Positive
	Land-Use Policy	New stations serve development and redevelopment sites	N/A	Significant Positive
	Other Government Policies	Contributes to objectives to encourage modal split to sustainable travel modes to Cardiff and Newport	N/A	Significant Positive

Description: Additional Hourly service Bridgend – Barry - Cardiff		Problems: Poor rail service levels to Llantwit Major and Rhoose Cardiff International Airport stations and forecast peak train overcrowding Barry - Cardiff	PVC Cost: £24.7m	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE (year 2005)	ASSESSMENT
ENVIRONMENT	Noise	Slight increase in number of trains passing sites that already experience rail noise.	N/A	Slight Negative
	Local Air Quality	Improvements due to Modal Shift	0.35 NO _x tonnes/year 0.02 PM ₁₀ tonnes/year	Slight Positive
	Greenhouse Gasses	Reduced CO ₂ emission levels due to Modal Shift	56 CO ₂ : tonnes/year	Slight Positive
	Landscape	No Impact	N/A	No Impact
	Townscape	No Impact		No Impact
	Heritage of Historic Resources	No Impact	N/A	No Impact
	Biodiversity	No Impact	N/A	No Impact
	Water Environment	No Impact	N/A	No Impact
	Physical Fitness	Slight Increase due to increased Rail use accessing stations by walking and cycle	N/A	Slight Positive
	Journey Ambience	No Impact	N/A	No Impact
SAFETY	Accidents	Road accidents reduced through modal shift	0.2 p.a.	Slight Positive
	Security	No Impact	N/A	No Impact
ECONOMY	Transport Economic Efficiency	Return on investment	NPV = £18.6m	BCR = 1.75
	Reliability	No significant impact	N/A	No Impact
	Wider Economics Impacts	Improving access to jobs in Cardiff and Bridgend and improving rail access to Cardiff International Airport	N/A	Slight Positive
ACCESSIBILITY	Option Values	Slight positive impact of greater service availability	N/A	Slight Positive
	Severance	No Impact	N/A	No Impact
	Access to the Transport System	No Impact	N/A	No Impact
INTEGRATION	Transport Interchange	Improved interchange between rail services and Cardiff International Airport	N/A	Slight Positive
	Land-Use Policy	No Impact	N/A	No Impact
	Other Government Policies	Contributes to objectives to encourage modal split to sustainable travel modes to Cardiff	N/A	Slight Positive