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Views expressed in this report are those of the researcher and not necessarily those of the Welsh Government

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Glossary

CASR	Cardiff Area Signal Renewal
CCBC	Caerphilly County Borough Council
CP4	Control Period 4
CVR	Central Valleys Railway package
DDA	Disability Discrimination Act
ERDF	European Regional Development Fund
GRIP	Guide to Rail Investment Process
PDFH	Passenger Demand Forecasting Handbook
PMB	Project Management Board
PTR	Programme Tactical Review
WEFO	Wales European Funding Office

Executive Summary

Introduction

1. AECOM was commissioned by the Welsh Government in December 2014 to undertake a Final Evaluation of the Central Valleys Railway (CVR) project. The project, funded by Welsh Government and the European Regional Development Fund (ERDF), was developed to encourage modal shift from car to rail through the provision of the following packages of rail infrastructure:
 - i. An additional intermodal facility at Energlyn, in the form of a new railway station and associated facilities including:
 - a. Provision of two platforms of 6-car length.
 - b. Improved underpass with stair and ramp access to platforms.
 - c. Waiting shelters.
 - d. Passenger information boards.
 - e. Real time passenger information displays.
 - f. CCTV and passenger help points.
 - g. Three disabled car parking spaces.
 - h. Improved lighting on all approaches.
 - ii. A new passing loop at Tir-Phil station, including:
 - a. A second platform at Tir-Phil station.
 - b. A Disability Discrimination Act (DDA) compliant access ramps.
 - c. 850m of additional track.
 - d. Loop entries/exits with heated switches.
 - e. Colour light signalling north of Bargoed with axle counters.
 - f. Power supplies.

Key findings

2. The station at Energlyn was completed in December 2013. The platform and passing loop at Tir-Phil was completed in 2014 but DDA compliant access and the full length of the new platform was still outstanding at the time of evaluation due to the co-location of Dwr Cymru Welsh Water assets. This additional infrastructure was designed to facilitate the running of additional rail services (1 train per hour) between Bargoed and Rhymney, increasing the number of services continuing upstream from Bargoed from one to two per hour. The results of this project will be influenced by the provision of a turn-back at Caerphilly station, to permit an

additional two trains per hour operating between Cardiff and Caerphilly. However, at the time of the final evaluation no additional rail services are operating on either section of the Rhymney Valley Line. This is due to the requirement to complete the ongoing Cardiff Area Signalling Renewal (CASR) programme, including the opening of Platform 8 at Cardiff Central which is now scheduled to be operational in 2017.

3. The scope of the Final Evaluation included a process evaluation of the implementation and management approaches adopted on the project. The project outturn cost of £13.195m exceeded the forecast cost of £11.248m, and variance was observed in forecast costs during implementation.
4. The project was procured and commenced construction later than forecast, and delays were experienced on specific elements of the Tir-Phil scheme. The programme synergies with CASR introduced delays which impacted on the CVR project, leading to significant delays in the completion of the Tir-Phil scheme.
5. A key issue which affected the benefits achieved by the project was that the planned service improvements were not implemented at the time of evaluation. Despite this lack of service improvement, the operator has been able to make use of the passing loop at Tir-Phil to provide additional network resilience to existing services and to serve Energlyn station utilising existing service frequencies.
6. The level of stakeholder engagement varied across the project. Engagement and liaison between strategic delivery stakeholders, such as Welsh Government, Network Rail and Arriva Trains Wales, was good, enhanced by the introduction of the Programme Management Board in January 2014. The Welsh Government and Welsh European Funding Office (WEFO) Rail Programme Board was also considered effective by stakeholders, a view endorsed by the evaluators. The approach to public engagement for Energlyn station was considered good. However, consultation on Tir-Phil station was considered by some stakeholders to be less effective. Improve on current capabilities and build on new innovative methods of operation piloted previously.
7. The overarching management and oversight of the project was also significantly enhanced by the introduction of the Programme Management Board. This monthly meeting increased the level of scrutiny across project delivery.
8. An ex-post impact evaluation could only be undertaken for the new station at Energlyn as there were no additional services operating to Tir-Phil at the time of evaluation (June 2015). The number of passenger journeys to/from Energlyn, is approximately 117,000 per year. Applying standard rail industry guidance, this

figure would reasonably be expected to ramp up to approximately 167,000 over the first few years as people become aware of the new station, and therefore will be largely in line with forecasts given the timetable in operation and actual growth rates. However, a significantly lower modal shift than forecast, a higher abstraction from other stations (with 55% of passengers transferring from other rail stations instead of 8%) and a shorter average trip distance (16.7km against a forecast of 24.3km) were key contributors to an outturn net increase in passenger kilometres of 0.76m compared with the forecast 4.25m for the reduced timetable.

9. The cross-cutting themes were evaluated and the CVR project will provide fully accessible facilities for all potential users, alongside bi-lingual information. The level of accessibility to train services has also been enhanced through the implementation of the new station at Energlyn.

Recommendations

10. This final evaluation has identified a number of lessons for future projects which could help in improving project delivery for future rail projects in Wales. These recommendations are listed below in relation to the key areas of project delivery analysed as part of this process evaluation.

Finance

- (1) To ensure the accuracy of GRIP 3 estimates and ensure that suitable levels of optimism bias are included in these estimates; a figure of 40% is best practice for UK transport ex-ante evaluations.
- (2) Conduct site survey work, including ground investigations, earlier for complex sites, even if not required by the GRIP process, to assist in mitigating risks or factoring in the cost of additional works.
- (3) Consider the efficiencies and economies of scale that can be achieved with other projects when planning and designing a scheme, including detailing the potential programme and cost risks of delayed implementation.

Schedule/Programme

- (4) It is important that the interdependencies between projects are well defined at the pre-construction phase, with mitigation put in place to avoid delays being cascaded from one project to the next. Additionally, putting sufficient time contingencies within the project could assist with reducing delays.

- (5) Enhanced involvement from all delivery teams responsible for the development of Business Plans would assist in ensuring a more realistic programme of delivery.

Stakeholder Engagement

- (6) The development of project specific stakeholder management plans. These would allow project specific issues likely to be of consequence to stakeholders to be communicated and managed in an effective way. Such plans would also define the proposed means and timing of engagement for each stakeholder group, including the public.
- (7) Early engagement between Network Rail and Welsh Government/local councils to ensure that the equality impact requirements are fully understood and complied with as part of their implementation. The newly established PMB or Tactical Review Meeting should be used to ensure that this is achieved.

Risk Management

- (8) The review of risks should be added to the Tactical Review Meeting (see Section 7) to ensure that risks are visible and the planned mitigation is agreed. The review should consider new or escalated risks as by exception, to ensure that this approach remains practical.
- (9) For interlinked projects in the future it would be appropriate to produce a shared risk register to consider the interconnections between risks.
- (10) Sufficient time contingency should be added to future project programmes where new technologies are proposed to mitigate these impacts.
- (11) Early site investigations should therefore be undertaken for future projects where difficult ground conditions are predicted, with sufficient time and cost contingency in place to mitigate this risk.

Programme Management

- (12) Enhanced monitoring and evaluation activities should be undertaken for future projects. It is recommended that a data collation/collection plan be agreed between WEFO and the project team, to sit alongside the monitoring plan prepared for the business case. This would help to ensure that all required data is available for the interim and final evaluations. Logic mapping should also be prepared as part of the ex-ante business case or

the aforementioned monitoring plan, to assist in identifying data requirements.

- (13) Project monitoring should commence with a baseline exercise to collate before implementation data, such as passenger demand (per line or station) and service frequencies. Where more than one year has elapsed between business case approval and project implementation, a review should be undertaken of the business case demand forecasts and assumptions to ensure that the baseline position reflects fully the base year.
- (14) An interim process evaluation should be undertaken to identify any systematic issues with project delivery, allowing improvements to be made during the duration of project delivery. This will also enhance the quality and data availability of the final evaluation consideration of project delivery issues.
- (15) An interim impact evaluation should also be undertaken, focusing on longitudinal datasets that are readily available; passenger data for example. It should be recognised that project implementation may generate disruption to services, but it remains important to consider changes in data to identify the potential impact of contextual factors. The interim impact evaluation should also collate all data required for the final evaluation. The logic mapping should be reviewed at the interim stage, and updated as necessary. Interviews with stakeholders and available quantitative data should be used to review and update the causal pathways. .
- (16) The final evaluation should include a full review of the project delivery, business case assumptions, outturn results and use logic mapping to consider the contribution of a project. It should build on the results of the interim evaluation.
- (17) Enhancements to specific data collection and analysis activities are also recommended. This should include the monitoring by contractors and Network Rail of the number of employment opportunities created during construction. Estimates of the net employment benefits to the local and regional economy should be undertaken at both the interim and final evaluation stages. This should include an agreement between Welsh Government and Network Rail on the levels of leakage and displacement.

- (18) Consideration should be given to introducing a programme level monitoring and evaluation activity, through which to track progress and ensure that the above recommendations are undertaken. This group or process would also enable a meta-evaluation of specific issues, such as the wider contribution of ERDF supported rail schemes to local employment and accessibility. This reflects the fact that some indicators, such as wider economic impacts, are better evaluated at the programme/route rather than project level.

1. Introduction

Evaluation Scope

- 1.1 As required under ERDF arrangements for projects receiving in excess of £2m support, the CVR project required an independent ex-post Final Evaluation. The specification¹ for the evaluation of the CVR project identified the following evaluation questions:
- How and to what extent did project activity reflect the commitments set out in the Business Plan?
 - What are the perceived outcomes of the project from the perspective of beneficiaries? How and to what extent is this making a difference compared to if the improvements had not been implemented?
 - Which aspects of project delivery have led to positive outcomes, or could be viewed as good practice.
 - What barriers and constraints has the project faced? What are the lessons learnt from dealing with such barriers and constraints?
- 1.2 The following overarching aims were also set for the evaluation as part of the contract:
- To conduct a comprehensive evaluation of project activity and results against the key performance indicators as outlined in the project Business Plan.
 - To assess the effects and efficiency of project delivery in achieving project aims and objectives outlined in the Business Plan.
 - To understand the added value of the project for its beneficiaries and stakeholders with regard to the packages of support offered.
 - To determine the nature of unintended outcomes not covered by the WEFO key performance indicators.
 - To address the project's delivery and achievement against the cross cutting themes, aims, aims objectives and cross cutting theme related indicators outlined in their Business Plan.

¹ Prepared by the Department for Economy, Science and Transport and the Social Research and Information Division of the Welsh Government

Process Evaluation

- 1.3 To answer the above questions a process evaluation was undertaken based upon evidence from a number of different sources, thereby permitting the triangulation of findings. Sources included in-depth interviews with members of the project team, key local and national stakeholders (the Welsh Government and Network Rail). All available project related data and reports have also been obtained, including financial reports, schedules, meeting terms of reference and minutes.
- 1.4 A scoping exercise was undertaken at the start of the evaluation to identify the areas of project implementation where a robust process evaluation could be undertaken. The key areas of project implementation included within the process evaluation were:
- Finance;
 - Schedule/Programme;
 - Stakeholder Engagement;
 - Risk Management; and
 - Project Management.
- 1.5 Each of these areas is presented in turn in subsequent sections of this report. The following evaluation questions were defined for each of the above areas to guide the process evaluation.

Finance

- Whether the project was delivered to the forecast cost, and if not what the main causes for variation?
- Which areas of project delivery experienced the greatest level of cost variance, and why?
- What mitigation was developed to minimise cost variance and how effective were they?
- How was the financial spend managed to ensure project delivery?
- What lessons can be learnt regarding project costing assumptions?

Schedule/Programme

- Was the project delivered on time, as scheduled at the Business Plan stage, and if not what were the main causes of programme slippage?

- Which areas of project delivery experienced the greatest variance in terms of programme and why?
- What lessons were learnt regarding project programming and slippage?
- What techniques and methods for project programming and management represented good practice and why?

Stakeholder Engagement

- Who were the key stakeholders and why? What were their roles and responsibilities?
- What were the different approaches to stakeholder engagement? Which were the most effective at engaging with their target audience and why?
- What lessons were learnt regarding stakeholder management and engagement?

Risk Management

- What were the main risks identified in the Business Plan, and did they materialise?
- What was the cost associated with key risks, and how accurate were the cost estimates?
- What were the main risk mitigation methods and how well did they work?
- Which areas of project delivery generated the most risks and why?
- What approach was taken to risk management and how effective was it?

Project Management

- How effective were the various project management procedures?
- How effective was communication between the delivery partners?
- Which approaches worked well and what lessons were learnt?
- How effective were the monitoring and evaluation activities?
- What equal opportunities monitoring has been undertaken during the project delivery?

1.6 The following evaluation questions relating to cross-cutting themes were also in scope of the evaluation:

- To what extent has the project delivered good value for money?
- To what extent has the project enhanced the level and/or quality of accessibility?
- To what extent has the project enhanced the level and/or quality of environmental sustainability?

Interviewees

- 1.7 The process evaluation involved extensive stakeholder consultation with members of the project delivery team, Welsh Government, Network Rail, Local Authorities and Arriva Trains Wales. A summary of the stakeholders interviewed is presented below.

Project Team

- 1.8 The interviews undertaken with the project delivery team included individuals with a working knowledge of the project delivery processes. This enabled the reasons for any cost variances to be explored, schedule delays or changes in stakeholder management arrangements to be assessed. Interviews were undertaken with the following members of the Welsh Government project team:

- Rail Technical Advisor.
- Rail Development and Delivery Manager.
- Rail European Union (EU) Grants Manager.
- Rail Projects Officer.

Stakeholders

- 1.9 In addition to the project team, interviews were undertaken with relevant stakeholders to establish wider views of the project performance. Interviews were undertaken with the following key stakeholders:

- Welsh Government EU Programme Manager.
- Network Rail Project Sponsor CASR².
- Network Rail Route Enhancement Manager.
- Network Rail Project Sponsor.
- Welsh Government Head of Rail.
- Rhondda Cynon Taff County Borough Council Transportation Manager.
- Caerphilly Council Principal Passenger Transport Officer.

- 1.10 In accordance with evaluation best practice, no individuals are identified in this report, and all comments/views have been anonymised. This commitment was undertaken at the outset of the evaluation to ensure that interviewees felt able to comment on the CVR project in an open manner.

² Cardiff Area Signal Renewal, with the aim of easing congestion on the rail services on the Cardiff and south Wales Valleys networks.

Impact Evaluation

- 1.11 To determine the extent to which the CVR project achieved its stated objectives, an impact evaluation was undertaken. This included the review of ex-ante forecasting assumptions, the analysis of outturn passenger demand and the calculation of ex-post results for the following key WEFO indicators:
- Gross increase of passenger kilometres on public transport; and
 - Net increase of passenger kilometres on public transport.
- 1.12 To supplement the quantitative analysis of results, a Theory of Change evaluation approach was adopted. This involved the preparation of project level logic mapping (see Section 2) to articulate the anticipated causal pathways through which the project will achieve its objectives. The outturn results were subsequently mapped onto these pathways, and consultation was undertaken with stakeholders to reach a consensus on progress towards targets.

2. Project Overview

Introduction

- 2.1 This section presents an overview of the CVR project. The project objectives, inputs (investment), outputs (physical works implemented) and logic map of anticipated results and impacts are presented.

Objectives

- 2.2 The CVR project, as defined in the 2011 Business Plan³, had the following stated objectives, to:
- Provide enhanced infrastructure therefore, encouraging a modal shift by reducing the level of car usage, particularly single occupancy journeys;
 - Enhance accessibility to employment opportunities via sustainable modes, key services and enabling local people to access education and training opportunities and the major employment locations within Wales; and
 - Reduce harmful greenhouse gas emission levels through additional rail services.

Project Inputs

- 2.3 The outturn inputs (cost) for the Energlyn Station was £5.46m and for the Tir-Phil passing loop was £7.74m, generating a total project cost of £13.2m.

Project Outputs

- 2.4 An initial activity in the evaluation was to define the precise delivered outputs of the project. The infrastructure delivered is presented for each location below.

Energlyn Station

- 2.5 The Energlyn Station project consisted of the following elements:
- Provision of two platforms of 6-car length;
 - Improved underpass with stair and ramp access to platforms;
 - Waiting shelters;
 - Passenger information boards;
 - Real time passenger information displays;
 - CCTV and passenger help points;
 - Three disabled car parking spaces;
 - 18 other parking spaces; and

³ Central Valleys Package Business Plan v 0 5

- Improved lighting on all approaches.

Tir-Phil Turn-back

2.6 The Tir-Phil project consisted of the following elements:

- A second platform at Tir-Phil station;
- DDA compliant ramps;
- 850m of additional track;
- Loop entries/exits with heated switches;
- Colour light signalling north of Bargoed with axle counters; and
- Power supplies.

2.7 The WEFO defined output indicators have been recorded for the overarching CVR project (Table 2.1).

Table 2.1 WEFO Objectives

WEFO Indicator	CVR Project
Intermodal facilities created or improved	2
Rail roads created or reconstructed (km)	0.85
Public transport services created or improved (vehicle km)	35,006

Source: Welsh Government Department for Economy, Science and Transport

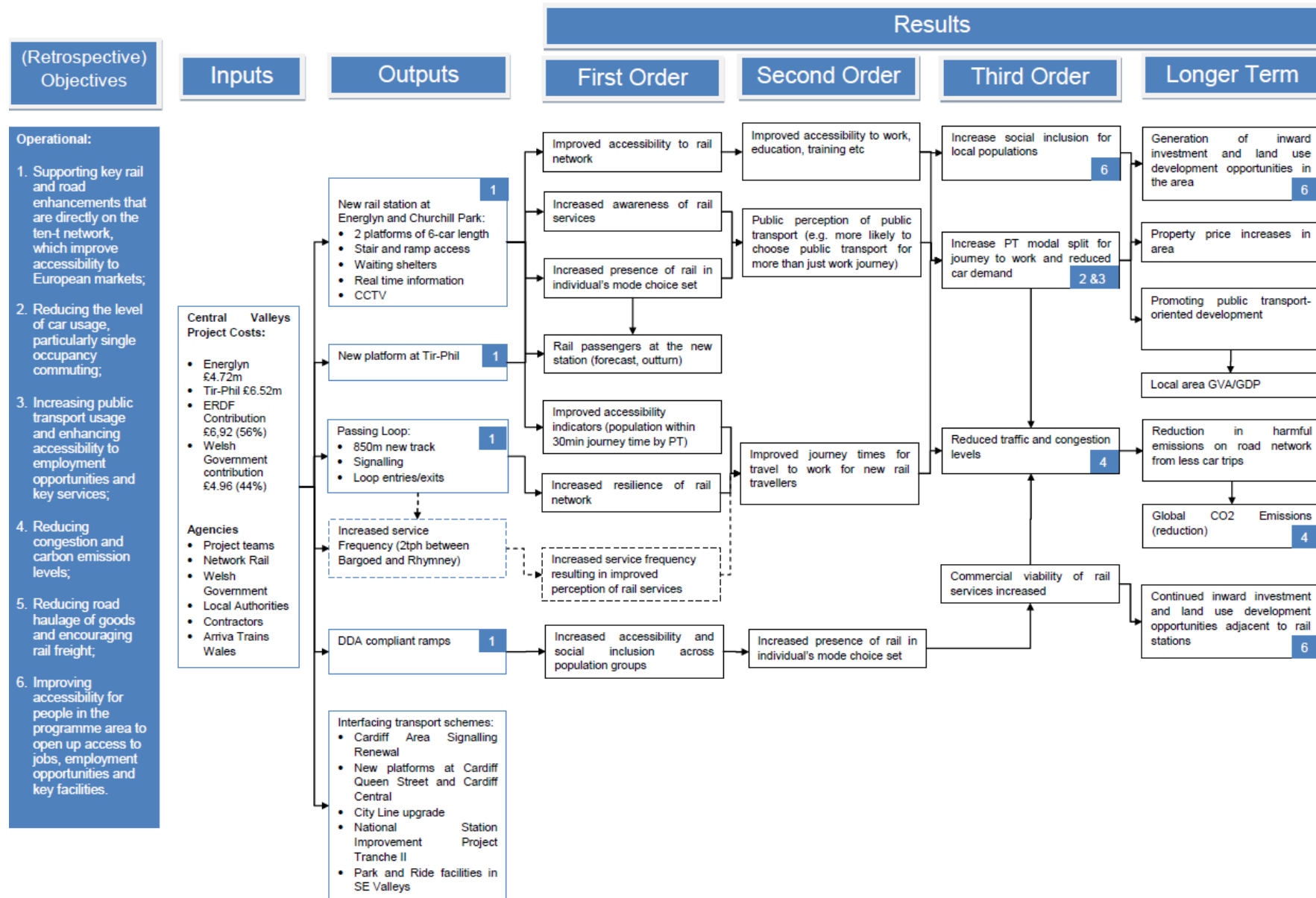
Anticipated Project Results

2.8 Figure 2.1 presents a logic map of the CVR project, indicating the anticipated steps through which the project objectives would be achieved as defined in the current WEFO evaluation guidance⁴. This has been used to review progress along individual causal pathways using all available data.

2.9 Although no additional rail services are being operated at present, compared with the pre-passing loop/new station baseline, operational/performance benefits were being realised according to stakeholders. There had been a limited use of the Tir-Phil passing loop to enhance levels of network resilience (a first order result in Figure 1) and this was a function of the legacy timetable rather than specific changes to service frequencies. The new station at Energlyn also provides access to the rail network for a new catchment area, although no associated service improvements are currently available.

⁴ Monitoring and Evaluation Guidance V1.02, November 2008, WEFO

Figure 2.1 Central Valleys Railway Package Logic Map



3. Finance

Introduction

3.1 The first element of the process evaluation examined the capital investment into the project. It included a quantitative analysis of financial performance comparing the ex-ante Business Plan costs with the outturn costs. Data from the Network Rail four weekly financial reports have also been used to track changes in costs through the duration of the project. A qualitative analysis of cost management has also been facilitated by interviews with the project delivery team and stakeholders. This element of the evaluation addressed the following evaluation questions:

- Whether the project was delivered to the forecast cost, and if not what the main causes for variation?
- Which areas of project delivery experienced the greatest level of cost variance, and why?
- What mitigation was developed to minimise cost variance and how effective were they?
- How was the financial spend managed to ensure project delivery?
- What lessons can be learnt regarding project costing assumptions?

Planned Costs

3.2 In 2011 as part of the Business Plan submission the project was anticipated to cost £11,248,233 (£4,724,150 for Energlyn Station and £6,524,083 for Tir-Phil Station platform and passing loop); these costs excluded the £510,272 ineligible costs which included Schedule 4 costs of £301,583 anticipated to compensate the operator, Arriva Trains Wales, in relation to the impact of track possessions. Of the £11,248,233 eligible costs, £6,285,512 (56%) was funded by the ERDF and £4,962,721 (44%) funded by Welsh Government.

3.3 The detailed planned costs for the Tir-Phil element of the CVR project are shown in Table 3.1. No equivalent details were available for Energlyn Station. This showed that direct contractor costs represented the biggest anticipated area of expense (£4.62m, 67%), with Network Rail's direct costs the next biggest area of expense (£1.34m, 19%). Within the contractor direct costs a large portion was allocated to General Civils work (£2.04m, 43%) reflecting the very challenging topography of the station at Tir-Phil. The proposed costs included a relatively small industry risk fund of £121,000, representing just 1.8% of the total scheme cost.

Table 3.1 Tir-Phil Station Planned Costs

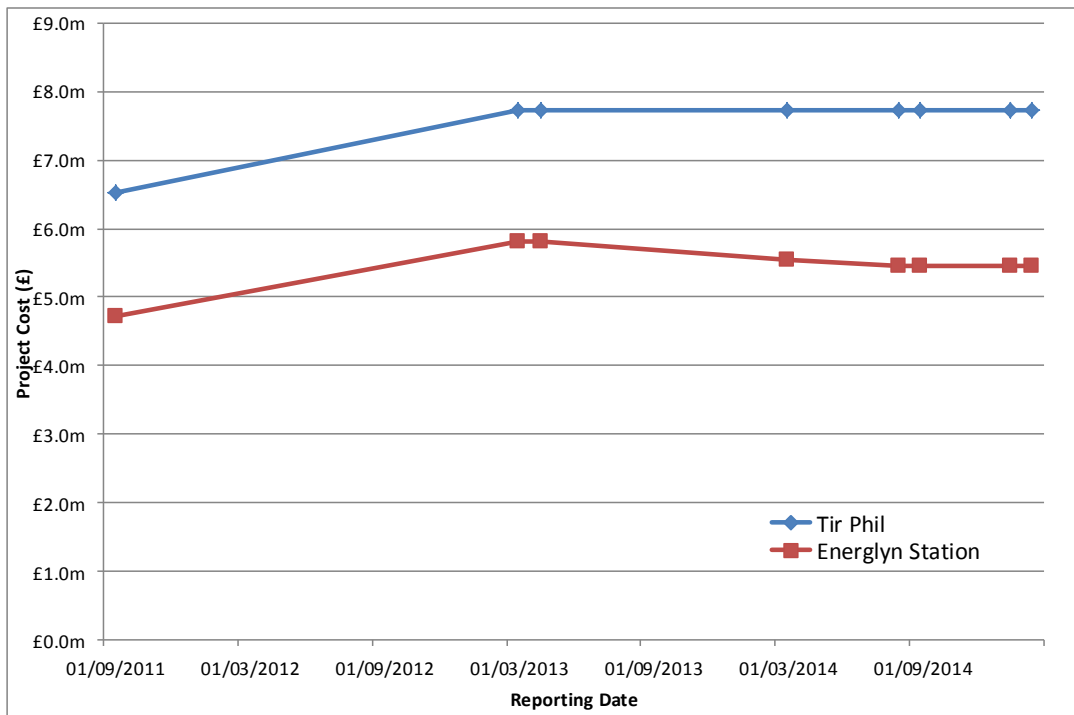
	Item	Capital Cost
1	GRIP 5-8	
2	Contractors Direct Costs	
3	Signalling	£856,532
4	Electrification and Plant	£106,513
5	Track Installation	£1,569,716
6	Telecoms	£46,646
7	Structure	inc
8	General Civils	£2,043,745
9	Utilities	inc
	Sub Total	£4,632,152
10	Contractors Indirect Costs	
11	Preliminaries	£469,264
12	Design	£88,591
13	Testing and Commissioning	inc
	Sub Total	£557,855
14	Network Rail Direct Costs	
15	Materials – Track and fittings	£464,118
16	Engineering Trains	inc
17	Tamper	inc
18	Possession Management	inc
19	Network Rail Project Management Costs	£456,742
20	Network Rail Fee Fund	£301,583
21	Industry Risk Fund	£120,633
	Sub Total	£1,343,076
	Total	£6,524,083
NB	Excluded	
	Schedule 4 (5% excluding contingency)	£301,583
	Grand Total	£6,825,666

Source: Annex 6b of 2011 Business Plan

Outturn Costs

- 3.4 The evaluation of cost variance through the period of project implementation was a key requirement of the final evaluation. Figure 2 shows how forecast costs for the two main elements of the project changed during the course of the project. This analysis was based upon a sample of financial data provided by Welsh Government and Network Rail through the four-weekly reports that feed into the Financial Review meeting (see Section 7 for details). This dataset is consistent in the format of reporting, allowing a longitudinal review of spend over time to be undertaken. However, it is noted that the cost values presented in the four-weekly reports only reflect the costs incurred by Network Rail and therefore differ slightly from those presented in the 2011 Business Plan.

Figure 3.1 Projected Out-turn costs



Source: Network Rail 4 weekly reports

- 3.5 Figure 3.1 shows that for the Tir-Phil station improvements costs increased from the £6.52m reported in the Business Plan submission to £7.74m at the start of project construction. The increase reflected the updated costs of groundworks, and an associated change in agreed scope of works with Network Rail; such a change was permitted within the contract. Following this they remained consistent from May 2013. This lack of change reflected the lump sum (staged payments) contract established between Network Rail and the Welsh Government for this element of work.

- 3.6 For Energlyn Station, £4.39m of the £4.72m costs were contracted to Network Rail in late 2011. Between September 2011 and May 2013 the forecast costs increased to £5.8m, before reducing slightly to £5.46m in February 2015, a decrease of 6%. This fluctuation in costs reflected the emerging costs contract adopted with Network Rail for this element of the CVR project. The outturn cost was higher than the £4.72m forecast in the 2011 Business Plan.

Barriers and Constraints - Reasons for cost variations

- 3.7 A selection of Network Rail four-weekly financial reports was reviewed to establish the issues contributing to cost variance within the project budget. Discussions with Network Rail have indicated that cost variances at Tir-Phil were experienced due to difficulties with ground conditions causing the need for additional underpinning of an existing road bridge as well as ground condition issues affecting the provision of a DDA ramp at Tir-Phil. The costs of these issues to Network Rail are unknown as they have been absorbed within the wider CASR costs.
- 3.8 The contracting and implementation of the Tir-Phil scheme as part of the wider CASR programme introduced dependencies regarding cost and programme. Whilst it was widely acknowledged by stakeholders that the availability of funding through CASR was an important factor in realising the Tir-Phil scheme, delays in implementation were also experienced (see Section 4). However, potential cost escalations through revised track possessions were absorbed by CASR and have not been passed on to Welsh Government due to the fixed contract adopted.
- 3.9 The reason behind the reduced spend at Energlyn post May 2013 was identified as being due to the removal of the contingency fund for this scheme. The reasons for this are not known to evaluators.

Cost Management

- 3.10 The CVR project costs were managed via finance meetings held on a monthly basis between members of the Network Rail and Welsh Government project teams. This provided a project-level forum to discuss and resolve any detailed risk or cost issues. The four-weekly finance reports provided the framework for these discussions.

- 3.11 However, discussions with the Welsh Government have indicated that they have found it difficult to obtain accurate cost forecasts from Network Rail. Accurate forecasting is required as part of the reporting prescribed by WEFO; therefore ensuring accurate forecasts has required significant engagement between Network Rail and Welsh Government to meet this requirement.

Lessons for future projects

- 3.12 An area of concern noted by the project team and stakeholders in relation to project finances was the accuracy of the cost estimate information used as part of the scheme development process. Interviewees felt that the GRIP⁵ process used in the project planning phase to inform the scheme costs and programme, which subsequently fed into the Business Plan, was not suitably comprehensive to allow accurate estimates to be made. A key lesson for future projects would be to ensure the accuracy of these estimates and ensure that suitable levels of optimism bias are included; a figure of 40% is best practice for UK transport ex-ante evaluations⁶.
- 3.13 The implementation of the above approach would require additional ex-ante evaluation work to be undertaken beyond the current requirements of the GRIP process. Additionally, it was felt by stakeholders that because the project was bid for, and contractors procured, during a period of economic recession the estimates provided by contractors at that point may have been particularly low to ensure the work was awarded to them. The increasing construction inflation costs within the industry since the time of procurement may have negatively impacted upon project outturn costs, although as identified previously, only the Energlyn Station was commissioned through an emerging costs contract and this was delivered within the available budget.
- 3.14 Costs for the Tir-Phil platform and passing loop were fixed once the scope of works was agreed in March 2013, reducing the risk of cost escalation for the Welsh Government. However, a number of issues were experienced as part of this project; particularly the need for bridge underpinning and issues with utilities affecting the installation of a pedestrian ramp. These issues were in part caused by poor information regarding ground conditions at the site, as no detailed ground inspection work was undertaken or required as part of the Network Rail GRIP 3 stage at which funding decisions are made. Earlier survey work, even if not required by the GRIP

⁵ Source: Network Rail Guide to Rail Investment Process (GRIP)

⁶ WebTAG Unit A1.2 – Scheme Costs and Unit A5.3 – Rail Appraisal

process, could have mitigated or factored in the cost of the risk of additional works required at this station, which were absorbed by Network Rail as part of the CASR project.

- 3.15 Part of the rationale for the timing of the CVR project was to maximise the benefits of, and synergies achieved with, the wider £220m CASR project. This offered the potential for economies of scale to be delivered, for example through shared track possessions to undertake adjacent works. Anecdotal evidence from stakeholders indicated that without the CASR project the costs for the CVR project would have increased. No quantified evidence or justification was provided by stakeholders and the evaluators were not able to substantiate this viewpoint. This highlights the importance of considering the efficiencies and economies of scale that can be achieved with other projects when planning and designing a scheme.

4. Schedule/Programme

4.1 The process evaluation included the assessment of the project programme, comparing the scheduled duration defined in the Business Plan with the variance observed during the course of the project. This section of the report reviews the programme management of the project to address the following evaluation questions:

- Was the project delivered on time, as scheduled at the Business Plan stage, and if not what were the main causes of programme slippage?
- Which areas of project delivery experienced the greatest variance in terms of programme and why?
- What lessons were learnt regarding project programming and slippage?
- What techniques and methods for project programming and management represented good practice and why?

Planned Timescales

4.2 Analysis of available data has been undertaken to establish the planned start date and duration for the key elements of the project.

Tir-Phil

4.3 Prior to the commencement of the project, the 2009 GRIP State 3 Option Selection Report for the Tir-Phil platform and passing loop indicated the estimated timings for Tir-Phil would be dependent upon the wider CASR programme. The contract for the CASR works, signed in March 2012, indicated that work was anticipated to be completed by the 8th April, 2013 and completion would be defined as the stage at which the commissioning of the signalling at each station was completed.

4.4 Table 4.1 shows the updated implementation programme as of 2013. It indicates that work on site was anticipated to commence in January 2013, with all work to be completed in October 2013. The main construction period was therefore anticipated to cover a duration of 304 days.

Table 4.1: Tir-Phil planned timescales

Task	Tir-Phil	Duration
Contract Award	w/k 1 st December 2012	-
Construction Complete	w/k 1 st October 2013	304

Source: Central Valleys Business Plan Appendix 5 Final Planner Spend Profile

Energlyn

- 4.5 The 2005 GRIP Stage 3 Option Selection Report for Energlyn Station indicated the planned durations for the key tasks in delivering the project (Table 4.2), although no indication is provided on when these tasks were anticipated to commence or complete. At this point it was anticipated that it would take a total of approximately 1 year and 11 months to go from the initial approval process to completion of construction of the station.

Table 4.2: Energlyn GRIP Stage timescales

Task	Duration
Form A	2 months
Form A Approval	1 months
Form B	3 months
Form B Approval	1 months
Book Possessions	3 months
Prepare Contract documents	2 weeks
Tender, Vet and Let	3 months
Detailed Design and Construction	9 months

Source: Energlyn Station Grip Stage 3 Report, 2005

- 4.6 Table 4.3 below shows the forecast implementation programme for Energlyn as of the Business Plan of August 2011. It indicates that work on site was anticipated to commence in October 2010, with all work to be completed in September 2011. The main planned construction period covered a duration of one year. This matches the timescales indicated in the GRIP Stage 3 report for tendering, vetting and letting, detailed design and construction.

Table 4.3: Energlyn planned timescales

Task	Taff Rhondda Turn-Back	Duration
Contract Award	w/k 1 st September 2010	-
Construction Complete	w/k 1 st September 2011	365

Source: Central Valleys Appendix 5 Final Planner Spend Profile, 2011

Actual Timescales

- 4.7 In terms of the actual commencement of construction works at Tir-Phil, on-site work commenced on the 18th March 2013, and on the 1st May 2013 at Energlyn. This represents a delay of 107 days for Tir-Phil station and a delay of 608 days for Energlyn compared to the planned timescales indicated in the Business Plan. These delays represent the additional time taken to identify and access the funds required to undertake the works, as well as additional design time beyond that originally foreseen.
- 4.8 The four-weekly financial reports were reviewed to establish how project completion timescales changed throughout the duration of the two key components of the project. Table 4.4 shows how anticipated project completion timescales shifted as the two projects proceeded.

Table 4.4 Planned and achieved project completion dates

Project Reporting Period	Tir-Phil	Energlyn
Period 1 2013/14	<ul style="list-style-type: none"> Planned completion 30/9/2013 	<ul style="list-style-type: none"> Planned completion 6/12/2013
Period 12 2013/14	<ul style="list-style-type: none"> Planned Completion 31/12/2013 	<ul style="list-style-type: none"> Planned completion 13/12/2013
Period 6 2014/15 (Report issued 22/9/2014)	<ul style="list-style-type: none"> GRIP 6 Construction planned 28/2/1015 GRIP 7 Handback Planned 1/9/2016 GRIP 8 Close Out Planned 1/3/2018 	<ul style="list-style-type: none"> GRIP 6 Construction achieved 13/12/2013 GRIP 7 Handback planned 4/8/2014 GRIP 8 Close Out planned 17/4/2015
Period 12 2014/15 (Report issued 6/3/2015)	<ul style="list-style-type: none"> GRIP 6 Construction TBC GRIP 7 Handback TBC GRIP 8 Close Out TBC 	<ul style="list-style-type: none"> GRIP 6 Construction achieved 13/12/2013 GRIP 7 Handback planned 24/4/2015 GRIP 8 Close Out planned 8/4/2016

Source: Network Rail four-weekly finance reports

- 4.9 Table 4.4 shows that the planned completion timescales for the Tir-Phil element of the project including all construction and re-signalling works, were delayed from the initial planned completion date of September 2013 to a planned date of February 2015 as of September 2014. The latest report (period 12, March 2015) provides no dates and instead indicates that timescales were to be confirmed. Part of the reported delay in the latest finance reports reflects the fact that GRIP 7 (scheme hand back) and 8 (project close out) dates have been moved to reflect the whole CASR programme, which has become significantly delayed.
- 4.10 The new platform at Tir-Phil was opened to four car passenger services in the Autumn of 2013. However, at this point ongoing work was being undertaken to underpin the road bridge to enable the platform to become operation to six car passenger services. This work and delays to the additional works required to construct a DDA compliant ramp on the existing platform have led to project delays. At the point of evaluation the works are still ongoing to install the new access ramp at Tir-Phil.

Energlyn

- 4.11 The April 2013 financial report indicated that the Energlyn station was planned to be completed by December 2013. The station was officially opened by then Transport Minister Edwina Hart on the 8th December, 2013, indicating that the planned timescales had been met and the majority of works were completed within a timescale of less than that initially planned (1 year for construction works). However, minor snagging works pushed the planned GRIP Stage 8 (project closeout) to April 2015. Further delays, including defect liability periods and the need for Network Rail to complete all the necessary internal sign-offs, pushed the close out to April 2016.

Barriers and Constraints

- 4.12 Discussions were held with the project delivery team on the issues they felt affected the project programme. Key issues identified included:
- The knock on effects of delays to the wider CASR project.
 - Delays caused by adoption of new signal technologies.
 - Delays due to bridge underpinning works at Tir-Phil not identified at GRIP 3.
 - Delays in the provision of a DDA compliant ramp at Tir-Phil due to utilities issues.
 - A lack of site investigations and utility identification until GRIP 5.

- 4.13 The CASR project, with which the CVR project was designed to achieve synergies and economies of scale, was significantly delayed. Stakeholders indicated that this was due to insufficient time contingency within the original programme. Due to the interconnections between these projects this has caused delays to the completion of the final elements of the Tir-Phil passing loop in particular.
- 4.14 As part of the Tir-Phil and CASR projects new rail signalling technologies were installed. These new technologies initially did not function as expected, causing delays to both CASR and Tir-Phil until a resolution could be found.
- 4.15 Unanticipated ground condition issues at Tir-Phil meant that a road bridge over the station required underpinning. Whilst this did not delay the opening of the station to four car trains, it has led to significant delays to the station being able to accept six car trains.
- 4.16 Unanticipated water pipes under the station have also delayed the completion of a DDA compliant pedestrian ramp at Tir-Phil station due to the need for liaison with Welsh Water and for redesign work.
- 4.17 Despite the above mentioned delays, the extended platform was completed ahead of proposed service frequency improvements, meaning that it has not had an impact upon rail service provision in any way for most passengers. However, the DDA compliant ramp is still currently incomplete, a delay which has affected the use of the station for those with limited mobility.

Lessons for future projects

- 4.18 The decision to undertake this project alongside the larger CASR project was a strategic decision to achieve overall economies of scale. It was indicated by stakeholders that without CASR this project was unlikely to have proceeded due to the additional costs of undertaking the work in isolation. However, because of the interdependence with CASR, delays to the CVR project were experienced when CASR become delayed. For future projects it is important that the interdependencies between projects are well defined at the pre-construction phase, with mitigation put in place to avoid delays being cascaded from one project to the next. Additionally, putting sufficient time contingencies within the project could have assisted with reducing the impact of delays.
- 4.19 In the view of some interviewees, the initial programme presented for this project was overly optimistic. Further involvement from the delivery teams from both the

Welsh Government and Network Rail with the teams responsible for the development of the Business Plan would have assisted in ensuring a more realistic programme was defined. For example, through this approach it may have been possible to identify the programme risks associated with the use of new signal technologies.

- 4.20 Additionally, further site investigations at an early stage in the project development up to the end of GRIP 3 could have assisted in identifying potential issues earlier on which led to significant delays and cost increases for Tir-Phil.
- 4.21 Whilst the dependencies between CASR and the CVR project led to delays, further such arrangements, for example with the National Station Improvement Plan works, have been recommended by stakeholders as a potential way of reducing overall project timescales. Providing suitable risks and contingencies are defined, this approach is supported by the evaluators.

5. Stakeholder Engagement

- 5.1 The process evaluation has considered the stakeholder management and engagement undertaken during the course of the project. This section of the report presents the different techniques and mechanisms used to engage with stakeholders to answer the following evaluation questions:
- Who were the key stakeholders and why? What were their roles and responsibilities?
 - What were the different approaches to stakeholder engagement? Which were the most effective at engaging with their target audience and why?
 - What lessons were learnt regarding stakeholder management and engagement?
- 5.2 Table 5.1 presents the key stakeholders involved in the project, as well as their role/interest and the engagement methods utilised. No stakeholder management plans were available to the evaluation team through which to assess the planned approaches to stakeholder management. The information below was therefore based upon the discussions held with the project team and key stakeholders.

Table 5.1: Key Project Stakeholders

Stakeholder	Role/Interest	Engagement Method
Public	Line side residents and passengers interested in construction disruption caused and benefits/impacts of the proposals.	Statutory consultation undertaken by Network Rail. Means of engagement included display boards, leaflets and door to door visits. A workshop event was also undertaken for Energlyn.
Network Rail	Key delivery partner responsible for delivery of the rail and station improvements.	Regular Programme Management Board between Welsh Government and Network Rail.
Arriva Trains Wales	Train operator, interested in service disruption during construction and service benefits of the proposals	Regular steering group meetings with Network Rail to discuss proposed facilities and service impacts.
Local Councils	Projects located within the Caerphilly Council area and affecting travel opportunities for residents of these areas.	The local authorities liaised with regularly by Network Rail in relation to access arrangements, traffic and townscape impacts, very limited involvement from Welsh Government.
Welsh Government	Key delivery agent responsible for part of project funding and channelling in EU funds. Also responsible for procuring service improvements. Working alongside NR to deliver the infrastructure improvements.	Regular Programme Management Board between Welsh Government and Network Rail.
WEFO	Responsible for distribution of EU funding for the scheme. Interested in outputs of the scheme and the reporting of these to European Commission.	Quarterly Welsh Government and WEFO meetings

Source: Evaluation study derived information

Barriers and Constraints

5.3 The following stakeholder engagement issues were identified during interviews, which are elaborated upon in subsequent paragraphs:

- Public concerns regarding delays to completion of works, particularly the DDA compliant ramp at Tir-Phil.

- Poor public and stakeholder consultation ahead of construction at Tir-Phil station, leading to issues agreeing access arrangements with local Councils.
- Difficulties engaging with Network Rail due to its complex organisational structure.
- Lack of Network Rail understanding of WEFO engagement requirements related to equality impacts.

5.4 Process evaluation interviews have indicated that there have been some complaints from the public regarding the delays to the completion of works at Tir-Phil, particularly from disability access groups unable to fully utilise this station until the DDA compliant ramp is completed.

5.5 Additionally, some interviewees felt that complaints could have been better minimised through earlier and more comprehensive engagement with disability access groups and station users. Interviewees were not aware of any significant public consultation or engagement activities undertaken as part of the Tir-Phil project, which may have exacerbated the situation.

5.6 The evaluators also noted concerns among stakeholders of the approach to stakeholder and public engagement adopted by Network Rail. A 'corporate approach' was observed with little recognition of the specific project location, population and characteristics in engagement programmes. Network Rail operated a two-tier approach to stakeholder management:

- **Tier One:** including Welsh Government, Network Rail, Arriva Trains Wales and the Department for Transport. The formal Project Management Board was established to provide an effective programme of engagement.
- **Tier Two:** including local authorities, interest groups, businesses and the general public. No formal arrangements were reported.

5.7 Equality is at the heart of Welsh Government and European Policy and this places requirements on contractors to ensure that correct processes were in place for engaging with equality impact groups. Welsh Government officers felt that the level of understanding within Network Rail regarding these requirements was below the level that it should be. The local councils were involved in the equalities impact assessment for Energlyn station and felt that this project was handled very well by Network Rail in terms of consultation with the public and consideration of equalities impacts. The level of consultation for Tir-Phil on the other hand was considered less

than satisfactory and this may have been a factor in the ongoing public concerns regarding completion of this scheme.

Lessons for future projects

- 5.8 The stakeholder engagement arrangements utilised could have been improved through the development of project specific stakeholder management plans. These would have allowed project specific issues likely to be of consequence to stakeholders to be communicated and managed in an effective way. Such plans would also define the proposed means and timing of engagement for each stakeholder group, especially the public.
- 5.9 Earlier engagement with stakeholders may have been beneficial, for example to engage with station users at Tir-Phil regarding construction disruption at this station. This could have negated some of the complaints received.
- 5.10 Further engagement between Network Rail and Welsh Government or the local councils would have been beneficial for Tir-Phil station to ensure that the equality impact requirements stipulated by Welsh Government and WEFO are fully understood and complied with as part of their implementation by Network Rail. The Programme Management Board established in January 2014 is considered by the evaluators to have provided the forum for such issues to be discussed and resolved.

6. Risk Management

6.1 Risk management undertaken during the course of the project was a central element of the evaluation. This section of the report presents the assessment of risk ownership and management to answer the following evaluation questions:

- What were the main risks identified in the Business Plan, and did they materialise?
- What was the cost associated with key risks and how accurate were the cost estimates?
- What were the main risk mitigation methods and how well did they work?
- Which areas of project delivery generated the most risks and why?
- What approach was taken to risk management and how effective was it?

Planned Approach to Risk Management

6.2 The 2011 Business Plan indicated that risks on this project would be managed by the Welsh Government's Rail Capital Project Delivery Manager. This would be in conjunction with Network Rail via the maintenance of a risk log, thereby seeking to avoid and mitigate risks via regular meetings. The only risks identified in the 2011 Business Plan related to the unplanned unavailability of sections of the rail network due to the implementation of the project and the risk of the rail franchise holder vacating the franchise prematurely.

6.3 The separate GRIP Stage 3 Option Selection Reports have been reviewed to identify the anticipated key risks for each element of the project.

Tir-Phil

6.4 The GRIP stage 3 report Annex C risk register contained seven risks, generating a mean risk exposure of £86,000. For the Tir-Phil element of the project, the four risks with the biggest risk exposure are identified in Table 8. The largest identified risk related to the potential issue of signal sighting which might require the lengthening of a platform. The other largest risks all related to issues of ground conditions. No ground investigations were required at GRIP Stage 3, which presents a major risk as project costs are determined ahead of such investigations being undertaken. In the view of the evaluator, the GRIP Stage 3 risk register is insufficiently detailed to capture the range of risks that could have been considered at this point. The risk register also significantly underestimated the economic cost of the risks it does

identify, for example, a risk identified relating to the certainty of estimates includes a mean risk exposure of £7.

Energlyn Station

- 6.5 For Energlyn station the GRIP Stage 3 report included a comprehensive risk register including 49 separate risks, dividing these risks into the following categories:
- Contract Risk: including possessions, contractor tenders and issues such as the weather;
 - New Structure Risk: including unforeseen ground conditions;
 - M&E Service Risk: including lighting columns and service subways;
 - Project Risk: including land acquisition, consents and scope change/creep; and
 - Infrastructure Risk: including embankments, signalling cables and services.
- 6.6 Despite providing a comprehensive assessment of the range of possible risks, no information was provided on the likelihood or impact of these risks, making it difficult to identify those risks considered most likely to occur or most costly should they occur. Additionally, no information was provided on how these risks were intended to be mitigated.

Table 6.1: Risk Assessment for Tir-Phil Turn Back

Risk Number*	Description	Mitigation	% Probability	Cost (£)
DDD946A06	Signal Sighting through the road bridge arch.	It may be necessary to lengthen the Up platform.	High	£60,000
DDD846A-03	There may be some significant increase in the excavation works to install the ramps if the bankings have to be cut back to accommodate it.	Confirm civil engineering solution as soon as possible so that the extent of piling is identified before GRIP Stage 5.	Medium	£10,878
DDD846A-02	Disposal of contaminated material - Until excavations take place it is unknown whether or not there will be more contaminated material to be disposed of that is included within the estimate.	Intrusive ground surveys to identify if there are contaminated materials so that resources can be arranged to deal with these.	Medium	£5,907
DDD846A-04	Additional excavation works (track) - It is not yet known how deep the excavation for the new track bed will need to be.	Ensure that the actual extent is identified during the intrusive ground survey.	Medium	£2,941

Source: Tir-Phil GRIP 3 Risk Register, 2009

*Reference number relates to the risk register numbering.

Materialisation of Risks

- 6.7 The evaluators were unable to obtain the project risk registers utilised by Network Rail during the project. The only risks evaluated were therefore those identified specifically by project stakeholders during the process evaluation interviews. The evidence available also did not enable an evaluation of the effectiveness of the approach undertaken to risk management.
- 6.8 Of the above risks identified at the project design stage at Tir-Phil, the risk relating to additional excavation works has transpired in terms of the additional works that have been required to underpin a road bridge at the station. This is believed by stakeholders to have caused a six month delay to the programme, as well as additional costs to Network Rail; although, due to the fixed nature of the contract for this element of the work these cost over-runs have not been passed on to Welsh Government. This highlights the risks of defining project costs at GRIP Stage 3 ahead of ground surveys which could have better quantified the scale and likelihood of this risk.
- 6.9 The scope of risk-related work undertaken through GRIP 3 Option Selection includes:
- Aim: Develop options for addressing constraints. Assesses and selects the most appropriate option that delivers the stakeholders' requirements together with confirmation that the outputs can be economically delivered.
 - Main Output: Single option determined and stakeholder approval to option secured through Approval in Principle.
- 6.10 And GRIP 4 Single Option Development includes:
- Aim: Initiation of the development of the chosen single option; and
 - Main Output: Reference / outline design
- 6.11 The project development activities undertaken up to the end of GRIP 4 do not involve detailed site investigation or the involvement of contractors. Only when the project progressed to GRIP 5 Detailed Design were contractors involved. GRIP 3 risk registers were therefore based on incomplete information in the view of some stakeholders.
- 6.12 Other issues which materialised, but were not anticipated as risks at the GRIP 3 planning stage included:
- The knock-on effects of CASR on project timescales.

- Technical issues associated with new signal technologies.
- Delays in the construction of a DDA compliant pedestrian ramp at Tir-Phil due to lack of information regarding ground conditions and issues with Welsh Water related to the drilling of bore holes.

- 6.13 The details of the above issues have already been discussed in the finance, programme and stakeholder sections of this report, so are not reiterated here. A delineation of risks was noted during stakeholder consultations. Welsh Government representatives highlighted the commercial risks that resided with them on Energlyn Station.
- 6.14 Welsh Government consultees were also critical of Network Rails' approach to risk mitigation. A perception was noted that Network Rail was focused on managing potential reputational risks on the project. Although Welsh Government interviewees supported the level of detail provided within GRIP 3 reports, and welcomed the presence of project risk registers, some questioned the extent to which active mitigation and management of risks was undertaken. This was considered to be a legacy of Network Rails' Control Period 4 (2009-14) procurement arrangements. The internal procedures of Network Rail are not within scope of this evaluation, but it is noted that significant initiatives have been implemented in CP4, such as Efficient Infrastructure Delivery, to enhance supply chain and delivery management. Network Rail confirmed during the evaluation that Quantified Risk Management was undertaken on the project each period.

Lessons for future projects

- 6.15 Due to the lack of risk management information available to evaluators it was not possible to conclude on their effectiveness. However, a key lesson of note is the importance of risk registers being available and monitored by all parties. It is recommended by the evaluators that risk be added to the Programme Tactical Review meeting (see Section 7) to ensure that risks are visible and the planned mitigation is agreed. In relation to the issues that materialised during implementation, the following mitigations could be considered for future similar schemes.

Knock-on effects of CASR

- 6.16 To achieve economies of scale the Tir-Phil project was interlinked with CASR. However, this interdependence presented a project risk as delays to CASR resulted in delays to the CVR project. It would therefore be appropriate to produce a shared

risk register to consider the impact of CASR or other interrelated risks on future projects and vice-versa.

Technical issues associated with new signal technologies

- 6.17 As with any new technologies, unforeseen circumstances can occur. Sufficient time contingency should be added to future project programmes to mitigate these impacts.

Delays caused by ground conditions at Tir-Phil

- 6.18 Both the issues experienced with the bridge underpinning and those experienced in constructing the DDA compliant pedestrian ramp relate to unanticipated ground conditions. For future projects of this nature, early site investigations should be undertaken, with sufficient time and cost contingency in place to mitigate this risk.

7. Project Management

7.1 The process evaluation has considered the project management processes and procedures utilised during the course of the project, and the structures and systems which facilitated decisions being made and enacted. Multiple decisions of differing levels of frequency and consequence are made throughout the lifespan of a project, a key element of the process evaluation was to determine whether the project management and decision making process were effective and assisted in delivering a successful project outcome. As part of this the following key questions were addressed:

- How effective were the various project management procedures?
- How effective was communication between the delivery partners? Which approaches worked well and what lessons were learnt?
- How effective were the monitoring and evaluation activities?
- What equal opportunities monitoring has been undertaken during the project delivery?

Project Team

7.2 At the stage of bidding for funding the development of the Business Plan was managed by the Transport Funding Unit within Welsh Government, whose remit included bidding for EU funds for all types of transport schemes. This team operated independently of the Welsh Government rail team and dealt with a variety of different types of projects, without specific rail expertise.

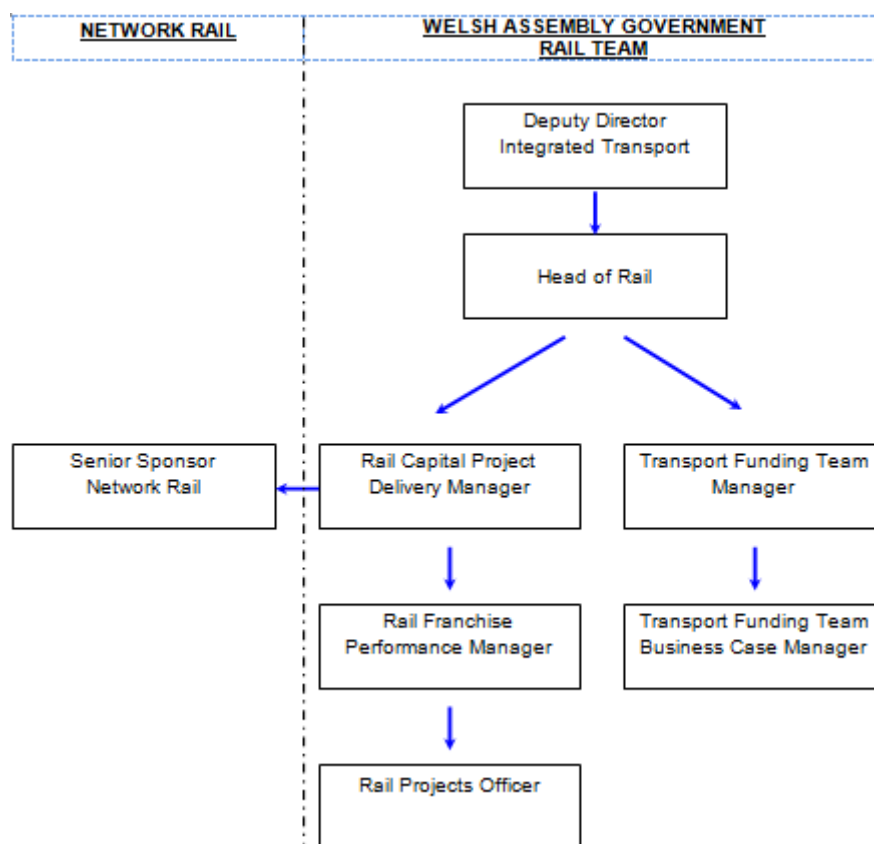
7.3 For the delivery of the scheme, the intention was that oversight of the project would be provided by the Rail Capital Project Delivery Manager through liaison with the Network Rail Senior Sponsor, as shown in

7.4 Figure 7.1. However, during the project there were a succession of organisational changes in the management structure within Welsh Government and management responsibility for this project was changed as a result.

7.5 The projects were managed by the Rail Technical Advisor, who joined Welsh Government in October 2013. These projects form part of their portfolio of responsibility along with a number of other rail projects currently being delivered by Welsh Government. A Programme Management Board was set up to manage the delivery of these schemes and all other rail capital projects (see below).

7.6 The interviews with key stakeholders indicated that as a result of the previously mentioned organisational changes there was a perceived lack of staff continuity within Welsh Government with regards to those working on the CVR project. This was considered by some interviewees to have affected the quality of reporting to WEFO, a situation that was addressed through the appointment of the Welsh Government's Rail EU Grants Manager. Stakeholders also felt that the lack of continuity also applied to the Network Rail team and that this led to communication difficulties between Network Rail and Welsh Government.

Figure 7.1 Initial Organisation chart



Programme Management Board

7.7 At the inception of the CVR project no formal arrangements were in place to facilitate regular meetings between Welsh Government and Network Rail. A programme of 4-weekly finance meetings was in place, with a focus on resolving any project invoicing matters. Informal meetings were also convened on an ad-hoc basis between the Welsh Government Deputy Director for Public Transport and

Network Rail's Senior Manager. These discussions were instigated by both parties on an issue-by-issue basis, and no formal terms of reference were established.

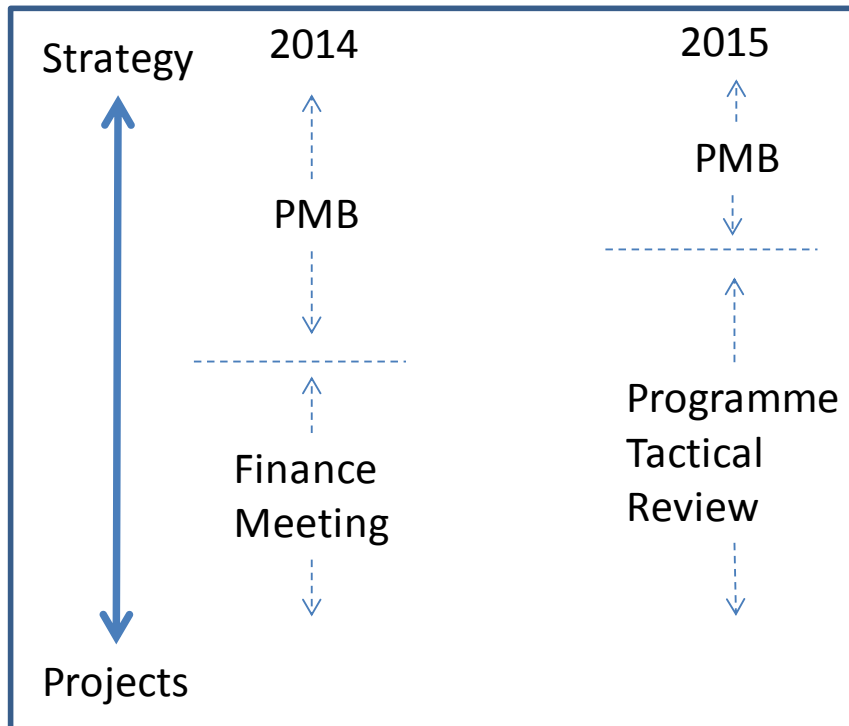
- 7.8 This arrangement was considered by stakeholders to be sufficient in the initial delivery period of the project. However, with the inception of additional rail capital projects, and following the emergence of delays on selected projects, a more formal arrangement was considered necessary.
- 7.9 In January 2014 the Programme Management Board (PMB) was instigated by Welsh Government to establish a more formal working arrangement with Network Rail, including providing oversight of the project. The draft Terms of Reference for the PMB defined the overall objectives as being:
- To jointly develop and deliver projects and programmes for the benefit of the public in Wales.
 - To ensure that best practice health, safety, welfare and environmental practices are deployed constantly.
 - To ensure that demonstrable value for money is derived.
 - To ensure that good governance is deployed consistently across all projects and programmes.
- 7.10 To support this, the PMB was defined to have a role to⁷:
- Specify and Implement Programme Governance criteria.
 - Approve Programme priorities and plans.
 - Ensure that the project/programme budgets are managed and controlled.
 - Monitor the projects/programmes to ensure they remain on course to deliver expected benefits within agreed timescales.
 - Manage strategic risks and define criteria for reporting project/programme status, including the process for escalation and resolution of risks and issues.
 - Develop a process for the management of project/programme contingencies and then ensure its deployment.
 - Oversee the strategy for community consultation, communications, publicity and wider stakeholder relationships.
 - Approve all funding submissions and ensure that funding applications are prepared in accordance with recognised best practice such as the 5 Case Business Model.

⁷ Source: draft Terms of Reference

- Apply independent scrutiny to the projects/programmes.
- Engage and influence at a high level and in a manner that fosters mutual trust and co-operation.

- 7.11 A central rationale for the PMB from the Welsh Government's perspective was to provide a forum to work with Network Rail towards a mutual understanding of their objectives for projects such as the CVR project. A core outcome reportedly derived was an enhanced understanding of Welsh Government requirements relating to project implementation, management and monitoring. As such, the PMB was considered by Welsh Government to have been a success.
- 7.12 The PMB membership consisted of three attendees each from Welsh Government and Network Rail, with an additional independent member from Arriva Trains Wales. The meetings were chaired by a Welsh Government representative. This membership model did not include the presence of any non-executive members, as the member organisations felt there was no direct benefit of such an approach, although this option was considered.
- 7.13 The PMB met on a monthly basis, and was supported by two other programme-level meetings. The first, as noted above, was a monthly finance meeting, which was convened one week prior to each PMB. The finance meeting reviewed project issues which were subsequently passed to the PMB for consideration and resolution. However, both Welsh Government and Network Rail perceived this arrangement as being too project specific, with the PMB constrained in its ability to consider more strategic matters.
- 7.14 The revised 2015 model of delivery saw the introduction of a Programme Tactical Review (PTR) meeting, designed to replace the finance meeting. The PTR focused on individual project issues, resolving those of a minor nature and only passing issues to the PMB if they could not be resolved satisfactorily. The consequence of this was a redefined scope for the PMB, considering projects only by exception and moving from 'problem solving to strategic thinking' (Figure 7.2).

Figure 7.2 PMB Models



- 7.15 A direct benefit of the PMB, noted by Welsh Government representatives interviewed as part of the process evaluation, was the change in reporting approach by Network Rail. The schedule of more regular meetings ensured that all emerging issues were discussed prior to any impact on project programme or profiles. The PMB remains central to the ongoing management of rail projects, and was considered by stakeholders to have contributed positively in reducing potential delays to the completion of the CVR project.
- 7.16 The introduction of the PMB and ongoing refinement to meeting and reporting arrangements reflected a step-change in governance arrangements for Welsh Government rail capital projects, including the CVR project. Following the confirmation of funding allocations for the 2007-13 programme period, it was noted by consultees that the level of Welsh Government resources fluctuated. This was perceived to have raised concerns about the project team's ability to close out projects, including the CVR.
- 7.17 The overarching governance lessons learnt through the CVR project, alongside other 2007-13 WEFO supported rail projects, were noted by Welsh Government consultees and changes were made to enhance the 2014-20 funding period preparation and subsequent delivery. The introduction of the position of EU Rail

Programme Manager in July 2014, within the Department for Economic, Science and Transport of Welsh Government, reflected the enhanced governance arrangements established.

WEFO Rail Programme Board

7.18 In response to the observed gaps in governance arrangements and project delivery associated with the CVR project, a Welsh Government and WEFO Rail Programme Board was also established in January 2014. This was convened to 'identify and fill the gaps' in Welsh Government resources with quarterly meetings arranged. From December 2014 the frequency of meetings was increased to monthly. Issues discussed have included:

- Project progress, slippage and mitigation;
- Issues arising on projects;
- Rail Programme or projects;
- Funding commitments and de-commitments;
- Innovation;
- Progress on WEFO indicators; and
- 2014-20 programme emerging projects and prioritisation.

7.19 Membership originally focused on issues of transport and finance, but from February 2015 the remit and attendees were broadened to cover all WEFO supported areas. Attendees in February 2015 included:

- Welsh Government Department for Economy, Science and Transport:
 - Finance and Performance (Chair);
 - Transport;
 - Public Transport;
 - Infrastructure Delivery;
 - Property;
 - Economic Policy;
 - Tourism;
 - Development.
- Welsh European Funding Office:
 - Programme Management;
 - Planning and Strategy;
 - Connectivity; and
 - Project Development.

- 7.20 Key outcomes from this Board have included an agreement to challenge project delivery profiles/schedules for the 2014-20 programme period.

Effectiveness of Monitoring and Evaluation Activities

- 7.21 The 2011 CVR project Business Plan produced by Caerphilly County Borough Council (CCBC) prior to Welsh Government taking over delivery of this scheme included a Monitoring and Evaluation Plan outlining how the success of the project would be assessed. This indicated that monitoring activities would focus on the 15 outputs, results and impacts shown in Table 7.1, with potentially additional indicators developed at a later date in conjunction with the WEFO Project Development Officer.

Table 7.1: Planned Monitoring and Evaluation Criteria

Criteria		Target	Proposed Evidence
Outputs	Number of public transport services created or improved	1	Evidence of works completed, e.g. photographs, certificates of works etc.
	Number of intermodal facilities created or improved	1 (Energlyn)	
	Railways created or reconstructed and pinch points tackled	850m extra rail track and 1 pinch point tackled	
Results	Enhancement of rail service capacity, frequencies and accessibility	Frequency doubled, 630,000 seats per annum from Rhymney to Bargoed	Pre and post scheme train timetables
	Gross increase of passenger kilometres on public transport	7.6m	Pre and post scheme passenger data from operator
	Improvement in reliability, customer satisfaction, comfort and convenience	Improved reliability, customer satisfaction, comfort and convenience	Pre and post scheme passenger data from operator

	Reduction in car dependency by providing affordable alternatives	2.1m less car kilometres per annum	Survey of train passengers
	Gross jobs created (scheme direct and indirect)	25	Personnel records
	Enhanced accessibility to jobs	12 minutes generalised travel time reduction	Population data and GIS catchment analysis
	Enhanced accessibility for Valleys businesses	12 minutes generalised travel time reduction	
	Gross reductions in greenhouse gas emissions	129.9 tonnes per annum gross reduction in CO ₂	Survey of train passengers to establish reduction in car use, calculated alongside timetables and DfT rail emission model to establish emission impacts.
Impacts	Net jobs created	12	Personnel records
	Net increase of passenger transport kilometres on public transport	5.8m per annum	Pre and post scheme passenger data from operator
	Net reductions in greenhouse gas emissions	129.9 tonnes per annum gross reduction in CO ₂	Survey of train passengers to establish reduction in car use, calculated alongside timetables and DfT rail emission model to establish emission impacts.
	Population bought within travel time threshold of a 'Key Centre' (key centres = Cardiff and Caerphilly)	4490 within 60 minutes, 3519 within 90 minutes	Population data and GIS catchment analysis

Source: Central Valleys Monitoring and Evaluation Plan, 2009

- 7.22 The above monitoring information was to be reviewed through pre, interim and post implementation monitoring. A schedule of formal reviews between the project sponsor (which was planned to be CCBC) and WEFO were to be agreed with WEFO, although the evaluators were unable to establish what reviews were actually undertaken.
- 7.23 An evaluation Steering Group was planned to be set up consisting of members of CCBC and an appointed independent evaluator. The frequency of these evaluation meetings was to be determined based upon the complexity of the project evaluation required. An interim evaluation was at this time planned to be undertaken to allow initial findings to be assessed and to outline interim progress on the project.
- 7.24 The final evaluation consultation with stakeholders has determined that no interim monitoring or evaluation had been undertaken on the CVR project to date. In the view of the evaluators, this has increased the difficulty of collating consistent and relevant evidence for the final evaluation, particularly given the turn-over of staff in the project team. It is recommended that enhanced interim data collation is embedded into project management practices for ERDF supported projects.

Equal Opportunities Monitoring

- 7.25 No evidence was available to the evaluators through which to assess the extent of equal opportunities monitoring undertaken as part of the CVR project. However, both stations were to be fully DDA compliant to ensure that they were accessible by all potential users. Work to complete the Tir-Phil DDA compliant ramp is yet to be completed at the time of evaluation, meaning that the station currently does not fully comply with DDA requirements.
- 7.26 Evidence from the final evaluation stakeholder interviews indicated that an Equalities Impact Assessment workshop was undertaken for Energlyn Station, which was considered to have been an effective and inclusive event. No evidence exists regarding the consideration of equalities impacts at Tir-Phil, although as previously stated the level of consultation undertaken for this station was considered by stakeholders to be insufficient.
- 7.27 Customer information at both Energlyn and Tir-Phil stations were provided in both English and Welsh.

Lessons for future projects

- 7.28 During the project there was a lack of team continuity, with different teams developing the initial proposals (this was initially managed by the CCBC), funding applications, managing the project at the inception phase and managing the project to completion. This lack of continuity was a result of the decision of the Welsh Government to take the projects in house as well as subsequent changes to the team structure within Welsh Government. Whilst no specific issues were identified resulting from this change of team, continuity should be maintained where possible and suitable hand-over arrangements put in place where team members do change.
- 7.29 Additionally there was a lack of continuity of team within Network Rail. This presented a communication challenge for the management of this project as there was a learning curve for the project delivery teams to get up to speed with delivery of the project and to understand the roles and responsibilities of the team. Whilst it would be optimum for a consistent team to have been available throughout the project from the business case development stage through to project completion, this is not always practical. Further documentation of roles and responsibilities at the project inception stage as well as comprehensive handover of tasks may have been beneficial in overcoming some of the communication issues that occurred.
- 7.30 The Project Management Board once initiated provided a formal and regular forum for project and strategic discussions to be held between key stakeholders. This proved very effective in resolving project issues and the ongoing operation of the Board is supported by the evaluators as an effective management process.
- 7.31 Planned monitoring and evaluation activities on the project concentrated on the monitoring of key as well as the final evaluation of project performance. A larger list of monitoring objectives aligned to key project delivery goals would have been beneficial in ensuring the project is progressing to plan. Additionally, an interim evaluation would have identified any systematic issues with project delivery, allowing improvements to be made during the duration of project delivery.

8. Energlyn Impact Assessment

Introduction

- 8.1 As part of this evaluation the results and impacts of the CVR project have been assessed where feasible, as agreed in the CVR Evaluation Scoping Report. The Tir-Phil project has enabled an enhanced frequency of service between Bargoed and Rhymney (2 trains per hour each way instead of 1 train per hour), which would not have been feasible to operate with a single track. However, Arriva Trains Wales have not been able to operate the enhanced service frequency envisaged in the 2010 business case. It is therefore not possible to assess the impacts of this element of the CVR project at this time.
- 8.2 The business case also envisaged 4 trains per hour calling at the new Energlyn station; this was based on the assumption of a revised timetable being in place for the whole line, incorporating the above frequency enhancement. In practice, this has not been delivered, with Energlyn currently only being served by 2 trains per hour, at intervals of 45 minutes and 15 minutes, rather than a regular half-hourly service. The evaluation therefore focused on the results achieved by the new Energlyn Station without this planned service improvement.

Objectives of the schemes

- 8.3 Table 8.1 summarises the objectives of the CVR project, with a commentary on the agreed approach to ex-post impact evaluation relating to Energlyn Station. Each of the objectives is discussed herein in turn.

Table 8.1: Energlyn Station Objectives

Results	Forecast Change	Scoping Conclusions
Gross increase of passenger kilometres on public transport	7.6m/ annum	Station and ticket data can be used to assess the interim position in terms of passenger demand at the new station at Energlyn. This will include the analysis of abstraction levels from other stations on the Rhymney Line and modal shift from other modes.
Improvement in reliability, customer satisfaction, comfort and convenience	Not stated in business case	Although this will predominantly be influenced by the service frequency enhancements, the provision of the Energlyn station will influence public perception. An initial review of this will be undertaken through the surveys undertaken with passengers boarding at Energlyn, and through the review of available Passenger Focus data for the wider corridor.
Reduction in car dependency by providing affordable alternatives	2.1m/ annum	An interim assessment could be undertaken to reflect the additional rail demand at the new Energlyn station and transfer from car to rail. This will be a constrained analysis as it will only include new rail trips attracted to the Energlyn station.
Gross jobs created (scheme direct and indirect)	25	This would again be an interim assessment to reflect jobs created by the new station at Energlyn and would be reviewed as part of the stakeholder interviews with the local authority.
Enhanced accessibility to jobs	12 minutes time reduction	A review will be undertaken of the change in catchment population for rail trips generated by the Energlyn station. No assessment will be undertaken of the change in generalised travel time.
Enhanced accessibility for Valleys businesses	12 minutes time reduction	See above
Net jobs created	12	This would again be an interim assessment to reflect jobs created by the new station at Energlyn.
Net increase of passenger transport kilometres on public transport	5.8m/ annum	Station and ticket data can be used to assess the interim position inclusive of the new station at Energlyn.

Source: Central Valleys Business Case, Jacobs, 2010

Gross/Net passenger kilometres

- 8.4 The business case identified that the CVR project would generate (in 2007) an increase in patronage on the Rhymney line of over 312,000 passenger journeys per year, yielding revenues of over £500k per year and generating gross 7.6m (net 5.8m) kilometres per year additional travel on public transport. These figures were driven by a combination of:
- An hourly additional service between Bargoed and Rhymney (positive impact);
 - A slightly longer journey time for passengers on trains which previously passed through Energlyn now stopping there (negative); and
 - Demand generated by the new station at Energlyn itself (users of the new station less those who were already using rail from another station).
- 8.5 The passenger journeys figure was broken down in the business case as shown in Table 8.2. The business case does not specify how the 7.6m kilometres figure is derived, but by implication an average journey was assumed to be 24.3 km long (dividing the 7.6m by 312,357 passenger journeys). Applying 3% per annum growth rate (as detailed in the business case) to the 2007 figures gives an expected 2014 passenger km figure of 9.35m (gross) and 7.13m (net).

Table 8.2: Breakdown of Passenger Journeys

Demand driver	Passenger Journeys (2007)
Rhymney frequency improvements	24,835
Journey time impact for existing users	-21,129
Users of Energlyn	334,751
Abstraction from other stations	-26,100
Total	312,357

Source: Jacobs 2010

- 8.6 Ticket sales data for 2014 has been used to assess the actual patronage at Energlyn station, which opened in mid-December 2013. This data, obtained via Arriva Trains Wales from the national rail Lennon database, has been used to provide raw actual passenger journeys and miles (then converted into kilometres).

- 8.7 It should be noted that the data recorded in Lennon is based on ticket origins and destinations. Whilst for the majority of the UK it is reasonable to assume this reflects the actual station to station journey being made, this is not necessarily the case on the Cardiff Valleys network where zonal fares apply. The fares to Cardiff from Energlyn are the same as those from other stations in the zone (which extends from Pengam to Caerphilly). Whilst any tickets sold from a ticket vending machine are automatically coded to the correct origin, many on-train issued tickets are sold from the zonal boundary, in this case Pengam, which speeds up the issuing process for the guard without detrimentally impacting the customer.
- 8.8 Around 30% of tickets on the Rhymney line are issued on-train, with several stations having no or very limited ticketing facilities. Even though Energlyn had an automatic ticket vending machine during the period in question it could not issue monthly and other long period season tickets which needed to be purchased from a staffed booking office (such as Aber or Caerphilly) with access to the season ticket holders' database. In practice this means many Energlyn commuters are travelling on tickets nominally from other stations. In addition, someone buying a Day Return from Energlyn to Cardiff Central would be recorded as returning to Energlyn, even if in practice they may have returned on a service not calling at Energlyn such as alighting at Aber. For the purposes of this evaluation, based on Arriva Trains Wales estimates⁸, 10% of the journeys recorded in Lennon as originating at Pengam have been assumed to have actually originated at Energlyn.
- 8.9 This results in passenger journeys for 2014 (the first full year of opening) to/from Energlyn of 117,464. The average journey length was 10.4 miles or 16.7 km, resulting in 1.96m passenger kilometres. This figure includes travel by passengers who may have previously travelled from another station.
- 8.10 AECOM carried out a survey of passengers boarding at Energlyn station on a single Wednesday and Saturday in May 2015⁹. A high completion rate was achieved of 100% for the weekday (139 passengers) and 95% for the Saturday (87 passengers). Assuming these were typical days, and the Sunday patronage is in line with elsewhere at around 65% of the Saturday patronage this equates to an estimated 65,000 passengers boarding per year, or 130,000 passenger journeys (assuming everyone who travels out travels back). This is broadly consistent with the number derived from Lennon, taking into consideration fare evasion (people

⁸ From a comparison of ticket sales against the actual headcount of passengers.

⁹ Full results can be found in Annex A

travelling without tickets), growth between 2014 and the survey in May 2015, and possible seasonal factors. The following key results were obtained from the passenger survey, albeit for a fairly small sample size:

- 72% of passengers had been making the same journey before the new station opened;
- 55% of all trips were previously made by rail from another station (mainly Aber); and
- 6% of all trips were previously made by bus.

- 8.11 Applying the observed abstraction factor would result in a gross passenger kilometres to rail of $(1-0.55) \times 1.96\text{m} = 0.88\text{m}$. Factoring in the patronage previously using the bus (6% of the total observed) would reduce this by $6\% \times 1.96\text{m} = 0.12\text{m}$ km, giving a net generated passenger kilometres of 0.76m per annum¹⁰.
- 8.12 No 'ramp up' factor was mentioned in the business case, to reflect the time taken for passengers to become aware of the new station and adjust travel behaviour accordingly. Industry guidelines suggest the first year figure only represents about 70% of the 'steady state' demand. Applying this would increase expected net generated passenger kilometres from 0.76m to 1.09m compared to the forecast of 2.93m (Table 8.3).

Table 8.3: Forecast and actual passenger transport kilometres

Measure	Net increase of passenger transport kilometres on public transport
Forecast – full service + expected growth	7.13m
Forecast – reduced service + expected growth	3.12m
Forecast – reduced service + actual growth	2.93m
Actual (2014)	0.76m
Actual plus ramp-up	1.09m

¹⁰ In the absence of local data, the business case used WebTAG guidance and assumed that 24% of new rail trips had come from bus. Observed data suggests 6% of the 45% of trips which were new to rail had come from bus, i.e. 13%.

- 8.13 A full assessment of the inputs and methodology used in the business case can be found in the Annex B, however the key differences are as follows:
- The additional frequency of service between Bargoed and Rhymney has not been delivered. This was forecast to generate 395,000 kilometres per year in 2007;
 - Energlyn receives an irregular 2 trains per hour instead of 4 trains per hour expected at the time the forecast was made. The possibility of 2 trains per hour (evenly spaced) was considered in the business case and was estimated to reduce demand by approximately 50%;
 - The business case appeared to use a factor of 2.46 to uplift the trip rate model output of Cardiff/Newport journeys to reflect journeys to/from all locations nationally. In practice a factor of 1.35 has been observed;
 - Abstraction from other rail stations was estimated to be 8%, whereas the observed figure from station passengers is 55%;
 - The implied average journey length for all additional passengers in the business case was 24.3km. The observed figure is 16.7km; and
 - The compounded growth rate 2007-2014 was assumed to be 23%. In practice journeys growth on the Rhymney Line (as recorded by Lennon) in the period has been 13%.
- 8.14 Once all the above have been taken into consideration, the trip rate model itself actually appears to have slightly under-estimated demand at Energlyn. Explanations for this include slightly higher than forecast catchment population, the provision of parking facilities at the station and lower average fares per journey into Cardiff.
- 8.15 There is no clear evidence from the Lennon data that the additional time stopping at Energlyn has had a detrimental impact for those travelling through the station. Ticket sales from stations north of Energlyn are up year-on-year by around 8%, which is well above the average for the Cardiff Valleys as a whole. However, this may not fully reflect the true position as discussed earlier. Only half the trains travelling through Energlyn currently stop there, so this effect could be more noticeable in future once all trains continue beyond Bargoed and stop at Energlyn.

Improved reliability, customer satisfaction, comfort and convenience

- 8.16 Many factors drive the published operational reliability figures for the Valleys lines. Whilst anecdotally from Arriva Trains Wales the presence of the passing loop at Tir-Phil has occasionally facilitated the ability to run more trains than would previously

have been the case, this has not been materially significant in the overall published performance figures. The impact of CASR and associated works significantly affected both actual and customer perception of reliability during 2014.

- 8.17 No passengers at Energlyn were surveyed in either the spring or autumn 2014 National Rail Passenger Surveys. The numbers surveyed at stations north of Energlyn were too small to provide a statistically significant sample to be able to usefully draw any conclusions regarding the impact of the Tir-Phil and Energlyn schemes, particularly in isolation from other drivers of satisfaction on the Cardiff and Valleys network as a whole.
- 8.18 Questions on satisfaction were included in an on-line follow-up to the passenger survey carried out by AECOM at Energlyn. Although the sample size was very small (with only 12 respondents), satisfaction with a number of facilities at the station was very high. All respondents were either very satisfied or satisfied with the level of access to/from the station, lighting and the cleanliness of the station environment. Furthermore, all respondents rated their overall satisfaction with the station as 6 out of 10 or better¹¹.
- 8.19 There are limited opportunities for improved comfort from the additional station per se, and the lack of additional service means any uncomfortable crowding which would have been relieved by extra trains will not have taken place. The type of train serving Energlyn is currently the same as that serving the other stations on the route.
- 8.20 The additional convenience for customers in the vicinity of Energlyn station can be shown on the accessibility maps in Table 8.4 later in this report. These highlight the reduction in walking time to a station brought about by the opening of the new station.

¹¹ The question was: Thinking overall, how satisfied are you with Energlyn and Churchill park station from a scale of one to ten, where one is very dissatisfied and ten is very satisfied?

Table 8.4: Forecast and Actual Improvement in reliability, satisfaction, comfort and convenience

Measure	Forecast	Actual
Improvement in reliability, customer satisfaction, comfort and convenience	Not stated	No appropriate quantitative data available, but positive

Reduction in car demand

- 8.21 The business case implied 28% of users of Energlyn station would have previously travelled by car (as a driver). Data collected during the passenger survey at the station suggests that in practice the figure is 8% (as driver – it is assumed for those as passenger the car driver has continued to travel by car). Of the 1.96m kilometres per annum made by train from the new station, it can therefore be estimated that around 156,800 would have previously been made by car (Table 8.5). The significantly lower than anticipated passenger kilometres generated by Energlyn, combined with lower than anticipated modal shift from car will be reflected in reduced benefits of congestion relief, improved air quality, and other figures derived from car usage reduction.

Table 8.5 Forecast and Actual reduction in car mileage

Measure	Forecast	Actual
Reduction in car dependency by providing affordable alternatives	2.1m/annum	0.157m/annum

Jobs Created

- 8.22 The business case assumed 25 posts would be created as a result of the two schemes, 12 in construction, eight in rail operations and indirectly a further five. Figures are not available from Network Rail regarding the number of people employed during the construction of the two schemes. The original estimate was calculated using industry standard indices, based on the total project capital expenditure. As the project has been delivered largely in-line with the forecast costs it can be assumed that the 12 construction jobs materialised. However, information was not available through which to undertake an analysis of the net employment impacts i.e. where the individuals filling these positions lived and previously worked.

- 8.23 The split of jobs created between the two schemes is not documented in the business case but it is assumed that the five additional train crew and three other maintenance staff expected to have would be employed on a permanent basis were as a result of the additional unit and additional services operating between Bargoed and Rhymney. These have not transpired therefore no additional staff have been recruited as a result.
- 8.24 As Energlyn station is unstaffed, and all services calling there are existing services, there have been no additional permanent jobs created through the opening of the new station. The new station has resulted in extra work for the contracted station routine maintenance teams, which could amount to around 15 hours a week, or 0.4% of a full-time post¹². In time, the station will need further maintenance as shelters, platform furniture and other assets need refurbishment.

Table 8.6: Forecast and Actual Jobs Created

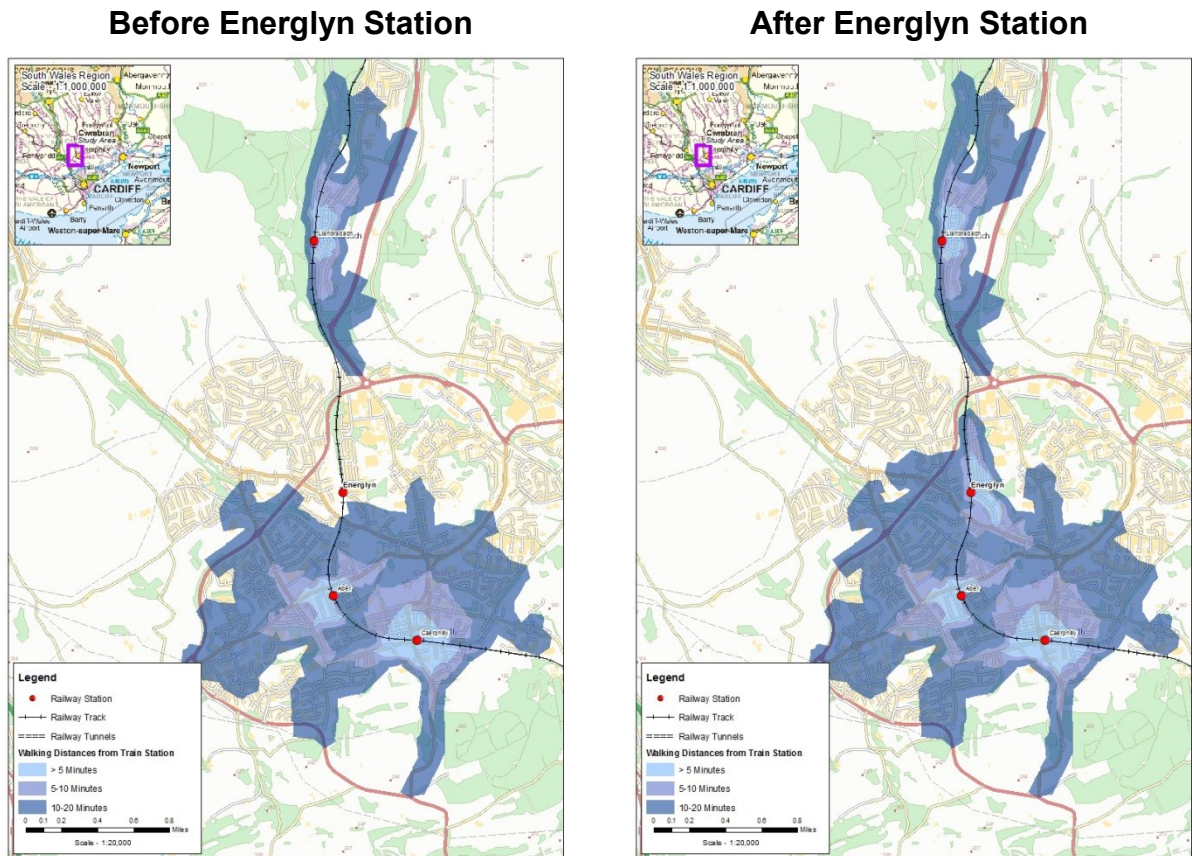
Measure	Forecast	Actual
Gross jobs created	25	17

Enhanced Access to jobs/education

- 8.25 The analysis driving the 12 minute reduction in journey time forecast in the business case under this heading related solely to the additional frequency of service between Bargoed and Rhymney, and the consequential reduced generalised travel time to Cardiff/Caerphilly. In practice this has not been delivered. As agreed in the scoping report, this is not being examined further here. The change in accessibility on foot to a rail station is shown in Figure 8.1.

¹² Source: AECOM analysis of Arriva Trains Wales cost data.

Figure 8.1 Walking catchment from station – before and after Energlyn opening



8.26 Table 8.7 shows the estimated population within specific time bands of Energlyn station. Around 1,500 people have been brought from outside a 20-minute walking catchment, to within 'walking distance' of a station following the opening of Energlyn. A further 2,900 people who were previously within a 20-minute walk of Aber are now within a 10-minute walk of Energlyn.

Table 8.7 Accessibility improvements

Distance to Existing Station	Distance to Energlyn	Approximate Population
Greater than 20 Minutes	10 to 20 Minutes	1,328
Greater than 20 Minutes	5 to 10 Minutes	206
Greater than 20 Minutes	Up to 5 Minutes	117
10 to 20 Minutes	5 to 10 Minutes	2,916
10 to 20 Minutes	Up to 5 Minutes	51

- 8.27 Notwithstanding the small sample size, all those responding to the on-line survey question agreed or were neutral on the statement that the new station had made it easier for them to access places further afield.

Table 8.8: Forecast and actual impact on accessibility to jobs

Measure	Forecast	Actual
Enhanced accessibility to jobs	12 minutes time reduction	As agreed, not calculated

Business Accessibility

- 8.28 As above, this is not being examined here due to the non-delivery of service enhancements between Bargoed and Rhymney.

Table 8.9: Forecast and actual impact on accessibility to Valleys Businesses

Measure	Forecast	Actual
Enhanced accessibility for Valleys businesses	12 minutes time reduction	As agreed, not calculated

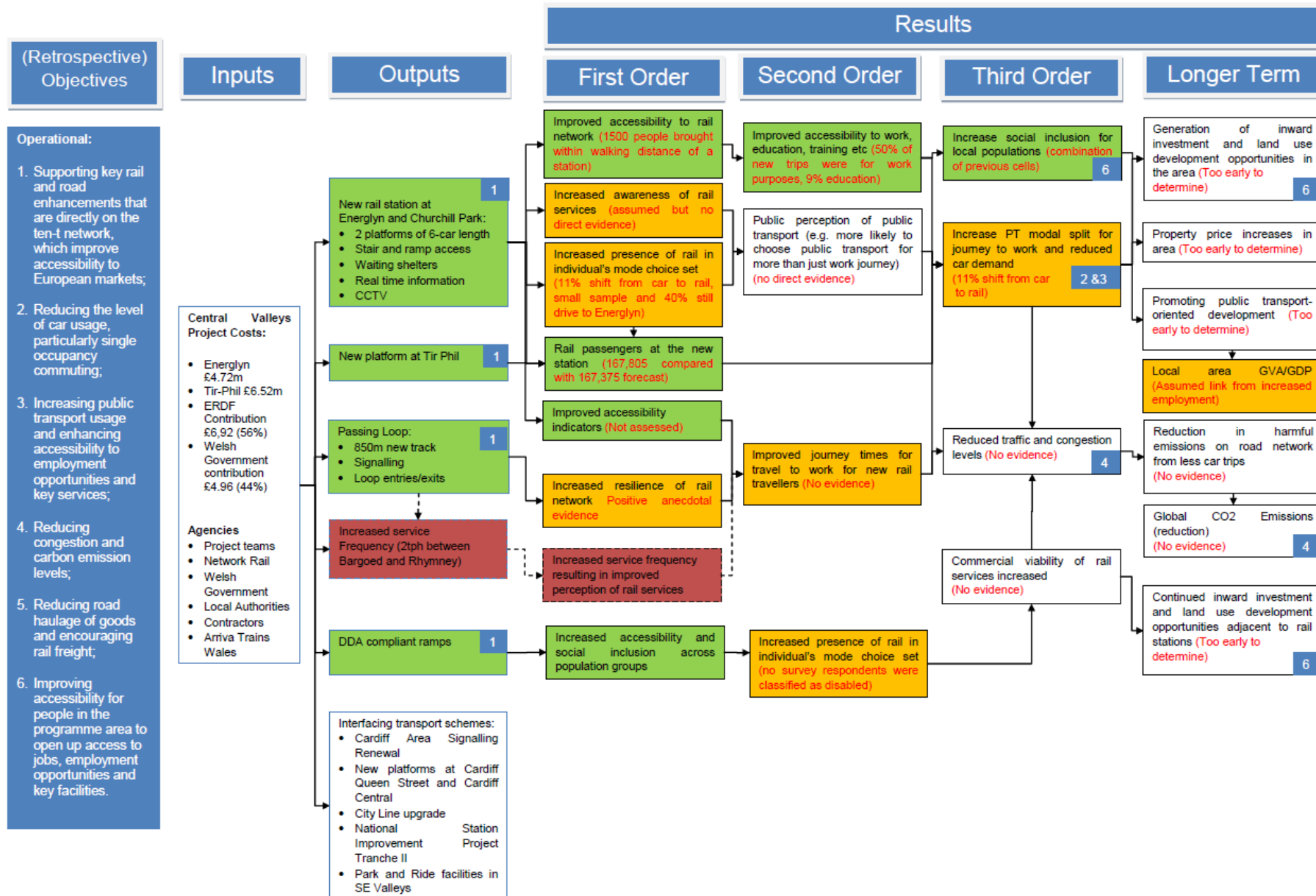
Attribution of Results to CVR Project

- 8.29 Following evaluation best practice and the European Commission Evalued guidance, a theory-based evaluation approach was also adopted on this project. The attribution of the observed results to the CVR project was the central focus, to understand more fully the impacts, or contribution, of the project. A two stage approach was adopted:
- First, the logic mapping for the project was annotated to show the outturn results; and
 - Secondly, consultation was undertaken with key stakeholders to generate a consensus on project impacts.
- 8.30 Figure 8.2 presents the project level logic map, annotated with the available results data. A RAG classification has been adopted to assist in highlighting where causal pathways have achieved their anticipated objectives.
- 8.31 The opening of the new station at Energlyn has, as noted above, resulted in improved accessibility levels for the local population. Although the passenger surveys noted a relatively small shift from car to rail, such results were in line with the direction of the project objectives. Furthermore, although no direct evidence was

available, the project is assumed to have enhanced social inclusion through these accessibility enhancements. However, it should be noted that the increase in local population through recent development will also have contributed to this result.

- 8.32 Two important first order behaviour changes were the increase in awareness of rail services and, linked to this, an increase in those choosing rail as their mode of transport. The latter has been, in part, confirmed through the shift in commuting mode from car to rail. However, no empirical evidence was available to confirm a positive shift in the profile and awareness of rail across the local population. Discussions with stakeholders did indicate that this was occurring, although there was also no evidence to support an increase in the perception of rail services (the assumed second order change).
- 8.33 A positive result in line with expectations was the use of Energlyn station, which generated approximately the forecast passenger trips (167,000). However, the higher percentage of trips abstracted from stations such as Aber contributed to a lower than forecast net increase in passenger kilometres.
- 8.34 A key constraint in achieving the longer term results, particularly influencing modal share across a wider population, has been the frequency and scheduling of the train services. The two trains per hour, at irregular frequency, will be impacting on potential passenger perceptions of rail services and the relative competitiveness of the central valleys line.

Figure 8.2 CVR Logic Mapping and Results



9. Cross-Cutting Themes

9.1 The European Commission requires that all projects qualifying for EU funding must incorporate the following cross-cutting themes to help contribute towards a well-balanced, sustainable and innovative economy:

- Equal opportunities;
- Environmental Sustainability; and
- Value for money.

9.2 This section of the report brings together the evidence presented elsewhere in this evaluation to establish how the project has contributed towards each of these themes.

Equal Opportunities

9.3 Equality is at the heart of Welsh Government and European Policy and this placed requirements on contractors to ensure that correct processes were in place for engaging with equality impact groups. Welsh Government officers felt that the level of understanding within Network Rail regarding these requirements was not at the level that it should be. However, the evaluators did not identify any specific equality issues which affected this project negatively.

9.4 No evidence was available to the evaluators through which to assess the extent of equal opportunities monitoring undertaken as part of this project. However, a qualitative assessment of the equality benefits identified in the business case has been undertaken. Table 9.1 presents the outputs of this assessment.

Table 9.1: Equality summary

Measure	Business Case	Final Evaluation
DDA Accessibility	The scheme will benefit people with a physical disability as Energlyn and Tir-Phil Stations will be built to DDA standards.	Both schemes are designed to be DDA compliant, and will have achieved this once Tir-Phil is complete.
Accessibility	Improved accessibility by rail will increase the opportunity to travel by public transport, especially in North Caerphilly. This will enable travel by the young and elderly.	Increased population within walking distance to a station, but no evidence available regarding particular age groups.
Information	Information at the new and improved station will be in Welsh and English and information on the trains is also in both languages. This will support diversity and culture.	This has been achieved.
Social Inclusion	Some residents suffering economic inactivity and social and multiple deprivation may benefit as the scheme will provide improved access to jobs and services in Caerphilly and Cardiff from north Caerphilly and Rhymney, where there are higher than average levels of inactivity and deprivation.	Some limited evidence of accessing employment by rail, but limited on the contribution of Central Valleys to observed behaviour change.
Human Rights	The scheme will support Human Rights by increasing the availability of rail as an option for travel and enabling access to more services and facilities.	Achieved.

- 9.5 Both projects aimed to achieve full DDA compliance, to ensure that both stations were accessible to all users, although works on the pedestrian ramp at Tir-Phil were still ongoing at the time of evaluation. Customer information at both stations were provided in both English and Welsh.

- 9.6 Further engagement between Network Rail and Welsh Government would have been beneficial to ensure that the equality impact requirements stipulated by Welsh Government and WEFO are fully understood and complied with. The Programme Management Board established in January 2014 is considered by the evaluators to have provided the forum for such issues to be discussed.
- 9.7 To ensure that equalities issues are given sufficient consideration as part of project delivery it is recommended that Equality Impact Assessments are undertaken at the start of projects to ensure that any identified issues can be 'designed out', reducing risks associated with issues identified at the later stages of project delivery. The Equalities Impact Assessment undertaken as part of the Energlyn project was considered particularly good by stakeholders and may represent an appropriate approach to be adopted for other projects.

Environmental Sustainability

- 9.8 Objectives for the CVR project outlined in Section 1 of this report included reducing levels of car use, reducing congestion and carbon emission levels are reducing road haulage of goods and encouraging rail freight. These objectives are directly related to improving environmental sustainability. The scope of this final evaluation did not include a full ex-post impact evaluation; therefore it is not possible to ascertain the extent to which these objectives have been achieved. The current lack of additional rail services operating to Energlyn and Tir-Phil stations is likely to have limited the environmental sustainability benefits achieved to date. However, the project has provided the additional network capacity required to facilitate these outcomes once additional service frequency is achieved.

Value for Money

- 9.9 As part of the process evaluation, interviews undertaken stakeholders were asked for their views on the extent to which the CVR project represents value for money. The consensus was that the project was able to achieve value for money through achieving synergies with the CASR project. It was felt that this helped to significantly reduce the cost of the project compared to delivering the CVR project in isolation. With the planned service improvements currently not in place, the economic benefits achieved by the scheme are limited to those benefits associated with the new station at Energlyn, as well as the reliability benefits for existing services which are able to utilise the passing loop facilities at Tir-Phil to improve operational efficiency.

10. Conclusions

- 10.1 The final evaluation of the CVR project considered performance in relation to its stated aims and objectives, and determined which aspects of project delivery led to positive outcomes. The barriers and constraints that the project experienced and the lessons learnt in dealing with these were also assessed. The process evaluation considered five key areas of project performance; Finance, Schedule/Programme, Stakeholder Engagement, Risk Management and Project Management.
- 10.2 The CVR project was delivered within the updated forecast budget, although some variance was observed in forecast costs during implementation. The monthly finance meetings between Welsh Government and Network Rail were an effective approach to manage project costs. Key challenges experienced included ground conditions at Tir-Phil, and the need to re-mobilise resources in an elongated implementation programme.
- 10.3 The project was procured and commenced construction later than forecast, and significant project delays were experienced on Tir-Phil, partially attributed to issues with ground conditions leading to the need to underpin a road bridge and delaying completion of a pedestrian ramp.
- 10.4 A key driver for this project was the maximisation of the benefits associated with the £220m CASR programme. This very significant parallel project provided the opportunity for the Tir-Phil project to be implemented through offering economies of scale. However, the programme synergies with CASR introduced programme delays which in turn impacted significantly on the CVR project. Whilst the Energlyn project, delivered separately from CASR, was delivered to schedule Tir-Phil was significantly delayed and currently remains incomplete; highlighting the risk of aligning the project with CASR.
- 10.5 A key issue which affected the benefits achieved by the project was the fact that the planned service improvements were not implemented at the time of evaluation. Despite this lack of service improvements the operators have been able to make use of Energlyn station and the new platform at Tir-Phil with existing services and to make use of the Tir-Phil passing loop to provide additional network resilience.
- 10.6 The level of stakeholder engagement varied across the project. Engagement and liaison between strategic delivery stakeholders, such as Welsh Government, Network Rail and Arriva Trains Wales, was good, enhanced by the introduction of

the Programme Management Board in early 2014. The Welsh Government and WEFO Rail Programme Board was also considered effective by stakeholders, a view endorsed by the evaluators. The approach to public engagement for Energlyn was considered by stakeholders to have been good. However, for Tir-Phil consultation was considered to have been less effective, with some complaints received regarding delays to project completion.

- 10.7 The identification of risks was extensive in the GRIP 3 reports. However, details regarding the cost and time impacts and mitigation measures identified were limited, with some identified risks transpiring and causing significant delays, notably issues relating to ground conditions at Tir-Phil. The approach to risk management and mitigation adopted during implementation was considered by stakeholders to be varied in quality. Improved visibility and mitigation were identified as key areas for improvement.
- 10.8 The overarching management and oversight of the project was significantly enhanced by the introduction of the Programme Management Board in January 2014. This monthly meeting increased the level of scrutiny across project delivery.
- 10.9 The Energlyn station generated passenger journeys in line with the business case forecasts. However, a higher proportion of these journeys had been abstracted from adjacent stations such as Aber. This, and a lower than forecast average journey distance, resulted in a significantly lower net increase in passenger kilometres.
- 10.10 The cross-cutting themes were evaluated and the CVR project provided fully accessible facilities (once the DDA compliant pedestrian ramp still under construction is completed) for all potential users, alongside bi-lingual information.

11. Recommendations

- 11.1 This final evaluation has identified a number of lessons for future projects which could help in improving project delivery for future rail projects in Wales. These recommendations are listed below in relation to the key areas of project delivery analysed as part of this process evaluation.

Finance

- 11.2 To ensure the accuracy of GRIP 3 estimates and ensure that suitable levels of optimism bias are included in these estimates; a figure of 40% is best practice for UK transport ex-ante evaluations¹³.
- 11.3 Conduct site survey work, including ground investigations, earlier for complex sites, even if not required by the GRIP process, to assist in mitigating risks or factoring in the cost of additional works.
- 11.4 Consider the efficiencies and economies of scale that can be achieved with other projects when planning and designing a scheme, including detailing the potential programme and cost risks of delayed implementation.

Schedule/Programme

- 11.5 It is important that the interdependencies between projects are well defined at the pre-construction phase, with mitigation put in place to avoid delays being cascaded from one project to the next. Additionally, putting sufficient time contingencies within the project could assist with reducing delays.
- 11.6 Enhanced involvement from all delivery teams responsible for the development of Business Plans would assist in ensuring a more realistic programme of delivery.

Stakeholder Engagement

- 11.7 The development of project specific stakeholder management plans. These would allow project specific issues likely to be of consequence to stakeholders to be communicated and managed in an effective way. Such plans would also define the proposed means and timing of engagement for each stakeholder group, including the public.
- 11.8 Early engagement between Network Rail and Welsh Government/local councils to ensure that the equality impact requirements are fully understood and complied with

¹³ WebTAG Unit A1.2 – Scheme Costs and Unit A5.3 – Rail Appraisal

as part of their implementation. The newly established PMB or Tactical Review Meeting should be used to ensure that this is achieved.

Risk Management

- 11.9 The review of risks should be added to the Tactical Review Meeting (see Section 7) to ensure that risks are visible and the planned mitigation is agreed. The review should consider new or escalated risks as by exception, to ensure that this approach remains practical.
- 11.10 For interlinked projects in the future it would be appropriate to produce a shared risk register to consider the interconnections between risks.
- 11.11 Sufficient time contingency should be added to future project programmes where new technologies are proposed to mitigate these impacts.
- 11.12 Early site investigations should therefore be undertaken for future projects where difficult ground conditions are predicted, with sufficient time and cost contingency in place to mitigate this risk.

Programme Management

- 11.13 Enhanced monitoring and evaluation activities should be undertaken for future projects. It is recommended that a data collation/collection plan be agreed between WEFO and the project team, to sit alongside the monitoring plan prepared for the business case. This would help to ensure that all required data is available for the interim and final evaluations. Logic mapping should also be prepared as part of the ex-ante business case or the aforementioned monitoring plan, to assist in identifying data requirements.
- 11.14 Project monitoring should commence with a baseline exercise to collate before implementation data, such as passenger demand (per line or station) and service frequencies. Where more than one year has elapsed between business case approval and project implementation, a review should be undertaken of the business case demand forecasts and assumptions to ensure that the baseline position reflects fully the base year.
- 11.15 An interim process evaluation should be undertaken to identify any systematic issues with project delivery, allowing improvements to be made during the duration of project delivery. This will also enhance the quality and data availability of the final evaluation consideration of project delivery issues.

- 11.16 An interim impact evaluation should also be undertaken, focusing on longitudinal datasets that are readily available; passenger data for example. It should be recognised that project implementation may generate disruption to services, but it remains important to consider changes in data to identify the potential impact of contextual factors. The interim impact evaluation should also collate all data required for the final evaluation. The logic mapping should be reviewed at the interim stage, and updated as necessary. Interviews with stakeholders and available quantitative data should be used to review and update the causal pathways. .
- 11.17 The final evaluation should include a full review of the project delivery, business case assumptions, outturn results and use logic mapping to consider the contribution of a project. It should build on the results of the interim evaluation.
- 11.18 Enhancements to specific data collection and analysis activities are also recommended. This should include the monitoring by contractors and Network Rail of the number of employment opportunities created during construction. Estimates of the net employment benefits to the local and regional economy should be undertaken at both the interim and final evaluation stages. This should include an agreement between Welsh Government and Network Rail on the levels of leakage and displacement.
- 11.19 Consideration should be given to introducing a programme level monitoring and evaluation activity, through which to track progress and ensure that the above recommendations are undertaken. This group or process would also enable a meta-evaluation of specific issues, such as the wider contribution of ERDF supported rail schemes to local employment and accessibility. This reflects the fact that some indicators, such as wider economic impacts, are better evaluated at the programme/route rather than project level.

Annex A – Passenger Survey Results

Methodological Overview

As part of the evaluation of Energlyn and Churchill Park station AECOM conducted surveys with passengers boarding trains on the station. To gain a composite view of passenger behaviour on the station, fieldwork was conducted on one weekday and one weekend day (Saturday) in May 2015. This section of the report presents the results of the study, making some comparisons between the two fieldwork days.

Interviews were conducted with all outbound train boarders on the station on the weekday and with around 95% of boarders on the weekend. A total of 226 interviews took place: 139 interviews were conducted as part of the weekday fieldwork and 87 were conducted during the Saturday. Both the northbound and southbound platforms were covered but the majority of interviews were conducted on the busier Cardiff bound (southbound) platform.

All respondents were then invited to take part in a follow up self-completion survey which was hosted online in both English and Welsh languages. We also provided paper questionnaires for those who wished to complete the survey via this method and then hand or post the survey back to us. There were twelve completed surveys: ten of these were conducted via the online version of the questionnaire and two respondents completed the survey on paper.

Passenger Profile Survey- Key Findings

A short profile questionnaire was conducted with all boarders, covering the following key questions: method of travel to the station and the reason for their journey, whether the respondent was making the same journey before Energlyn and Churchill Park station opened, and if they were what mode they used to complete this. We also collected demographic information (age Table A1 and gender Table A2) from all passengers.

Table 0.1 Demographic breakdown

Q5 To which of these age groups do you belong?	Total (226)	Weekday (139)	Weekend (87)
16-24	76	45	31
	34%	20%	14%
25-34	74	47	27
	33%	21%	12%
35-44	29	24	5
	13%	11%	2%
45-59	38	21	17
	17%	9%	8%
60 and over	5	1	4
	2%	0%	2%
No answer	4	1	3
	2%	0%	1%

Table 0.2 Gender Breakdown

Q6a Gender (by observation)	Total (226)	Weekday (139)	Weekend (87)
Female	92	57	35
	41%	41%	40%
Male	123	78	45
	54%	56%	52%
No answer	11	4	7
	5%	3%	8%

It was found that the majority of passengers travel to the station on foot; 78% stated they walked there on the Wednesday as did 89% on Saturday. While driving to the station and parking on the designated car park was the second most used mode it only accounted for 14% of journeys to Energlyn and Churchill Park station on the weekday and by less than one in ten (7%) of those interviewed during the weekend fieldwork. All other modes (cycling, bus and travelling as a passenger in a car to the station) were used by less than 5% of all passengers.

In terms of reasons for travel, two thirds (65%) of those travelling on the weekday stated they were commuting to their place of work via Energlyn and Churchill Park station; unsurprisingly this fell to 23% amongst those using the station during the weekend fieldwork. Shopping was the most given reason for travel on the weekend (24% cited this), 22% said they were travelling for leisure or recreational purposes, 15% were meeting family or friends and 13% said that they were travelling home.

In total just over seven in ten (72%) of all passengers using Energlyn and Churchill Park station were making the same journey before the station opened in December 2013. It was found that the majority of these passengers had been previously travelling by train, boarding at another station on the line (74% of those interviewed on the weekday told us this, as did 81% of those interviewed during the weekend fieldwork). Of all of those who previously boarded the train elsewhere across both fieldwork days Aber was the most used; cited by 69% of passengers who previously boarded the train elsewhere. A further, 26%, said that they previously used Caerphilly station.

Llanbradach, Pengam and Pontypridd were also cited but were used by a small minority totalling 5% of all passengers who previously used another station.

In terms of mode shift, although the bases are low for other modes used to complete the journey before Energlyn station opened, just over half of the 18 respondents who said they previously made their journey by car now walk to Energlyn Station to board the train instead as do 13 of the 14 respondents who previously made their entire journey by bus.

Passenger Self-Completion Survey- Key Findings

As mentioned previously, the self-completion survey received 12 responses. These results can only therefore be seen as indicative, and as such we cannot present the findings as percentages; all of the numbers shown represent responses.

Nine of the 12 respondents who took part said that they were making their journey to work when we approached them to take part in the survey. Obtaining a new job was the most cited reason for starting to use Energlyn and Churchill Park station; six respondents gave this reason. When we asked to what extent the opening of the station had influenced their decision to apply for a new role, five out of the six respondents stated that it had influenced them 'a great deal' - the remaining respondent said that it had no influence. Convenience was the second most cited reason for starting to use Energlyn and Churchill Park station - four respondents gave this response.

Respondents were also asked to rate Energlyn and Churchill Park station across certain attributes. In terms of the highest rated elements of the station, all of 12 respondents said that they were satisfied with access to and from the station, the visibility and lighting on the station and the station's level of cleanliness. Nine of the 12 respondents said that they were satisfied with the level of protection from the weather provided by the station, with three respondents giving a neutral response.

Car and cycle parking facilities were the only elements to gain a 'don't know' response - presumably from those who haven't made use of them. Of those who gave a satisfaction rating for Energlyn station's provision for car parking, six said that they are 'very satisfied' with it - there was one negative response. Five respondents said that they are very satisfied with the cycle parking facilities on the station.

Staff availability and helpfulness of gained the highest neutral response of all of the elements that were rated. The same two respondents said that they were dissatisfied with staff availability and helpfulness of staff.

Respondents were also asked to what extent they agreed with attitudinal statements regarding their behaviour since the station was opened. Eight out of ten respondents said that they agreed strongly that they have reduced their car use since the station opened. Eleven of the 12 respondents said they agreed that the station has made it easier for them to access places further afield, with six of those agreeing strongly with this statement. Ten out of the 12 respondents agreed that the station has made their commute easier, and nine agreed that they use the train more now than they did 12 months ago. When respondents were asked to rate Energlyn station overall (excluding the quality and level of train services) out of ten we found that the general response was positive - the lowest rating gained was a six out of ten.

Annex B – Technical Review of Business Case

Introduction

AECOM has reviewed the Central Valleys business case submission prepared by consultants on behalf of the Welsh Government. This review has been undertaken to determine the accuracy of the parameters and input assumptions used to prepare the original demand and revenue forecasts in 2010 and were based on 2007 data. This assessment will determine whether it would be advantageous to refine these assumptions or the approach used to inform future forecasting.

Comparison of the Results

The starting point for this assessment is a comparison of the outputs produced in 2010 by the Welsh Government's consultants versus the actual results analysed by AECOM. As discussed in the main body of this report, the frequency enhancements between Bargoed and Rhymney have not been delivered, and the numbers of passengers using the new Energlyn and Churchill Park station are below forecast.

Several factors may have contributed to the differences. The remainder of this appendix reviews the contributory factors to the Energlyn forecast which have been sub-divided into the following areas:

- Timetable issues;
- Socio-economic factors used to populate the trip rate modelling;
- Journey time and fare assumptions also used in the trip-rate modelling;
- Sensitivity to frequency issues;
- Factoring for non-Cardiff/Newport journeys;
- Ramp-up factor;
- Abstraction for other stations;
- Underlying passenger growth rates;
- Journey length;
- Modal shift;
- Operating costs and subsidies;
- Capital costs; and
- Appraisal.

The suitability of individual parameters and datasets applied in the business case has been compared with the more recent data to inform this assessment. A commentary reviewing the differences is given, as well narrative of the consequences of applying the alternative assumptions in the overall forecasts.

Timetable Issues

Table 9 from the 2010 business case report summarises the proposed timetable for the Rhymney Line. This describes the proposed service timings for the frequency enhancements between Bargoed and Rhymney, plus the extra stops at Energlyn. Four trains per hour were assumed to stop at Energlyn in Table 9. The winter 2014 timetable (December 2014 to May 2015) comprises some important differences versus the business case assumptions. Firstly, there is only an hourly service to Rhymney for the majority of the day. There is a finite fleet of trains available for ATW therefore Rhymney cannot be served by 2tph until further trains are procured and / or rolling stock is diverted from other routes.

Instead of the four trains per hour calling at Energlyn, there are just two services each hour operating at present. This lower frequency is further exacerbated by the bunched scheduling. For example, the timing of the trains is not evenly distributed, with a 15 and 45 minute gap between trains each hour. This pattern is less convenient compared with 2tph every 30 minutes apart. The bunching is driven by the time needed to 'turn around' the train at its destination (Bargoed or Rhymney) and come back in time to reliably meet its 'slot' on the congested approach to Cardiff. The 'turnaround time' on two of the three services reversing at Bargoed is too tight to allow for a slightly later arrival having stopped at Energlyn on the way up, turn around, then leave slightly earlier to allow time to stop at Energlyn on the way back.

The demand forecasts for Energlyn are presented as a range (257,500 to 365,300) in the business case report, which are assumed to represent the low and high growth forecasts outputs. It is assumed that the 334,751 trips shown in the summary table of the business case report represents the 'middle' growth scenario. If Energlyn is served by 2tph in the peak and an hourly off-peak service due to signalling limitations, the range of forecasts drops to 127,369 to 180,699.

Table B1: Summary of the Standard Hour Timings (Southbound)

Station	Standard Hour Timings							
	Business Case				2014			
Rhymney		08.59		09.28				09.27
Tir-Phil		09.09		09.38				09.35
Bargoed	09.01	09.16	09.31	09.46	09.00	09.17	09.32	09.45
Pengam	09.06	09.21	09.36	09.51	09.05	09.22	09.37	09.50
Energlyn	09.20 ½	09.35 ½	09.50 ½	10.05 ½	09.20	-	-	10.05
Caerphilly	09.25	09.40	09.55	10.10	09.25	09.39	09.55	10.10

Source: AECOM analysis of the business case, Arriva Trains Wales timetable winter 2014

Table B2: Summary of the Standard Hour Timings (Northbound)

Station	Standard Hour Timings							
	Business Case				2014			
Caerphilly	08.21	08.36	08.51	09.06	08.21	08.36	08.51	09.06
Energlyn	08.24	08.40	08.55	09.09	08.25	08.40	-	-
Pengam	08.39	08.55	09.10	09.24	08.40	08.55	09.08	09.23
Bargoed		08.59		09.30	08.52	09.00	09.16	09.31
Tir-Phil		09.08		09.37		09.08		
Rhymney		09.18		09.48		09.18		

Source: AECOM analysis of the business case, Arriva Trains Wales timetable winter 2014

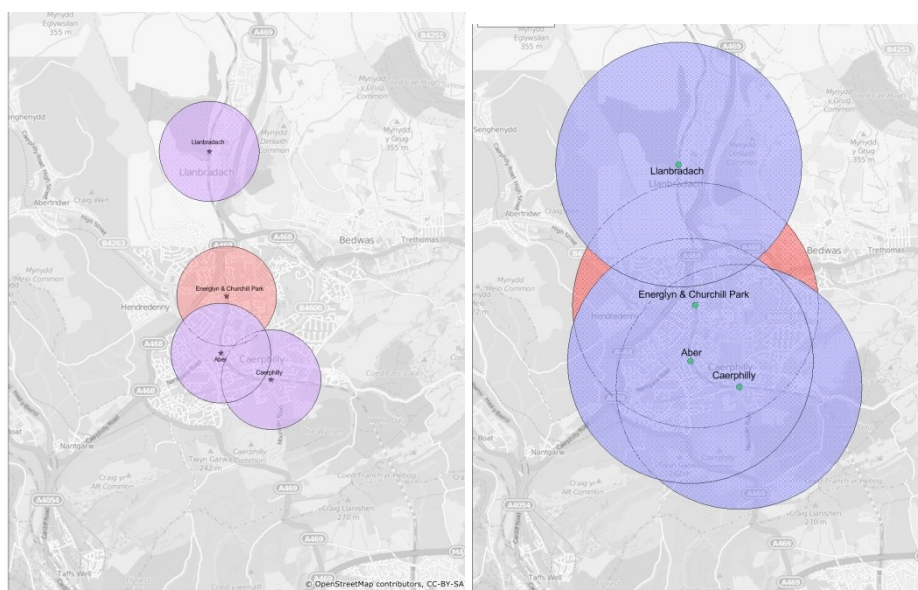
Conclusion: the current service pattern to/from Energlyn is constrained by the signalling capability. However, the combination of the lower number of trains calling at the station, together with a non-standard pattern of departure times, is expected to have significantly contributed to the lower number of observed trips compared with the 2010 forecasts.

Socio-economic data

The original business case study was produced using 2001 Census data, supplemented by estimates of population growth up to 2016 due to new housing developments in the vicinity of Energlyn and Churchill Park station. In the meantime, several new datasets have become available including the 2011 Census. It is worth noting that one of the largest housing schemes mentioned in the business case (200 dwellings between Mill Lane and Lewis Drive) was under construction in early 2015, but is expected to be occupied in line with the forecasts by 2016.

Table B3 compares the 2001 and 2011 Census data for several key metrics. This information is compared for the four catchments most affected by the opening of a new station either directly (Energlyn) or as a result of abstraction from neighbouring stations (Caerphilly, Aber and Llanbradach). The results highlight that the population catchments in all four areas has increased apart from Llanbradach where the population within 800m and 2km reduced. The population growth affecting the adjacent Energlyn catchment may have contributed to this change. Figure B1 illustrates the 800m 'as the crow flies' catchments for Caerphilly, Aber and Energlyn stations. There is some overlap between the Energlyn and Caerphilly/Aber catchments, with only the area to the north Energlyn not previously served by a station.

Figure 0.1 800m/2 km 'as the crow flies' catchments



The socio-economic data for Energlyn highlights that the number of households in both the 800m and 2km catchment areas has increased between 2001 and 2011. Similarly, the number of people in employment living in the catchment increased between 2001 and 2011. Data for employment located within the catchment (independent of the place of residence of the employee) is not readily available. Car ownership levels have also increased, but the percentage change is smaller compared with the other factors.

The red areas on the above maps account for an estimated 5319 people (800m catchment) and 274 people (2km catchment). This is an increase over the purple areas (allowing for overlaps) of 42% and 0.5% respectively.

It is possible to conclude from the updated Census data that the additional jobs and population adjacent to the station would have increased the likelihood of achieving the original forecasts.

Table B3: Census data

Data Input	2001 Census	2011 Census
Population: 800m catchments	<ul style="list-style-type: none"> • Caerphilly: 3,388 • Aber: 6,924 • Energlyn: 6,000 • Llanbradach: 2,059 	<ul style="list-style-type: none"> • Caerphilly: 5,220 • Aber: 8,077 • Energlyn: 7,565 • Llanbradach: 1,763
Population: 2km catchments	<ul style="list-style-type: none"> • Caerphilly: 20,197 • Aber: 25,259 • Energlyn: 29,405 • Llanbradach: 11,827 	<ul style="list-style-type: none"> • Caerphilly: 23,666 • Aber: 28,204 • Energlyn: 33,543 • Llanbradach: 10,990
Socio-economic indicators: 800m catchment of Energlyn station	<ul style="list-style-type: none"> • Households: 2,474 • Employment: 2,221 • Unemployment: 199 • Households 0 car: 787 • Households 1 car: 1,182 • Households 2+cars: 505 	<ul style="list-style-type: none"> • Households: 2,951 • Employment: 2,766 • Unemployment: 271 • Households 0 Car: 846 • Households 1 Car: 1,410 • Households 2+ Cars: 695
Socio-economic indicators: 2km catchment of Energlyn station	<ul style="list-style-type: none"> • Households: 11,920 • Employment: 12,219 • Unemployment: 775 • Households 0 car: 3,247 • Households 1 car: 5,459 • Households 2+cars: 3,214 	<ul style="list-style-type: none"> • Households: 12,830 • Employment: 13,230 • Unemployment: 1,094 • Households 0 Car: 3,155 • Households 1 Car: 5,916 • Households 2+ Cars: 3,759

Source: AECOM analysis of the Jacobs business case and 2011 Census

Conclusion: AECOM's review of the 2011 Census data indicated that the population totals were higher compared with the modelling inputs produced in 2010. This outcome should increase the likelihood of achieving the forecasts issued in 2010.

Journey Time and Fare Assumptions

Table B4 compares the journey time and cost assumptions used to populate the trip rate model. Individual inputs have been reviewed to determine whether the inclusion of more recent data would have materially altered the relative competitiveness of rail versus car or bus. A combination of data from the Travel Cymru and national rail websites has been used to inform these comparisons. First, the journey time data for 2014 appears to be largely unchanged compared with the original assumptions outlined in the 2010 report.

Actual average fares paid per one-way journey (derived from Lennon data) have been different from those forecast, even allowing for price inflation, with local fares to Cardiff (the dominant market) less than forecast, and those to Newport higher. The Cardiff figure indicates a higher than expected proportion of annual season tickets and other fares offering a discount over the basic adult single fare. This reflects ATW's policy in recent years of using the permitted flexibility in fares regulation to increase the attractiveness of season tickets, and the growth in employers facilitating the use of season tickets through loans. It should also be noted that the Lennon system credits the rail operator with a year's worth of journeys on the day an annual season ticket is purchased, although the revenue is spread across the year.

The Newport figure is higher than forecast, also reflecting regulatory fares policy on the route, in particular the use by ATW of 'flex' to implement higher increases to make up for a significant fares drop in 2005 due to a 'fares war' on the route between them and First Great Western.

Although the average fare paid to Newport is higher than the forecast, this market segment generates a very small proportion of the total journeys and hence will have a modest impact on the total revenue.

Based on the above conclusions, any differences between the journey time and cost data used in the 2010 report versus the observed data in 2014 should not contribute to any material differences between the results presented in the business case versus the observed totals.

Table B4: Summary of the Journey Time Inputs

Data Input	Assumption	Actual 2014	Commentary
Parking at the station	None available	17 spaces provided	Marginal increase expected
Bus frequencies to Cardiff	2 bus per hour	2 per hour	Frequencies are unchanged compared with the assumptions
One-way average fare to Cardiff	£2.00 (2007 prices, £2.59 in 2014 prices)	£2.42	Even allowing for inflation, the average fare is still lower than would be expected, indicating a high proportion of discounts from the full adult single fare
One-way average fare to Newport	£3.60 (£4.65 in 2014 prices)	£5.05	Regulatory policy of above inflation fares rises may reduce attractiveness of rail, however small proportion of overall market
Rail journey time to Cardiff	24 minutes	24 minutes	This journey time has been achieved
Rail journey time to Newport	49 minutes	49-54 minutes	The interchange time at Cardiff Central determines the overall travel time

Source: AECOM analysis of the Jacobs business case, Travel Cymru, www.nationalrail.co.uk

Conclusion: the comparison of current journey time and fares confirms the assumptions collated to support the 2010 modelling offered an accurate estimate of future travel conditions.

Sensitivity to frequency

The business case presents results for sensitivity tests if the service frequency to Energlyn was initially lower as a result of limited signalling capability. Compared with the results based on 4tph, the report assumed about 70% of the peak demand would be retained if only 2tph operated, with 30% retained with 1tph in the off-peak. The overall total demand would be 50% lower. To achieve the forecast change in demand, this implies the peak/off-peak split for journeys is 50/50.

Generalised journey time (GJT) should be used to take estimate the impact of frequency changes. The calculation of the GJT includes time spent on the train too. Using assumptions in the Passenger Demand Forecasting Handbook (PDFH) for a notional trip from Energlyn to Cardiff, it is estimated that demand would be lower by 11% and 23% for the reduced and full/season ticket passengers respectively if 2tph operated rather than 4tph. Furthermore, there would be a 30% and 54% change for the reduced and full/season ticket passengers in the off-peak if just 1tph operated. With the report indicating that demand would fall by 30% and 70% during the peak and off-peak periods respectively, the estimates presented in the 2010 business case do not appear consistent with the PDFH.

To assess the accuracy of the peak / off-peak split of passengers, the timing of trips boarding Rhymney Line services was estimated using 2014 data derived from the rail industry Moira modelling tool. This demonstrated 72% of trips boarded during the peak period, rather than the 50% forecast.

Conclusion: There is limited information presented describing the functionality of the trip rate model. However, AECOM has some concerns regarding some of the inputs. The methodology for adjusting demand if a reduced service frequency was initially introduced at Energlyn does not appear consistent with the PDFH guidance. However, these differences will only apply for a short period and hence have a small impact on the overall forecasts.

Factoring for non-Cardiff/Newport journeys

Lennon ticket sales data has been examined to determine the actual factor needed to uplift the Cardiff and Newport demand figure to cover all other journeys. For Energlyn, this is 1.35, relative to the 2.46 that would appear to have been applied in the business case. The Energlyn figure is in line with nearby stations without booking offices. The application of a lower factor to represent these 'other' trips has two major consequences. The overall number of forecast trips will be lower, whilst the average journey length will be affected if the adjustment for 'other' trips is also reduced.

Conclusion:

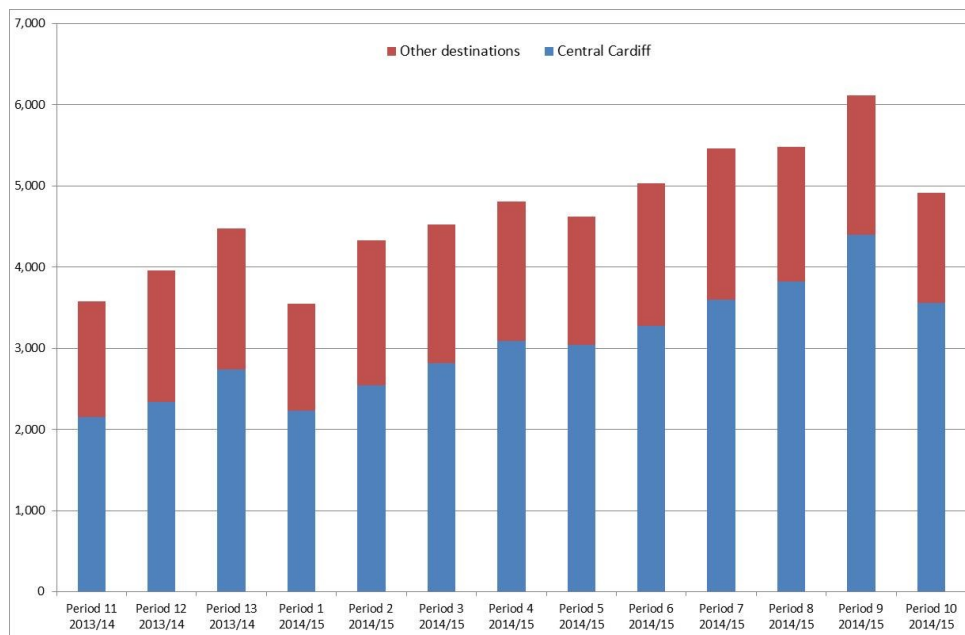
The adjustment factor used to uplift the modelled journeys to/from Cardiff and Newport to cover all other journeys appears to have been significantly overstated.

Ramp-up factor

A 'ramp-up' factor is typically applied to adjust the first year demand forecasts to reflect the time lag for passengers to become aware of the new station and adjust to the new journey opportunities available. In accordance with PDFH guidance, a value of 70% is typically used in Year 1, although no factors are referenced in the 2010 business case report. Applying this ramp-up factor would therefore mean 'steady state' station usage at Energlyn 43% higher than the first year of opening figures.

This ramp up is evident from 4-weekly periodic data, as shown in Figure B2. With the exception of Period 1 2014/15 (which coincides with the Easter period), demand increased from about 3,700 trips per four week period to 6,100 journeys by Period 9 (early November to early December). The total for Period 10 drops to about 5,000 trips, due to the Christmas break and hence a reduction in commuting trips.

Figure B2: Total Number of Journeys per Period



Source: AECOM analysis of Arriva Trains Wales Lennon data – journeys from Energlyn

In response to the absence of ramp-up factor in the original business case shortfall, the relevance of applying an alternative ramp-up factor to the PDFH guidance has been examined. For example, are newly opened stations in South Wales affected by a steeper ramp-up profile compared with examples elsewhere in the UK? Patronage data derived from ticket sales for the Ebbw Vale Line has been reviewed to understand whether any of these stations had steeper ramp-up profiles compared with the PDFH guidance. This outcome would mean journey patterns at selected stations take longer to adjust compared with other stations. It should be noted that zonal fares apply on the Ebbw Vale line. Therefore, there may be some discrepancies between ticket origins and actual origins, as discussed in the main report above.

With stations on the Ebbw Vale Line reopening in February in 2008, the first full year of operation was 2008/09. The passenger numbers using each station for subsequent years to 2013/14 was calculated as a percentage versus 2008/09 to understand the profile. This analysis indicates that Ebbw Vale Parkway, Newbridge, and Risca & Pontymister had achieved about 85% of their 'mature' Year 4 demand by the end of Year 1. In contrast, Cross Keys and Llanhilleth had only achieved 55-60% of their Year 4 'mature' demand by the end of Year 1. If the demand profile for Energlyn is similar to Ebbw Vale, Newbridge or Risca, this would be a concern for Energlyn. Alternatively, if the new Rhymney Line station achieved a profile which is comparable to other examples on the Ebbw Vale Line, Energlyn

would then achieve its forecasts based on the reduced signalling capability. Observed data for the next 12 months is needed at Energlyn to understand which profile is applicable.

Table B5: Summary of Station Usage for the Ebbw Vale Line

Station		2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Rogerstone	Total	71,030	92,330	101,446	98,556	101,366	115,110
	vs 2008/09	100%	130%	143%	139%	143%	162%
Risca & Pontymister	Total	101,594	99,964	107,330	103,770	100,236	108,734
	vs 2008/09	100%	98%	106%	102%	99%	107%
Cross Keys	Total	67,334	103,734	107,674	117,362	117,012	119,362
	vs 2008/09	100%	154%	160%	174%	174%	177%
Newbridge	Total	115,676	120,678	132,092	130,970	133,672	134,154
	vs 2008/09	100%	104%	114%	113%	116%	116%
Llanhilleth	Total	40,946	66,684	75,342	76,000	76,308	77,800
	vs 2008/09	100%	163%	184%	186%	186%	190%
Ebbw Vale Parkway	Total	252,414	253,946	246,718	246,102	254,956	263,538
	vs 2008/09	100%	101%	98%	97%	101%	104%

Source: AECOM analysis

Conclusion: No ramp up factor was applied in the business case. Standard rail industry guidance is available, which would be reasonable to have applied to Energlyn. A review of this guidance with respect to other new stations in south Wales gives a wide variance in results, with further observations required to ascertain the applicable profile for Energlyn.

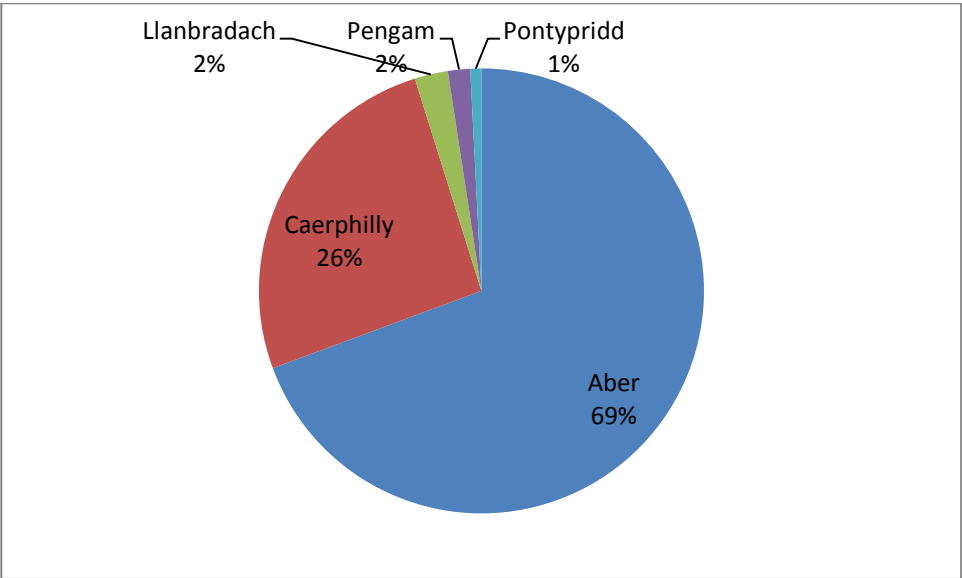
Abstraction from other stations:

The business case produced in 2010 used end-to-end journey data from the 2004 National Rail Travel Survey (NRTS) to estimate the percentage of trips that would switch from Aber and Caerphilly if Energlyn offered a more convenient choice. A total of 26,100 trips per annum were expected to transfer, or 8% of the 335,000 forecast total trips to/from Energlyn for the 4 trains per hour assumption. The figure was assumed to halve for the 2 trains per hour assumption.

AECOM's passenger survey of 226 boarders at Energlyn suggests in practice 55% of trips originating at Energlyn and Churchill Park were previously made by rail, from another station. This is backed up by anecdotal evidence from ATW during stakeholder interviews.

In practice, as discussed earlier, the service frequency is such that at certain times in the hour, Energlyn is not as convenient as other stations. Anecdotally, some people may travel out from Energlyn and return to a different station. This may not be correctly recorded in ticket sales data, so is difficult to assess. It would be expected that passengers would have more control of their outward journey, say their journey from home to work, and therefore the originating demand would be expected to be more accurate than that for passengers returning home in the evening.

Figure B3: previous station used by those previously travelling by rail



It is unclear why the abstraction rate assumed in the forecast model is so low, especially as the overlapping catchment between stations was well recognised in the population figures fed into the trip-rate model. It is also unclear from the text of the business case the precise methodology adopted, however it appears that only abstraction from Caerphilly was measured, rather than the closer station, Aber, which is where in practice most of the abstraction has been from. The small sample rate from the NRTS could also have meant the estimate of abstracted trips was miscalculated.

Conclusion: AECOM's passenger survey suggests 55% of trips were previously made from another station, compared with the 8% abstraction suggested in the business case.

Growth rates

Several growth scenarios were presented in the demand and revenue forecasting report. Low, medium and high growth scenarios were calculated for 2005 to 2016 and 2005 to 2026, as shown in Table B6. These growth rates were subsequently revised, particularly for the short term period to reflect more recent trends and then presented as a revised scenario. The compound growth rate from the revised scenario is about 45% between 2007 and 2015 which is broadly similar to the combined 'high' growth from the initial scenario.

Table B6: Summary of Potential Growth Rates

Initial Scenario			Revised Scenario					
Scenario	2005-16	2005-26	Year	Growth Rate	Year	Growth Rate	Year	Growth Rate
Low	23%	38%	2007	7.50%	2010	5.00%	2013	2.50%
Medium	35%	48%	2008	8.00%	2011	3.50%	2014	1.50%
High	46%	69%	2009	6.50%	2012	2.50%	2015+	1.24%

Source: AECOM review of business case report

However, the observed growth rate for the Rhymney Line service code was just 12.9% between 2007 and 2014, which includes several years where passenger numbers using the Rhymney Line remained virtually unchanged. This change is significantly lower compared with the average for the Arriva Trains Wales franchise (32%) over the same period. In contrast, the lines to Merthyr and Aberdare achieved a 36% and 20% increase in passenger numbers over the same period. This is mainly due to service improvements, hence would be expected.

Conclusion: the comparison of growth rates indicates observed demand for the Rhymney Line corridor 2007-2014 has been significantly lower than the forecasts presented in the 2010 business case report. With lower observed growth rates, this indicates the overall scheme benefits could be overstated.

Average journey length

Analysis of raw Lennon data shows that 73% of journeys to / from Energlyn have a destination in Cardiff (Queen Street, Central, Cathays or Cardiff Bay). Less than 2% of journeys are outside the Cardiff Valleys network. This has resulted in an average one-way

journey length for users of the station of 16.7 km, marginally over the distance between Energlyn and Cardiff Central by rail of 16.1 km.

The business case implied an average trip length of 24.3km (7.6m passenger kilometres, divided by 312,000 trips). Passengers benefiting from the Rhymney frequency improvements may have a longer trip length compared with journeys from Energlyn, although this accounts for less than 10% of the total trips. The basis of the average trip length used in deriving the overall passenger kilometres figure is not clear from the business case, but would appear to have come from the Moira model output for the Rhymney frequency enhancements, rather than any analysis associated with the new station at Energlyn.

Conclusion: the observed average journey length for passengers to/from Energlyn is 16.7km, compared to a forecast assumption of 24.3km. Even if Energlyn eventually achieves its estimated number of passengers, it will not generate the forecast number of rail kilometres and societal benefits will be reduced.

Mode shift

The business case assumed 24% of passenger kilometres would be abstracted from buses based on DfT / WeITAG data. The AECOM station passenger survey suggests in practice 6% of passenger journeys were previously made by bus. This affects the calculation of net passenger public transport kilometres.

The business case also indicates there would be a total of 2.1m fewer car kilometres using the network. This implies about 28% of trips would transfer from car which is again consistent with the DfT / WeITAG guidance. The station survey suggested in practice 8% of trips from Energlyn were previously made by car. The number of car kilometres removed from the network are therefore significantly lower than forecast, due to the lower number of total rail kilometres in addition to the lower than forecast modal shift. Furthermore, the greenhouse gases assumed to be saved as a result of the scheme will be lower.

Conclusion: Observed data suggests modal shift from bus and car are significantly lower than the assumptions in the business case which were based on DfT/WeITAG guidance.

Operating Issues and Subsidy

The service extension to Rhymney from Bargoed would require a single additional unit. This appears reasonable, given the journey time of 17 minutes from Bargoed to Rhymney. A total of 630,000 additional seats per annum are also proposed. A total of 11 trains per day in each direction would be extended to Rhymney from Bargoed. Assuming services operate six days a week, this equates to about 90 seats per service which appears reasonable based on the current rolling stock capacity. The incremental operating costs are £650,000, which seems reasonable for the train related mileage.

The fare-box revenue presented in the business case is £505,000. The business case indicates that an annual subsidy of £116,000 would be required. It is unclear whether this total assumes the revenue estimate has 'matured' and does not take account of the higher subsidy during the ramp-up period.

There are two concerns with the calculation of subsidy requirements. Firstly, the cost estimates do not appear to take account of the totals associated with maintaining an unstaffed twin platform station. Using these characteristics as a proxy, the incremental operating costs could be £120,000-150,000 per annum higher, and this additional support would need to be included in the subsidy total shown above. Furthermore, in response to the limitations affecting the demand forecasts outlined above (even if the outlined adjustments are achieved) and the inclusion of the station operating costs which appear to be omitted, the annual subsidy required based on the current revenue totals could be over four times higher than the estimate presented in the business case. A total annual subsidy of £550,000 would be required and this may have implications for the financial case for the scheme.

Conclusion: although the estimated operating costs for the service extension between Bargoed and Rhymney appear reasonable, the total does not include station operating costs for Energlyn. However, the subsidy requirements appear to be underestimated, given the revenue shortfall arising from a lower than forecast patronage.

Capital Costs

The capital costs presented in the business case are £4.62m and £7.25m for the Energlyn and Tir-Phil schemes respectively. The outturn costs for the new station was £5.77m, whilst the cost for the passing loop and station works at Tir-Phil increased to £7.74m. The higher cost estimates affecting the latter scheme resulted from the requirement to relocate utilities

adjacent to the existing platform and the additional underpinning needed to support the road bridge over the railway line. The benefit cost ratios for the two schemes will need to be revised as set out below.

Conclusion: the inclusion of the revised (higher) capital costs in the economic appraisal means the benefit cost ratio will be reduced.

Results of the Economic Appraisal

A combined benefit cost ratio for Energlyn station and Rhymney frequency improvements is presented. In addition, a series of sensitivity tests illustrate the various alternative scenarios including revised optimism bias, amended growth scenarios, removal of fuel duty escalator, and a separate assessment for Energlyn. However, only the detailed results are presented for the scenario which includes the impact of synergies from the CASR.

Table B7 summarises the results of the economic appraisal, along with the impact of various sensitivities. As well as the CASR sensitivity test, the impact of applying the alternative methodology to calculate the benefit cost ratio is illustrated. The shortage of information in the business case means it is not possible to recalculate the impact of the revised demand forecasts, lower growth rates, lower passenger kilometres removed and higher capital scheme costs. However, if this scenario was overlaid onto Scenario 3, the combined impact of these issues suggests the benefit cost ratio would be lower.

Table B7: Summary of the Economic Appraisal (£m)

	Scenario		
	1 – Core	2 – Revised Costs	3 – Amended RailTAG
Journey time	36.755	36.755	36.755
Revenue	23.078	23.078	0
Cost	-23.620	-23.620	-23.620
Subsidy	0.542	0.542	0.542
Environmental benefits	12.482	12.482	12.482
PVB	49.237	49.242	26.159
Investment costs	12.210	16.525	12.210
Subsidy	0.542	0.107	0.542
Indirect tax	2.287	2.286	2.286
Revenue	0.000	0.000	23.078
PVC	15.029	20.300	43.378
NPV	34.197	28.941	-17.219
BCR	3.27	2.43	N/A

Conclusion: AECOM has calculated the BCR using the latest methodology. This indicates the scheme would generate a weak economic case. This outcome would be exacerbated when the impact of the revised assumptions are overlaid onto the business case.

Conclusions

Applying more up-to-date data including actual results has highlighted the overall methodology and the input into the trip-rate model used in the business case to be reasonable and representative of current characteristics. The high level assumptions that

that operator would have trains available to operate an enhance service between Bargoed and Rhymney and that 4 trains per hour could call at Energlyn, were noted as a risks but have prevented the bulk of the forecast outputs having been achieved.

The comparison of factors used to derive patronage and related other data from the trip-rate output however, has highlighted some key issues:

- Under-estimated abstraction from other stations;
- Under-estimated journeys outside Cardiff and Newport, with resulting shorter average journey length;
- No ramp-up;
- Over-estimated growth assumptions (obtained for business case from external parties); and
- Over-estimated modal shift, particularly away from car.

Overall, this means the commercial and economic cases for the improvements on the Rhymney Line have been overstated. As a result, the subsidy requirement is too low if the assumptions are amended. The revised methodology to calculate the benefit cost ratio following the WebTAG revisions means the scheme now would appear to offer poor value for money. This conclusion will be further exacerbated if the impact of revised assumptions is considered, including the higher out-turn capital costs and station operating costs.

The business case demand forecasts for Energlyn appear ambitious relative to the 2007 patronage at other stations in the vicinity, particularly given the expected lack of car parking and proximity to existing stations. If forecast numbers had been met, Energlyn would have been the third busiest station on the Rhymney line in 2007. The observed totals for stations on the Ebbw Vale Line reinforce this conclusion, particularly as some of them serve significantly larger catchments than Energlyn.

It is recommended that future business cases for new stations, particularly on the Cardiff Valleys network, adopt revised assumptions regarding the factors applied to outputs from trip-rate models based on the emerging results from Energlyn, as well as new and more established stations on the Ebbw Vale line.