



Traws Link Cymru

West Wales Rail Campaign

Ymgyrch Rheilffordd Gorllewin Cymru

A NEW STRATEGIC RAIL CORRIDOR FOR WEST WALES



September 2020

Front cover: Train leaving Carmarthen station

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1. Background and Context

On the basis of a range of socio-economic indicators West Wales is one of the most deprived areas of the United Kingdom. This has been recently highlighted in *Ceredigion and Powys Collaboration: A Vision for Growing Mid Wales*, May, 2020, which points to the poor GDP (Gross Domestic Product) and GVA (Gross Value Added) within these two counties; a declining and ageing population; market failure; low pay and rural poverty. Most concerning is the projected economic decline of 3.45% during the period 2018-2040 against a projected growth in the UK economy as a whole of 7.4%. Yet this region, along with the adjacent county of Carmarthenshire, has considerable potential in terms of tourism and agriculture; it has an employment pool that could service a wide range of small and medium-scale industries; it has three university campuses and several linked colleges of further education on seven campuses; it has the National Library of Wales; the Royal Commission for Ancient and Historic Monuments; the headquarters of the S4C television channel; and it has a rich and diverse cultural history.

Unlocking this potential requires considerable inward investment, vision and planning, but a major requirement is a significant improvement in transport network, both within the region itself, as well as outward to the nearby urban centres of South Wales, the English Midlands, and Merseyside and Manchester. Poor transport connectivity and access to markets and services has been recognised as a major infrastructural weakness by previous economic assessments (see, for example, *Framework for Action Plan* produced by the *Growing Mid Wales Partnership*, 2016, and *Rural Wales – Time to Meet the Challenge*, 2017, by Baroness Eluned Morgan). Currently, the road system in Mid- and West Wales in particular is inadequate for the region’s needs, and while the existing railway links eastwards from Bangor and Aberystwyth, and east and west from Carmarthen, are both well-used, they do little to improve regional connectivity (Figure 1).

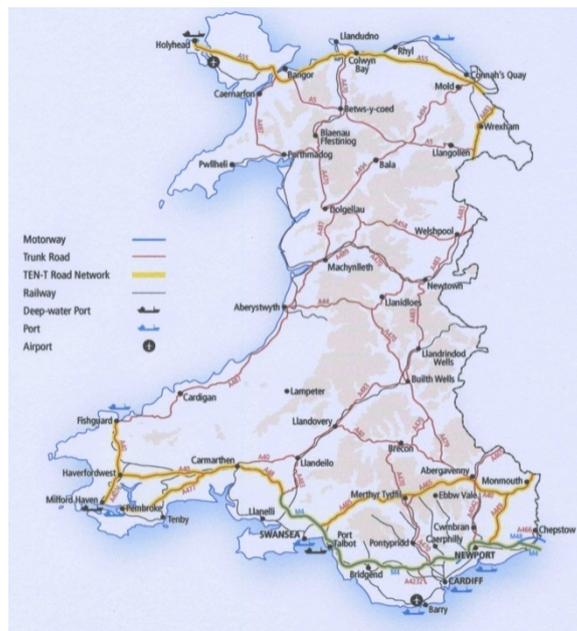


Figure 1. A road/rail map of Wales showing the large gap between Aberystwyth and Carmarthen with no railway connection and no major roads. This means that the whole area is particularly poorly served by public transport. From Welsh Infrastructure Investment Plan for Growth and Jobs, 2012. Welsh Government, Cardiff.

For the past seven years, Traws Link Cymru (hereafter abbreviated to TLC) has been campaigning to reinstate the 90 km-long railway line between Aberystwyth and Carmarthen, which was closed to passengers in 1965 under the programme of Beeching Cuts to the British rail network. It is TLC’s contention that the re-opening of this line could be a major driver in the economic and social regeneration of Mid- and West Wales. It would link a number of small towns between Aberystwyth and Carmarthen along a north-south axis (Llanilar, Tregaron, Lampeter, Llanybydder, and Pencader), while providing easier access to the major population centres of South Wales and beyond. However, TLC also envisages that, in due course, the 44 km-long North Wales rail connection between Afon Wen and Bangor would be restored which would complete the rail link between North and South Wales along the western fringe of the country (Figure 2). Quite apart from the considerable economic benefits that this would bring to West and North-west Wales as a whole, a railway line running from Bangor in the north to Carmarthen in the south would be of wider significance as this western ‘Rail Corridor’ would not only provide an important transport link between industrial South Wales and the rural north, but would also bind the country together to produce a more integrated Wales. As such, a new railway line would have considerable strategic significance.

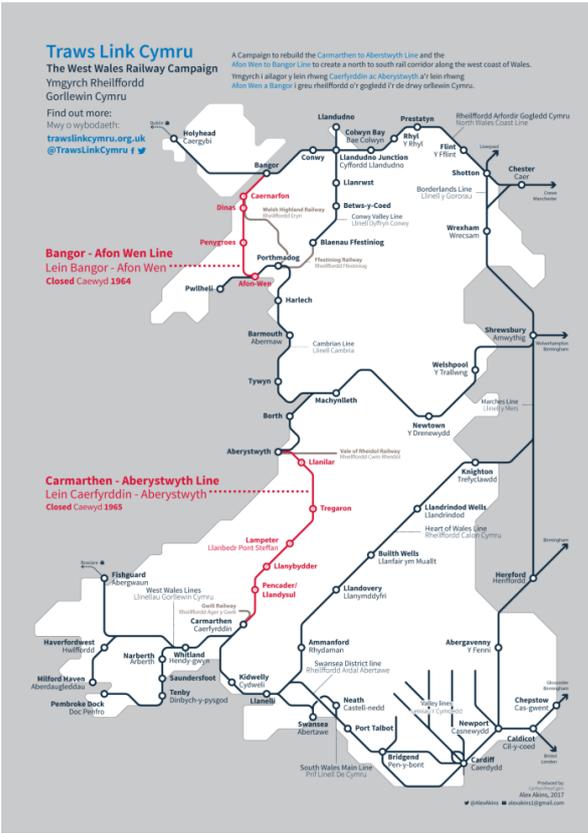


Figure 2. The Traws Link Cymru map showing the proposed new railway lines connecting North and South Wales to create a strategic West Wales Rail Corridor.

In this document we set out the arguments for re-opening these railway lines, initially in the context of recent Welsh Government Policy, and subsequently in terms of the social, economic and other benefits that we see the new railways bringing to West and North-west Wales. Although the rebuilding the northern section the line has always been a long-term ambition of TLC, the focus of the campaign to date has been exclusively on the Aberystwyth to Carmarthen section of the proposed Rail Corridor. Indeed, both a Scoping Study (2015) and a Feasibility Study (2018) have been undertaken to assess the viability of re-opening this particular stretch of line (see sections 4 and 5). Accordingly, much of the detail in the

following pages relates specifically to the Aberystwyth to Carmarthen line and we would envisage that this part of the Rail Corridor would be the first to be constructed.

2. The West Wales Rail Corridor and Welsh Government Policy

2.1 Introduction

The proposed re-opening of the Aberystwyth to Carmarthen railway is fully in line with two key areas of Welsh Government Policy: **The Welsh Transport Strategy, 2008**, and the **Well-being of Future Generations (Wales) Act, 2015**.

2.2 Welsh Transport Strategy, 2008

This document, also titled ‘One Wales: Connecting the Nation’, sets out the Government’s Transport Strategy which focuses on three distinct, but inter-linked, long-term outcomes: **Social, Economic** and **Environmental**. Under ‘Social’, the strategy identifies improved access to health care; improved access to education, training and lifelong learning; improved access to shopping and leisure facilities; the encouragement of healthy lifestyles; and improving the actual and perceived safety of travel. In the ‘Economic’ category, we find: improved access to employment opportunities; improved connectivity within Wales and internationally; improving the efficient, reliable and sustainable movement of people; improving the efficient, reliable and sustainable movement of freight; and improved access to visitor attractions. Finally, under ‘Environmental’ the following are listed: an increase in the use of more sustainable materials; reduction in the contribution of transport to greenhouse gas emissions; adaption to the impacts of climate change; reduction in the contribution of transport to air pollution and other harmful emissions; reducing the impact of transport on the local environment; reducing the impact of transport on our heritage; and improving the impact of transport on biodiversity.

The re-opening of the railway lines in West and North-west Wales and the creation of a new Rail Corridor would contribute to all of the core elements in the Transport Strategy as set out above. The rail links would clearly enhance connectivity both regionally, and nationally; they would improve international connections, for example to airports in Cardiff, Bristol, Birmingham, and Manchester and to the ferry ports along the Irish Sea coast; they would promote greater social inclusion, offering a viable means of public transport for those in transport poverty; they would provide better access to health care and education, and to shopping and leisure facilities; they would help stabilise the population in rural areas by providing new forms of employment; and they would enhance commuting potential from rural areas to urban centres. In addition, by reducing the numbers of cars on the roads, they would reduce traffic congestion and accidents and therefore provide a safer form of transport. They would also provide a more rapid and efficient transport link between the major centres of population in West and South Wales, and would enhance the tourist attraction of West Wales by improving access to visitor attractions. Above all, by providing a more environmentally-friendly form of transport, they will make a significant contribution to the reduction in emissions of carbon dioxide and other pollutants associated with road vehicles.

In the introduction to the Strategy Document, five key areas where the Welsh Government needs to make substantial progress in the development of a viable transport strategy are listed:

1. reducing greenhouse gas emission;
2. improving public transport and better integration between modes;

3. improving links and access between key settlements and sites across Wales and strategically important all-Wales links;
4. enhancing international connectivity;
5. increasing safety and security.

The re-opening of the Carmarthen to Aberystwyth and Afon Wen to Bangor railway lines meets every one of these core aims of the Welsh Government's Transport Strategy.

2.3 The Well-being of Future Generations (Wales) Act, 2015

The central theme of this Act is the improvement of the social, economic, environmental and cultural well-being of Wales. Its aim is to encourage public bodies to think more about the long-term, work better with people and communities and each other, look to prevent problems, and take a more 'joined-up' approach. The Act notes that Wales faces a number of challenges now and in the future, such as climate change, poverty, health inequalities, jobs and growth, and in order to give future generations a good quality of life, careful thought has to be given as to how decisions made now will impact on them. This Act will ensure that the public sector does this. It is an important piece of legislation that will inform all future decisions-making within the public sector in Wales.

The Act sets out seven well-being goals:

1. **A prosperous Wales:** An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
2. **A resilient Wales:** A nation which maintains and enhances a bio-diverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
3. **A healthier Wales:** A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.
4. **A more equal Wales:** A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic background and circumstances).
5. **A Wales of cohesive communities:** Attractive, viable, safe and well-connected communities.
6. **A Wales of vibrant culture and a thriving Welsh language:** A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.
7. **A globally responsible Wales:** A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being and the capacity to adapt to change (for example climate change).

As is the case with the aims of the Welsh Transport Strategy discussed above, the re-opening of the Aberystwyth to Carmarthen rail link would make significant contributions to many of the Well-being goals listed above. These include reduction in carbon footprint (goals 1, 2 and 7); an increase in regional prosperity (goals 1 and 4); enhanced connectivity to improve, for example, health care and education provision (goal 3) and intra- and inter-regional linkages (goal 5); and improved transport links that would bring social, cultural (including the Welsh

language), and economic benefits to West Wales (goals 4, 5, 6 and 7). Insofar as all the major public bodies in Wales now have a statutory duty to work towards the seven goals described above, it is encouraging to see that, in very broad measure, the proposed new rail links already fulfil the aspirations of the Well-being of Future Generations (Wales) Act. Indeed, this appears to be acknowledged in the recent policy paper from the Welsh Government, *A Railway for Wales, Meeting the needs of future generations, 2019*, which outlines a programme to meet the needs of future generations in terms of rail transport provision, and which specifically targets new strategic corridor developments, including enhanced north-south connectivity along the western margins of Wales (Figure 3).

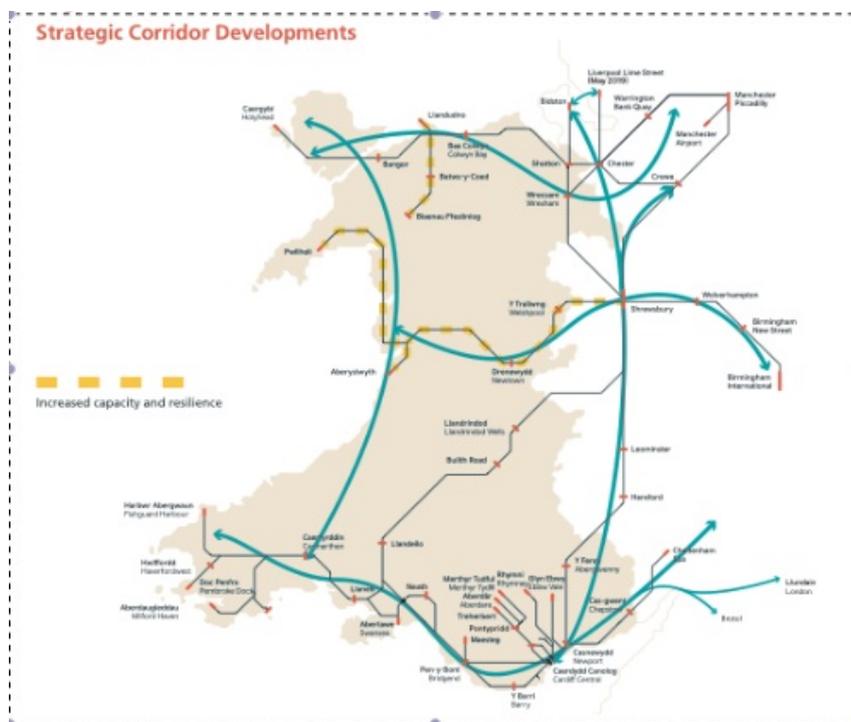


Figure 3. Future strategic rail corridor developments as set out in ‘A Railway for Wales: Meeting the needs of future generations, 2019’. These include a West Wales corridor from Ynys Mon to Swansea, Carmarthen and South Wales which may include upgraded lines as well as re-opened lines.

3. The New Railway Line

3.1 Introduction

TLC’s proposal is to re-install the rail connection between Aberystwyth and Carmarthen, wherever possible along the old alignment. This rail connection ceased passenger operations in 1965. All remaining freight operations finally ceased in 1973, after which the tracks and other infrastructure were removed. Apart from subsequent road and housing developments at both the Aberystwyth and Carmarthen ends of the line, almost the entire track-bed (97%) of the former rail line is still intact. Where deviations from the old track alignment are required, these are covered in Sections 4 and 5 of this document.

3.2 Type of Rail Line to be Installed

There have been proposals that the line could be re-instated as a “light railway”, possibly with the use of tram/trains. Similar proposals have been adopted elsewhere in the UK for disused or under-utilised suburban rail lines adjacent to major cities, and have been incorporated into

“metro” schemes. In some cities these schemes can also incorporate street running to gain access to city centres.

Whereas a light rail system with tram/trains can negotiate steeper gradients and tighter curves than a conventional heavy rail system, this situation does not arise in the case of the Aberystwyth to Carmarthen line. The gradients and curves already exist and were originally designed for a heavy rail line, which carried both passenger and freight trains for over 100 years.

If a light rail system were to be installed for the Aberystwyth to Carmarthen line, there would be some savings in the initial construction costs, as bridges could be designed for a lighter load, less ballast may be required and a lighter gauge of rail line could be used. It might also be argued that with a light rail system “*at grade*” road crossings could be allowed, but it could also be argued that some “*at grade*” crossings should even be allowed for a heavy rail system in a rural setting.

The cost savings if a light rail scheme were adopted would not be significant compared with the total cost of the whole project. Furthermore, any savings in the engineering cost would be more than off-set by having to buy dedicated tram/trains as well as providing a special servicing and stabling depot. In addition, most tram/trains are electrically powered, which if adopted for the Aberystwyth to Carmarthen line would add significantly to the cost.

A huge downside of opting for a light rail system would be the lack of connectivity at both the Aberystwyth and Carmarthen ends of the line. TLC’s proposal is for an integrated rail system with direct rail connections, initially from Aberystwyth and other towns along the line to Swansea and Cardiff, and eventually linking Bangor and Caernarfon directly to South Wales. TLC is also proposing that some freight also be transferred from road to rail. A light rail system would preclude the use of the line for freight.

It is TLC’s firm proposal that the re-installed rail line should be constructed to “heavy rail” standards. TLC considers that a “light rail” system would not be appropriate to the circumstances pertaining in the West Wales corridor.

3.3 Rail Construction Standards

For new rail construction projects Network Rail imposes very strict standards. Amongst these requirements are conditions for the slope angles in cuttings and for embankments. There is also a requirement that there are no “*at grade*” crossings of the rail line, meaning that any crossing must be by way of an over-bridge or under-bridge.

Whilst such strict standards make obvious sense for new projects such as HS2, it is debatable whether these same standards should apply to the re-instatement of a previously operating line in a rural setting.

It is TLC’s opinion that some relaxation should be granted by the Welsh Government to avoid unnecessary excessive expenditure. This relaxation would apply to acceptance of the existing slopes for cuttings and embankments with appropriate remedial measures where necessary, subject to geotechnical examination. It would also possibly apply to some track crossings for farm access and some minor roads, where alternative technology could be considered to ensure safe crossing of the line without the necessity of building expensive bridges.

Had the Aberystwyth to Carmarthen line not been shut down in 1973, Network Rail would have carried on to this day with existing cuttings and embankments, possibly with some localized limited improvement works. Network Rail would have also continued to operate with all the existing level crossings.

By reinstating the railway line to conform with W10 (3.8 m high by 3.3 m wide) or W12 (3.8 m high 3.4 m wide) loading gauge, Hi-cube containers could be carried on standard wagons or, in the case of W12 loading gauge, refrigerated containers. Whilst all new bridges could be constructed to these loading gauges, examination of existing bridges and tunnels would be needed to assess whether they would meet these standards.

In re-instating the line, provision should be made to ensure that bridges, tunnels and track-bed have sufficient clearance to allow for possible future electrification.

4. Aberystwyth to Carmarthen Railway Scoping Study, 2015

This Study, funded by the Welsh Government (£30,000), was carried out by AECOM. The brief was to provide Technical Advice setting out the issues to be considered under a full Feasibility Study into the re-opening of a heavy rail railway between Aberystwyth and Carmarthen, and a scope, programme and cost for that Study. It noted that over 97% of the approximately 90 km original route remains undeveloped, with the most significant development at the northern (Aberystwyth) end. The core formation, including tunnels, embankments and bridges, generally remain intact. It noted that the original route would not necessarily be the optimum one, although it acknowledged that the topography of the area does not readily lend itself to alternative alignments. However, some divergence from the original route may be necessary to reduce environmental impacts, reduce costs, avoid areas of conservation and sites of scientific interest, and attract more patronage. The topography of the route would largely preclude widening the formation to two tracks and hence a single track line was envisaged.



Figure 4. Aberystwyth station. Built by the Great Western Railway in 1925, it is now a Grade II listed building. On the right is a Transport for Wales train recently arrived via the Cambrian Line from Shrewsbury.

With a number of uncertainties regarding the precise location of the route, it was only possible to give an indicative cost for the rebuilding of the line which could be up to £505 million (2015 prices). Land and consent costs could add a further £250 million bringing the total project costs to around £750 million. It was estimated that a full Feasibility Study could cost in the region of £350,000.

5. Aberystwyth to Carmarthen Feasibility Study, 2018

In 2017, Transport for Wales commissioned the global consultancy company Mott MacDonald to undertake a full Feasibility Study into the reinstatement of the railway line between Aberystwyth and Carmarthen. The Study was funded by the Welsh Government (£300,000) to look into the ‘Case for Change’ in the improvement of strategic connections between Aberystwyth and Carmarthen that had been identified by the *WelTAG Stage 1 ‘Outline Case Report, November 2016’*, and to explore further the opportunities suggested by the previous Route Scoping Study (see section 4).

The Study broadly confirmed the technical feasibility of reinstating a modified route and train service, although a number of challenges were identified. These included crossing part of Cors Caron (an important SSSI, SAC and RAMSAR site); resolution of the flood-risk impacts and potential problems relating to bridge construction on the River Towy in the vicinity of Carmarthen; accommodation of the Gwili Railway Preservation Company; mitigation of extensive flood risks within Flood and Tan15 Development advice zones; property impacts; environment; and consents where the route passes through sites and features protected by statutory designations; and problems relating to ground conditions, residual structures and earthworks.

Subject to satisfactory resolution of these constraints, the Study concluded that the railway could be rebuilt and could provide a regular hourly service between Aberystwyth, Llanilar, Tregaron, Lampeter, Llanybydder, Pencader and Carmarthen, with an end to end journey time of around 85 minutes. With a potential opening year of 2024, initial demand assessments indicated that the reinstated railway could attract up to 370,000 trips in the first year of operation, rising to 425,000 and 489,000 in the assessment years 2027 and 2037 respectively.

A total cost build up of £775 million was envisaged for a single line formation; this included an *optimism bias* uplift of £276 million which is a general risk allowance reflecting HM Treasury/DfT guidance. The Study concluded that while there are no compelling engineering reasons why the railway should not be built, it suggested that low population levels along the line mean that on purely economic grounds the scheme does not present a positive case. Indeed a relatively low BCR of 0.43 was assigned to the project. Hence progression of the scheme would need to be based on wider societal needs and strategic aims, both of which fell outside the remit of the Feasibility Study. It is the contention of TLC that wider societal needs and strategic aims do indeed support the case for reinstating the line, and we explain why this is so in the following section.

6. The Social, Economic, Cultural and Strategic Case for Re-opening the Aberystwyth to Carmarthen Railway

6.1 Introduction

As noted above (section 2.2), the re-opening of the Aberystwyth to Carmarthen rail link is in line with all of the core elements of the *Welsh Government Transport Strategy* of 2008. The importance of good transport networks and connectivity to support economic growth and development in Wales is a key component of policy documents at local, regional and national level and was emphasized as such in the Feasibility Study. These documents include, in addition to the Welsh Government Transport Strategy, the *Network Rail Welsh Route Study, 2016*, *Priorities for the future of Welsh Rail Infrastructure, 2016*, and the *Welsh National*

Transport Finance Plan, 2015. Moreover, the Feasibility Study acknowledged that good public transport connectivity is key to helping rural communities, who may experience deprivation as a result of fewer employment and education opportunities. Economic growth across Ceredigion and Carmarthenshire is therefore dependent on accessibility in terms of the highway network and access to public transport. The re-opening of the Aberystwyth to Carmarthen railway reflects the over-arching policy objectives as set out in these various documents, especially as several highlight the un-sustainability of car use.



Figure 5. The southern terminus of the line at Carmarthen station. On the right is the station at the time of the visit of 60163 Tornado. Steam-hauled excursions frequently terminate at Carmarthen and attract large numbers of visitors to the town.

What was not taken into account in the Feasibility Study, however, was the *Well-being of Future Generations (Wales) Act* (section 2.3). As noted above, this wide-ranging legislation was designed to inform all future decision-making within the public sector in Wales. It was given royal assent on 29 April 2015 and came into effect in April 2016. As such, the aims and objectives that are enshrined in the Act should figure strongly in any assessment of the rationale for re-opening of the Aberystwyth to Carmarthen railway line. Yet Mott MacDonald's Feasibility Study makes no reference to this key piece of legislation. As a consequence, no account was taken of the wider social, cultural, political or strategic context for the line, with the resulting relatively low BCR (0.43) being derived from an algorithm that was based on a narrowly-defined set of economic criteria.

There seems to be some disagreement on the exact dates when the provisions of the Act should apply. It has been claimed that, although the Feasibility Study was published in September 2018, the contract was let before the Act came into effect. However, the provisions of the Act must have been well-known before the terms of reference for the study were agreed and it should have been realized that the Act would apply within the time-scale of the study. Indeed, without addressing the provisions contained in the Act, the overall validity of the Feasibility Study will have been compromised.

In the following paragraphs we examine the wider social, cultural and strategic factors that underpin the case for reopening of the railway. We then look critically at certain aspects of the Feasibility Study itself (see section 8) and propose revisions to some of the cost estimates (see section 9). If these were applied, they would raise the BCR to at least 1.0, which would make the reinstatement of the Aberystwyth to Carmarthen railway line a viable proposition.

6.2 Population and Passenger Numbers

The Feasibility Study took as a basis for the population input into the BCR calculations the 2011 census figures for the settlements along the line. The five towns of Llanilar, Tregaron,

Lampeter, Llanybydder and Pencader have a combined population of around 8000. According to the Feasibility Study, there are a little over 12,000 in Aberystwyth (although the 2011 census shows 18,965) and 14,500 in Carmarthen, giving a combined population of at least 35,000.

However, it is clear that the railway would serve the much wider counties of Ceredigion and Carmarthenshire, whose total populations are around 260,000. If the neighbouring county of Powys, which is linked with Ceredigion in the strategically important Growing Mid Wales initiative (see section 1) is included, a further c. 130,000 potential rail users are added to the passenger pool. Along the entire Western Rail Corridor (Carmarthenshire, Ceredigion and Gwynedd), the population catchment is 384,000. If the population of the district (county) of Swansea (247,000) is included, this increases the total catchment area to around 630,000.

Between Aberystwyth and Carmarthen, there are c. 40,000 students in schools, colleges and universities along the line. There are, in addition, more than 13,000 students on the Trinity Saint David campus in Swansea (see sub-section 6.12), and some 20,000 students at Swansea University who would also benefit from improved rail connectivity in West Wales. Further north, there are over 10,000 university and college students in Bangor. Finally, there is the transient visitor population of business travellers and tourists, many of whom would make use of the line. Data from the Welsh Tourist Board show 2.73 million visitors to Ceredigion in 2018, and 6.39 million to Carmarthenshire. This suggests that the population figures upon which the BCR has been calculated are excessively conservative and that the number of potential rail users is likely to be considerably higher.

6.3 Demand for Public Transport

There is a demonstrable need for public transport in West Wales, as shown by the T1 bus service between Aberystwyth and Carmarthen which, since April 2018, has, carried over 530,000 passengers.



Figure 6. The university in Lampeter (left) and the National Library of Wales, Aberystwyth (right). Opened in 1822 as St David's College, Lampeter is the oldest degree awarding institution in England and Wales outside Oxford and Cambridge. It is now part of the University of Wales, Trinity Saint David. The National Library was founded in 1907 and is the largest library in Wales holding over 6.5 million books and periodicals.

In line with national trends, which indicate an increasing demand for rail transport, both Aberystwyth and Carmarthen stations have shown a marked increase in passenger footfall in recent years. Office of Road and Rail data show that for Aberystwyth, the increase has been 21.65% over the past 15 years (2018/19: 309,000; 2004/5: 254,000), while the figures for Carmarthen show a 30.4% increase (2018/19: 383,386; 2004/5: 294,000) over the same

period. Being on the North Wales mainline, Bangor passenger numbers, are considerably higher; in 2018/19 the footfall was 658,934, with little change from 2013/14 (662,970).

6.4 Inter and Intra-regional Connectivity

The Aberystwyth to Carmarthen railway will re-connect a largely rural area with major centres of population and provide an efficient passenger public transport link between these key regional centres. It will provide significant time savings at peak times when compared with road transport. Park and ride facilities, as at the new Bow Street station on the Cambrian line, and bus feeder services to the new stations will also open up the whole route to a wide catchment area ensuring the benefits are maximised. The Aberystwyth to Carmarthen railway would link with trains to Shrewsbury and Birmingham, westwards to Haverfordwest, Pembroke and Fishguard and south-eastwards to Swansea, Port Talbot and Cardiff, and then on to London. The rail connection to Cardiff and beyond would be further improved by the proposed construction of a new West Wales Parkway station near Felindre; this would provide a direct corridor along the South Wales main line between Carmarthen and Port Talbot, and reduce significantly journey time between west and east Wales (Youle, 2019). These various developments would enable people to travel more easily to Cardiff Airport, Bristol Airport and Birmingham and Manchester airports, and via the new Crossrail hub at Reading to both Heathrow and Gatwick airports. There is also the possibility of a future passenger airport at Pembrey, which would have direct rail access from the Carmarthen to Swansea line.

A further potential benefit would be that congestion into Aberystwyth and Carmarthen will be significantly reduced as the railway will provide a realistic and attractive alternative to the car for commuters, shoppers and students travelling to places of study (see sub-sections 6.12/13).

6.5 Transport Poverty

In Wales, the proportion of households with no cars or vans, is 22.9%, but in Carmarthenshire the proportion without falls to 18.8% and in Ceredigion to 18.39%. Vehicle ownership becomes more of a necessity in many rural areas where there are fewer jobs and poorer public transport provision, but many people struggle to afford a car and have to forgo other necessities in order to run one. This trap of ‘transport poverty’ would be alleviated by a better public transport system and, especially, by a better rail network.

6.6 Environmental Benefits

Research has consistently shown that the carbon footprint from rail is significantly lower than that from road transport. In the UK it is estimated that while transport currently accounts for 26% of all carbon emissions, only 1% of this comes from trains. Indeed, trains are one of lowest emitters of CO₂, releasing 0.046 kg per kilometre each passenger travels, whereas a diesel car is double that at 0.117 kg (Mayers & Bamford, 2020). The re-opening of the Aberystwyth to Carmarthen railway line will therefore offer a more ‘environmentally-friendly’ mode of transport, and will reduce significantly the carbon footprint of transport in West Wales. The reinstated rail link would also ensure that adequate provision is made for future electrification to further reduce carbon emissions in line with Government policy for zero net greenhouse gas emissions by 2050.

6.7 Road Safety and Road Maintenance

The Department of Transport (DoT) has devised an algorithm to value the average cost of reported road accidents, taking into account damage to vehicles and property, insurance

administration costs, police and ambulance costs, the costs of hospital treatment, the direct economic costs of lost output and a quantification of the human costs – pain, grief and suffering to the casualty, relatives and friends. Applying this to road accidents along the route of the Aberystwyth to Carmarthen railway, the full economic costs of road accidents between 2011 and 2015 was £51.3 million (c. £10 million per annum).

While the re-opening of the railway will not eliminate all road accidents and their costs, it might be anticipated that a fast regular train service could be expected to reduce them substantially. Indeed, the experience of the Borders Railway in Scotland (see section 7) is that a re-opened railway can lead to significantly fewer car journeys and, by implication, a reduction in the number of road traffic accidents

A reduction in road traffic should also lead to lower road maintenance costs. Welsh Government figures show that for the two principal arterial roads in West Wales, the A470 and A487, expenditure on safety and resurfacing for the period 2013-2020 was almost £115 million. The re-opening of the rail link between Carmarthen and Aberystwyth, initially, with possible further connection to Bangor via Caernarfon, would divert both passenger and freight traffic away from these roads, thus reducing future maintenance costs.

6.8 Rural Sustainability and Development

The Aberystwyth to Carmarthen railway is the strategic key to unlocking the long-term economic potential of Ceredigion and Carmarthenshire by providing effective access to the labour markets of Aberystwyth and Carmarthen and assisting these two towns to manage their demand for housing by spreading commuter pressure into the hinterland. This will assist the sustainability of the counties by creating the critical mass necessary to maintain the connecting railway services, important institutions (for example Trinity Saint David, University of Wales, Lampeter) and ultimately the local communities.

6.9 Population Structure and Stabilisation

Wales has a higher proportion of people over 65 than England: 18.36% compared to 16.34%. In West Wales the proportion rises to 20.63% in Ceredigion and 20.77% in Carmarthenshire. With an ageing population, public transport becomes even more important.

Wales also has a lower proportion of young adults (18-44): 34.39%, compared to 36.9% in England. This falls to 30.62% in Carmarthenshire, but increases to 36.01% in Ceredigion. The figures suggest that young adults are increasingly leaving the West Wales area to find jobs elsewhere. Wales also has 18.16% of the population aged 15 or under, compared to 18.91% in England. In Ceredigion the figure falls to 14.79%, with Carmarthenshire at 17.96%.

The economic stimulus provided by the new railway would help to reverse the ageing trend of the present population, bringing a new vibrancy to the area. A more efficient transport network provided by the railway will also encourage retention of population in the area. Younger people in particular would be more tempted to remain, which would increase the stability and reduce age imbalance in the regional population.

6.10 Inward Investment

Evidence from the Borders Railway in Scotland (see section 7) suggests that the Aberystwyth to Carmarthen railway line could be a powerful catalyst for inward investment. New businesses could be attracted to Llanilar, Tregaron, Lampeter, Llanybydder and Pencader,

bringing much needed employment to one of the most deprived areas of Wales. The railway will markedly improve the perception of Carmarthenshire and Ceredigion as an area in which to invest.

6.11 Health Service Provision

The line will connect five hospitals: Bronglais (Aberystwyth), Glangwili (Carmarthen), Prince Phillip (Llanelli), Singleton (Swansea), Morrision (Swansea), although there is no reference in the Feasibility Study to hospital provision. Ultimately, the Western Rail Corridor will provide a direct link to Ysbyty Gwynedd in Bangor. The re-opening of the line is strongly supported by the Hywel Dda University Health Board in Ceredigion and Carmarthenshire.

In Ceredigion, the proportion of people with a long-term health problem is 23.2% and in Carmarthenshire is 31.9%. Many such households will be less likely to use private cars, due to infirmity. Improved connectivity between these hospitals by rail would benefit, in particular, the elderly and for those without a car. Even for car owners, the hospitals would be more easily reached without lengthy road trips.

6.12 Universities and Colleges

The fact that a rebuilt line would connect further and higher education institutions along its corridor is an important factor in developing social inclusion, personal development, attainment, and aspiration. Again, given the importance of universities in West Wales (universities provide 20% of employment in Ceredigion and Carmarthenshire), it is surprising that the Feasibility Study is largely silent on students as potential passengers on the line as the re-opened railway will link four university campuses: Aberystwyth, Lampeter, Carmarthen (which now includes the headquarters of the S4C television channel) and Swansea. It will also link further education colleges in Aberystwyth, Carmarthen, Llanelli and Swansea. Ultimately, there will be a direct rail connection between these educational institutions and both the university and further education college in Bangor. In addition, the line will connect Cardiff, Swansea, Carmarthen and Lampeter campuses with the National Library of Wales in Aberystwyth. The new line would be of particular benefit to students at Trinity Saint David, which is based on three campuses (Swansea, Carmarthen and Lampeter). Currently Lampeter is the only university in Wales and England not currently served by a railway line, and the lack of a rail connection has often been cited as one of the reasons for Lampeter's student recruitment problems over recent years.



Figure 7. Two important market towns along the line: Lampeter (left) and Tregaron (right), the latter showing the statue in the town square of the Victorian peace campaigner, Henry Richard.

6.13 Schools

There are two secondary schools in Aberystwyth and two in Carmarthen (one bilingual and one Welsh medium in each case), one in Llandysul near Pencader, one in Lampeter and one in Tregaron. In all, these schools teach more than 6000 students, and there are a further 2700 along the line from Aberystwyth to Bangor. The Tregaron school does not have a sixth form and hence A-level students have to travel either to Lampeter or Aberystwyth. The railway would offer a safe and reliable means of public transport for these students. As with university students, the Feasibility Study makes no mention of school and college students as potential passengers.

6.14 The Welsh Language

TLC has the backing of Cymdeithas yr Iaith Gymraeg (the Welsh Language Society) as the re-establishment of the railway is seen as a way of supporting the language in Ceredigion and Carmarthenshire, both areas having seen an increase between 2008 and 2018 (of 8% and 3% respectively) in people able to speak Welsh. The Welsh Government's aim is for one million Welsh speakers by 2050, and a more stable population within the region would undoubtedly benefit the language by encouraging young Welsh speakers to remain domiciled in the area, while commuting more easily to Aberystwyth, Carmarthen, Swansea and Cardiff for work.

6.15 Tourism

Tourism and recreation is an important part of the Welsh economy, currently generating in excess of £5 billion per year. Recent estimates indicate that revenue from tourism in Ceredigion amounts to around £300 million annually (creating 5700 jobs), and in Carmarthenshire the figures are £441 million and 6176 jobs. The railway would be a further and important boost to the tourist economy of West Wales by bringing more visitors to the area, as has been the case with the Borders Railway in Scotland (see section 7). Indeed, a potential increase in tourist numbers is referred to in the Feasibility Study, although it was noted that in order to quantify the increased numbers, further analysis involving stakeholder consultation is required. Rebuilding of the railway between Aberystwyth and Carmarthen would also provide a substantial encouragement to investment in accommodation and leisure facilities in a very poorly supplied area of outstanding countryside.



Figure 8. Tourist attractions in the Teifi Valley area: Strata Florida, a former Cistercian Abbey near Tregaron, founded in 1164 (left), and the ruins of Newcastle Emlyn Castle which was probably built by the Welsh Lord Mareddud ap Rhys around 1240 (right).

West Wales is popular for a range of outdoor pursuits including hill walking, coastal walking, pony trekking, horse riding, fishing, swimming, coracling, coasteering, kayaking, surfing, cycling and mountain biking, rock climbing and orienteering. According to Natural Resources Wales, 2015, mountain biking is worth over £23 million to the Welsh economy, while the value of coastal and hill-walking in 2009 was estimated to be £632 million. The re-established railway would give access to the Cardigan Bay Coastal Path which is rated as the second most attractive coastal path in the world. The current Ystwyth Trail would be retained alongside the railway and linked with the Coastal Path. Again, according to Natural Resources Wales, walkers on the Welsh coast spent £84.7 million in 2014, supporting 1000 jobs.

There are numerous National Trust and Cadw properties and other key sites, including Llanerchaeron in the Aeron Valley, Strata Florida Abbey, the large Iron Age hill forts of Pen Dinas near Aberystwyth and Pen-y-Bannau to the north of Tregaron, and Newcastle Emlyn and Aberystwyth Castles. The line also runs alongside the Cors Caron (Tregaron Bog) nature reserve, a SSSI and Ramsar-designated wetland site.

Several preserved full and narrow gauge railways are to be found in West Wales, including the Gwili Railway near Carmarthen and the Vale of Rheidol in Aberystwyth, while further north are the Talyllyn, Ffestiniog and Welsh Highland Railways.



Figure 9. Tourist activity in the Teifi Valley. Cycling on the Ystwyth trail along the old track-bed of the railway line (left); coracles in the river at Cenarth near Newcastle Emlyn (right).

Moreover, the 87 km-long Cambrian Coast Line between Machynlleth and Pwllhelli has itself been described as one of the world's most scenic railways, and has featured in two recent (2019) national TV documentaries by British Broadcaster Channel 5 and by the German Broadcaster SWS. The Cambrian Community Rail Partnership estimates that the line attracted more than 460,000 additional visitors to the region in 2019.

6.16 Freight

A fully engineered heavy railway could also be used for freight transport. This is in line with the Department of Transport's *Rail Freight Strategy* (2016) to move more freight from road to rail. It is envisaged that most of the freight would travel at night, thus avoiding conflicts with daytime and evening passenger services. Potential materials that could be moved by rail include meat products from the abattoir in Llanybydder; milk and cheese from more than 700 dairy producers in Ceredigion and Carmarthenshire; woven wool products from mills that operate close to the line; and domestic waste from the LAS Waste Facility in Lampeter. Food and other domestic products could also be transported by rail, with possible new railway-based retail hubs being developed in West Wales, similar to the Tesco hub at Magor near Cardiff (Wales Route Study, 2016)

An important potential product for rail transport is timber. According to Natural Resources Wales, the Welsh Forestry Sector is worth over £450 million to the economy and employs over 11,000 people in hundreds of small to medium sized rural businesses. It includes forestry logging and related services (£31 million), the manufacture of wood and wood products (£182 million), and pulp, paper and paper products (£201 million). There are two timber businesses along the line and both would welcome the reintroduction of rail transport. In 2005, a six week experiment to supply timber by rail from Aberystwyth to Kronospan Ltd, Chirk, demonstrated the viability of this form of transport. With each train carrying 200 tonnes of timber (equivalent to eight lorry loads), it showed that, over a five-year period, this could remove some 16 million tonne kilometres of timber traffic (4000 lorry loads) from Welsh roads every year.

Another important potential cargo that could be transferred to rail on the re-opened line would be petroleum products from the refinery in Pembrokeshire, or elsewhere in South Wales. The old siding and oil depot are still in existence in Aberystwyth station and could be reinstated. The transport of petroleum products by rail would free up the existing road network from heavy oil tankers on narrow and twisting local roads.

Containers could also be carried on the line, provided the line is constructed to the appropriate loading gauge, reference to which is made in Section 3.3 on page 7.

6.17 Other Businesses Benefitting from Re-opening of the Line

The construction industry in Ceredigion and Carmarthenshire would benefit both during the four years estimated to rebuild the railway, but also from the anticipated expansion in house building, as has occurred in Scotland following the re-opening of the Borders railway (see section 7 below). Businesses in the building supply industry such as Travis Perkins, Jewson and T.L Thomas could see a significant increase in trade. Other specialist suppliers such as Teifi Concrete and several quarries would also see new opportunities to expand. Cambrian Pet Foods Ltd. in Pencader would find new markets open to them and the supply of feeds for farm animals would also be facilitated.

7. The Borders Railway: An Analogue for the Aberystwyth to Carmarthen Railway Line

The 50 km-long Borders Railway between Edinburgh and Tweedbank, which was re-opened in September 2015, is a good analogue for the Aberystwyth to Carmarthen railway line. Its principal effects have been felt in the tourist industry, but there have also been significant economic benefits to the immediate hinterland and to the Borders area as a whole. Passenger numbers for the first year of operation (2015-16) were 1,267,599, almost double the official forecast when the railway was opened, and this figure increased to 1,387,819 in the second year.

The Scottish Tourism Economic Assessment Monitor (STEAM) statistics for the Borders region compared the first half of 2016 to the same period the year before, and these showed that the number of visitor days in hotels/bed & breakfasts had risen by 27%; there was a 20% rise in visitor spend on food and drink; visitor spend on accommodation was up 17%; and the number of days visitors stayed in the Borders increased by almost 11%. Collectively there was an overall increase in visitor spend of 16%, and an estimated 8% increase in employment directly related to tourism.

Data from the *Border Railway Year 2 Evaluation*, 2018, indicated that 15% of users had moved to the region because of the railway, and 52% of those interviewed who had changed their jobs cited the railway as a key factor. Furthermore, it was estimated that around 36,000 car journeys per year were saved because of the railway, while there were 14,000 fewer bus journeys. Of those interviewed during the course of the Transport Scotland survey, 25% stated that they would not have visited the region had it not been for the railway.

The opening of the Borders railway has given a significant boost to the housing market in the region, with the number of house sales increasing by up to 48% in some areas, while 10,000 new homes are set to be built near the rail corridor. In addition, 150 hectares of land adjacent to the railway have been designated for commercial use. At Tweedbank, the southern terminus of the line, a new Central Borders Business Park is being established and plans are in hand for a hotel and retail outlets adjacent to the new station. Indeed, so successful has the Borders Railway project been that funding has now been secured for a Feasibility Study (£10 million from the British and Scottish Governments) to examine the prospects of extending the line southward by 110 km, thereby completing the old Waverley Route through to Carlisle.

In the initial Business Case for the Borders railway, a BCR of 0.50 was assigned to the project, very similar to the figure of 0.43 for the Aberystwyth to Carmarthen line. However, in the final version of the Borders Business Case, there was a significant methodological change with the narrow economic appraisal being replaced by a wider brief that incorporated a broader and socially inclusive methodology. Indeed, three of the four investment objectives within the Business Case were focused on connectivity, accessibility and key social inclusion. Typical attributes that were given a determinable BCR value by utilising this methodology included creating a ‘modal shift from the car to public transport’, and the recognition of increasing levels of social inclusion by making public services more accessible to those who do not have access to a car. When included as sensitivity indices these factors raised the BCR to a viable and healthy 1.3. The experience of the Borders Railway in raising the value of a BCR by stressing connectivity, accessibility and key social inclusion factors as a determinable value in its calculation is a critical dynamic. In this respect the approach taken by the Scottish Government and Transport Scotland stands in sharp contrast to the Mott MacDonald approach for the Feasibility Study on the Aberystwyth to Carmarthen railway line.

8. Comments on the Mott MacDonald Feasibility Study

8.1 Methodology Used to Calculate Benefit/Cost Ratio (BCR)

Because the capital cost estimation was given to another consultant (Chandler/KBS), Mott MacDonald have estimated how much capital the project could afford to achieve a break-even BCR of 1.0. For the recommended hourly train service, the value of benefits used in this calculation is given in Table 34 of the Feasibility Study (page 182), under DS3 line (H) – “Cost Gap allowing for construction inflation”. The figure is £333 million. It is assumed that construction inflation has been added back to the discounted figure in line (G), so that it can be compared with the undiscounted capital cost estimation given by Chandler/KBS.

By dividing the £333 million figure by Chandler’s capital cost estimate of £775 million, a BCR of 0.43 is derived. However, Mott MacDonald’s report gives no explanation as to how the BCR has been calculated, nor does it provide a breakdown of the benefits evaluated to produce the “Cost Gap” figure of £333 million.

8.2 The Chandler/KBS Capital Cost Estimate

Chandler/KBS produced a total cost estimate of £775 million to be used in the Mott MacDonald report. Out of this total figure, only £326 million (direct construction costs plus land & compensation) has been directly estimated from bills of quantities or direct measurement. The remaining 58% of the capital cost estimate has been calculated based on arbitrary percentages or ad-hoc add-ons. Furthermore, it can be seen that, from a direct construction cost of £288 million (which accounts for the visible tangible assets once constructed), there is a huge mark-up of 268% to produce the estimated final project cost.

Apart from costs for design, project management and land purchase/compensation, there seems to be little justification or explanation for these additional costs. A figure of £276 million has been added as “*optimism bias*”. This is required by the Treasury for Network Rail projects. It is based on the historical record of Network Rail in failing to bring in rail infrastructure projects on time and within budget. However, most of these projects were of a far greater complexity than this project. With better design, specification and management of the project during design and construction, this figure seems excessive. Furthermore, under Treasury/DfT guidelines, this “*optimism bias*” could have been reduced from 66% to 18% had a *Quantitative Risk Assessment (QRA)* been carried out. This would have reduced the “*optimism bias*” from £276 million to £90 million, resulting in a reduced total project cost of £589 million, assuming the mean value remained unaltered after QRA.

There are a number of cost items under “*Employer Indirect and Other Project Costs*”, which appear to be payments to Network Rail. As Network Rail is wholly owned by Government, these are not net cash outflows, but internal Government transfers. The same argument can be applied to Chandler’s figure of £28.8 million for “*Overheads and Profit*”.

8.3 Comparison of the Chandler/KBS Capital Cost Estimate with Other Rail Projects

The Chandler/KBS capital estimate works out at a unit rate of £8.6 million per km. The only comparable project in the UK to this project is the Borders Railway in Scotland (section 7). This was completed within budget in 2015 for a cost of £294 million, managed by Network Rail. The route length is 50 km but there are long sections of double track, giving a total track length of 64 km, and there are seven stations (compared with five for this project). This gives a unit rate of £5.9 million per km, which if inflation were added to bring these costs to Mott MacDonald’s base year of 2017, would bring the unit rate to approximately £6.3 million per km. This is a substantial discount (27%) on the Chandler/KBS estimate, and if applied pro-rata to this project, would result in a capital cost estimate of approximately £570 million.

In 2018 the European Commission published a comprehensive study of rail construction costs throughout the EU. The report was entitled “*Assessment of Unit Costs (standard prices) of Rail Projects (Capital Expenditure)*”. Figure 2 on page 11 of that report gives unit cost ranges in millions of euros per kilometre under different types of conventional rail projects.

	Unit Cost (euro mil/km)			Unit Cost (£mil/km)		
	Mean	Max.	Min.	Mean	Max.	Min.
New Lines	8.2	9.5	6.9	7.4	8.6	6.2
Rehabilitation	4.4	7	1.8	4.0	6.3	1.6
Upgrades	6.1	8.7	3.5	5.5	7.9	3.2

Table 1 European Commission Report on Unit Rail Construction Costs

Table 1 summarises these figures, together with those costs converted to £millions per km. The same European Commission report also makes reference to an earlier study of unit rail costs in 2000 by Baumgartner. These give cost estimates of 2 million euros per km with a range of 1-3 million euros per km for “easy topography”. As the Carmarthen route has obviously all been flattened from the original railway construction, this category would apply. With inflation since 2000, this would give a maximum unit cost of £2.7 million per km.

Whilst it could be argued that the capital cost estimate provided by Chandler/KBS may be in line with Treasury guidelines for rail projects undertaken by Network Rail, it is apparent from evidence given above, that this results in estimates significantly above realistic figures in other countries, or even for the Borders Railway in Scotland.

A further current example is the new railway line being constructed in Laos by Chinese construction companies, which is nearing completion, and scheduled to be opened in early 2022. This is a 414 km. single track standard gauge electrified line with a train speed of 160 km per hour, constructed through very demanding topography. Nearly half the total length of the route (47%) has been constructed in tunnels (75 separate tunnels); there are 167 bridges (with 15% of the route on elevated viaducts) and 32 stations. The total cost is US\$6 billion (£4.6 billion at an exchange rate of £1=\$1.30). This equates to a unit cost of £11.1 million per km, which is only 29% higher than Chandler/KBS’s estimate for the Carmarthen-Aberystwyth project, where there is an order of magnitude difference in difficulty and complexity.

8.4 Consequence of Applying Network Rail Standards

Mott MacDonald have assumed that the track-bed profiles must conform with the latest Network Rail standards for new rail projects. They have re-profiled the existing track so that rock slope angles are reduced to 2:1 (63 degrees) and soil slope angles to 1:2 (27 degrees). From Mott Macdonald’s own calculations this will result in 1.2 million cu.m. of additional suitable fill being required to reduce the slope angle of existing embankments. It will also produce 3.8 million cu.m. of cut material, comprising both rock and soil from flattening the angle of all existing cuttings. Some of this excavated cut material may be re-used as fill, depending on relative locations of the fill requirements and sources of the excavated cut material. However, there would still be a large surplus of cut material to be disposed off-site. The cost implications of conforming with these Network Rail standards will be substantial.

Mott MacDonald have also followed the latest Network Rail guidance concerning *at grade* crossings. This means that any crossing of the rail line must be by an under-bridge or over-bridge. Whilst this makes sense where public roads are involved, the substantial additional cost for farm tracks with very limited frequency of use should be queried, when with modern technology it may be possible to use an alternative method to ensure safe crossing at grade.

8.5 Condition of Existing Track-bed and Associated Slopes

The Scoping Study by AECOM indicated that only 4 km out of a total length of 90 km has been lost to development. This would require some diversion of the track from the historical alignment. A whole new alignment and tunnel would be required between Llanbadarn and Llanfarian, at the Aberystwyth end of the line, as well as a new alignment and bridge to join Carmarthen station with Abergwili Junction. There would be minor diversions elsewhere. All new alignments would be constructed to current Network Rail standards. Costs for this work have been included in the Feasibility Study.

The historic problems with the sections of the line adjacent to the Ystwyth River, near Llanilar, and crossing Cors Caron, near Tregaron, have been addressed in the Feasibility Study. Solutions have been proposed and appropriate costs have also been included in the Feasibility Study.



Figure 10. Left; the railway track-bed across part of Cors Caron with the Cambrian Mountains in the background. Right: the south entrance to Pencader Tunnel. At 901m, this is the longest of the three original tunnels along the line and was opened on 1st April 1864

Apart from the short sections referenced in this chapter, the remainder of the track is in a satisfactory condition. Trains operated on this track for over 100 years and it is nearly 50 years since all operations ceased in 1973. The track-bed has been well compacted over time and the associated embankments and cuttings have been well established. The Geotechnical Report, which accompanied the Feasibility Study, did not reveal any significant evidence of slope failure or distress. In the event of minor slope problems along the existing alignment, it would be far cheaper to use appropriate remedial measures (e.g. rock bolting, retaining walls, soil nailing etc.) to locally rectify such problems.

It makes little sense financially to comply with Network Rail current standards for new rail projects, when the existing track profile is adequate for re-instating the rail line. Had the rail line not been shut down in 1973, Network Rail would have carried on to this day with the existing cuttings and embankments, possibly with some localised limited improvement works.

8.6 Population Figures Used to Calculate Train Journeys

The actual population figures used in the Feasibility Study are listed in table 22 on page 159 of the Feasibility Study. With the exception of the population figure given for Aberystwyth, figures for other stations agree with published population figures for those towns. The figure used by Mott MacDonald for Aberystwyth is significantly lower than the published figure. This is confusing; additionally in another part of the report, it states that student population in Aberystwyth is around 10,000 and 2,000 in Lampeter. The published figure of the population for the built-up area of Aberystwyth, which includes Waun Fawr and Penparcau, is 18,965 in the 2011 census, with the estimate for 2018 being 16,248. The actual number of students at Aberystwyth University is currently approximately 8,000.

Mott MacDonald's case for the project being non-viable rests on the low population density along the route. Figure 2 on page 16 of the Study shows the weekly forecast journeys for six stations (including Aberystwyth but not Carmarthen) for the year 2024. It compares this with the journeys required to achieve a break-even BCR for a capital cost of £775 million. It also under-lays this graph with the populations of each station.

Mott MacDonald have assumed that train demand falls off almost completely if the station is not within walking distance. Figure 32 on page 139 illustrates a decay curve of demand against distance. Unfortunately, the axes of the graph in the Feasibility Study have not been annotated. However, table 9 on the same page gives figures indicating a demand of between 1% and 29% at a distance greater than 2 km. for a variety of towns, which they have used as a basis for estimating demand over the Carmarthen-Aberystwyth route. These demand figures have been taken from the *Passenger Demand Forecasting Handbook*. The Feasibility Study seems to take no account of demand from the immediate hinterland of each train station, if adequate parking were to be provided or there was a local on-call bus service to link with train departures. This seriously under-estimates the possible demand and is one major reason for the pessimistic conclusion reached in the Feasibility Study.

8.7 The Gwili Railway

A major omission from Mott MacDonald's Feasibility Study is firm proposals, and consequent costs, for how to deal with the Gwili Railway. This is a heritage standard gauge line, which operates on the original Carmarthen-Aberystwyth track-bed between Abergwili Junction and Danycoed via Bronwydd Arms. The operating length of the track is 7 km, although the Gwili Railway has purchased the whole track-bed as far as Llanpumsaint, comprising a total length of 13 km.

The Scoping Study by AECOM did identify the Gwili Railway as a major constraint to progressing the project. AECOM suggested a 3 km diversionary tunnel to by-pass the Gwili Railway, as there is probably insufficient room in the narrow Gwili river valley to accommodate the Gwili line in parallel with the re-instated Carmarthen-Aberystwyth line. Sharing the same track was considered to be technically and commercially very complex and, in all probability, it would not be feasible.

Chapter 3.8 (pages 91-94) of the Feasibility Study does comment on possible alternative options for solving the Gwili Railway problem. The option of a diversionary tunnel, proposed by AECOM, has been discounted on the grounds of cost, although no cost was estimated and it would have been useful to have a comparative cost figure for this option. Mott MacDonald have stated that due to the tunnel length (3 km) and depth below surface (nearly 100 m), a twin-bore tunnel would be required for emergency escape purposes. TLC agrees with this view. Mott MacDonald also agree with AECOM that parallel tracks or a shared track through the Gwili river valley are unlikely to be feasible. Mott MacDonald have concluded that the Gwili Railway Preservation Company should be either financially compensated or otherwise assisted in re-locating the heritage line to another suitable location. However, the Feasibility Study did not investigate any possible alternative locations nor provide any cost figures for such a re-location.

TLC's view is that the most suitable site for re-location of the Gwili Railway would be along the track-bed of the previous line between Carmarthen and Llandeilo. This branches off from the Carmarthen-Aberystwyth line at Abergwili Junction, which is the present southern terminus of the Gwili Railway. TLC considers this option to be preferable to the other possible re-location sites on the closed branch lines to Newcastle Emlyn or to Aberaeron for the following reasons:

- part of the Newcastle Emlyn line is already occupied by the narrow gauge heritage line, Teifi Valley Railway, and unless some agreement could be reached between

- the two heritage railway companies, removal of the Gwili Railway to this line would be complicated;
- the Aberaeron line is quite far removed from the Gwili Railway's present base;
 - as the Carmarthenshire County Council have invested funds in the Gwili Railway, it would be politically prudent to keep the railway in Carmarthenshire;
 - the southern terminus would remain at the same location as present, Abergwili Junction, and the distance to re-locate Gwili Railway assets to the new site would be relatively short;
 - the Gwili Railway could have a direct connection with the existing rail network, which would allow specialist steam excursions to run on the heritage line;
 - a joint new station could be built at Abergwili Junction to service both the Gwili Railway and, depending upon the exact location, to facilitate easy access to Glangwili hospital, which is very close-by, for patients/visitors from stations on the Carmarthen-Aberystwyth line.

It is suggested that approximately 13 km of the Carmarthen-Llandeilo track-bed would be purchased and transferred to the Gwili Railway. The project would also finance or undertake itself, as part of the contract for re-instating the Carmarthen-Aberystwyth line, the re-provisioning of all the Gwili Railway's assets to the new alignment.

TLC is aware of current proposals to convert the entire length of the track-bed of the former branch line between Carmarthen and Llandeilo to a cycle track. Cost estimates for this work are indicated at between £5 million and £8 million. This proposal would obviously compromise the ability to transfer the Gwili Railway to this same alignment. However, TLC recommends that the provision of a cycle path should be carried out in tandem with works to re-provision the Gwili Railway, provided there is sufficient width to accommodate both the railway track-bed and the cycle path. If this work were carried out as part of the same contract, it would save a significant amount of money and should satisfy both parties.

8.8 Freight

No reference has been made to the possible future use of the re-instated line to carry freight. In line with the Welsh Government's stated aim of moving freight from the roads onto rail, where possible, and also to reduce greenhouse gases, some investigation should have been carried out to determine possible future revenue from freight business. Bulk transport of petroleum products, timber and possibly milk are obvious targets to look at.

9. Traws Link Cymru's Proposed Modifications to Figures Used in the Mott MacDonald Feasibility Study

9.1 Additional Benefits from Increased Passenger Catchment Area

Analysis of figures from the Borders Railway in Scotland showed that passenger journeys exceeded forecasts by 22% in the first six months of operation and in the second year, there has been a further 9% increase in passenger figures over the first year. In the first six months of operations for stations at the southern end of the line (Tweedbank and Galashiels), the original forecasts grossly under-estimated actual numbers by a factor of 7 (39,546 forecast; 288,511 actual). This was attributed to passengers driving to the station and parking their cars from a wider catchment area, which had not been taken into account in the original feasibility study/business case.

This scenario is very similar to this project and Table 2 shows the additional population that could be considered if an 8-10 km catchment zone were taken into account for each of the stations. The additional towns/villages included in the wider catchment areas for each station are shown in Table 5 in Appendix 11.1.

Station	Population		Additional population	Total population
	Mott report	2018 est.	within 8-10 km	Within 8-10 km
Aberystwyth	12,315	16,248	3,405	19,653
Llanilar	1,066	1,075	3,359	4,434
Tregaron	1,183	1,219	2,050	3,269
Lampeter	2,972	3,046	2,835	5,881
Llanybydder	1,596	1,596	2,518	4,114
Pencader	1,066	1,061	4,572	5,633
TOTAL	20,198	24,245	18,739	42,984

Table 2 Additional Population within 8-10 km of Stations

As can be seen from Table 2, by considering an 8-10 km catchment zone for each station, the population is double that used in the Mott MacDonald report. This wider catchment area is considered realistic for a rural area and would involve a car/bus journey of approximately 15 minutes. In figure 2 on page 16 of the Mott MacDonald report, the required weekly journeys to achieve a breakeven BCR with an assumed capital of £775 million are shown for each station. These are also converted into the required population required for each station. This same graphic can be used to estimate the equivalent populations required if a reduced capital expenditure (capex) of £560 million were to be used. These recalculated projections are shown in Table 3.

Station	Population req'd for	Population (2018 est.)	% increase pop. req'd for capex £560 mil	Population	% additional pop. Within 8-10 km
	capex of £560 mil			within 8-10 km	
Aberystwyth	19,061	16,248	17	19,653	21
Llanilar	1,613	1,075	50	4,434	312
Tregaron	1,789	1,219	47	3,269	168
Lampeter	4,062	3,046	33	5,881	93
Llanybydder	2,325	1,596	46	4,114	158
Pencader	1,457	1,061	37	5,633	431
TOTAL	30,307	24,245	25	42,984	77

Table 3 Comparison of Population Required for Capex of £560 million with Increase in Population

The figures in the above tables show that to achieve a break-even BCR with a capital expenditure of £560 million, it would require a population increase on Mott MacDonald's own figures of 50%, but if the 2018 estimate of population were used instead, this figure would reduce to 25%. The additional population from an 8-10 km catchment zone is 18,739. Thus, if 32% (6,063) of this increased catchment zone were to use the train that would be sufficient to give a break-even BCR on a reduced capital expenditure of £560 million. As demonstrated with the Borders Railway, this should be easily attainable, provided adequate, free and safe/secure parking facilities were provided at all the new stations

9.2 Revised Capital Cost Estimate

A revised capital estimate has been calculated by TLC taking into account suggested divergences from Chandler/KBS's estimate. This is shown in the following table (Table 4). The assumptions used to produce the figures contained in Table 4 are detailed in Appendix 11.2.

	£ millions
Direct Construction Works	
Railway Control Systems	27.6
Electric Power & Plant	2.8
Permanent Way	57.1
Telecommunication Systems	2.6
Buildings & Property	7.2
Civil Engineering	156.7
Enabling Works	16.1
	Direct Costs 270.1
Indirect Costs	
Site Investigation (3%)	8.1
Design (12%)	32.4
Comprehensive Feasibility Study & Business Case	8.0
Removal & Re-instatement of Gwili Railway	12.1
Project Management (8% total minus feasibility study)	29.9
Land Purchase & Compensation	38.2
Other Indirect Costs	12.9
	Indirect Costs 141.6
Total Direct & Indirect Costs	411.7
Contingency (35%)	144.1
TOTAL ESTIMATED CAPITAL COST (2017 terms)	555.8
Current Estimate in 2020 Terms (inflation @ 3.5% p.a.)	616.2

Table 4 Revised Capital Cost Estimate

An overall contingency of 35% has been allowed, which is less than the 66% “*optimism bias*” recommended by Treasury. However, TLC consider this level of contingency to be more reasonable for this project, which is significantly less complex than most of Network Rail's recent projects. It should be noted that for the Border Railways project, the actual working contingency used for construction was fixed at 8%.

The figures given are in comparable time terms to those contained in the Mott MacDonald study. However, to provide a current capital cost estimate for 2020 with assumed inflation rates of 3.5% per annum, this would rise to £616 million.

The revised capital cost estimate compares reasonably well with the actual cost figure for the Borders railway, once allowance has been made for the different route lengths, extra sections of double track and more stations.

10. Conclusions

This document has set out the case for the re-opening of the railway between Aberystwyth and Carmarthen. It is the contention of TLC that there is a compelling argument for reinstating this railway line, because of the economic, social and cultural benefits that it would bring to West Wales. But there is also a wider strategic objective. Not only would the rebuilt railway improve both inter- and intra-regional connectivity but, in due course, it could form the first stage in a new transport network along the western fringes of Wales that would link the north and south of the country without an eastward diversion into England. This western Rail Corridor would connect the industrial areas of South Wales via the Aberystwyth to Carmarthen line, to the rural heartland of Wales, and then northwards via the re-opened link from Afon Wen ultimately to Bangor and North Wales. The strategic imperative of binding Wales together as a nation by schemes such as this, will become even more important if the ramifications of leaving the European Union are to be fully addressed.

It is also important to stress that from an engineering perspective alone, the Feasibility Study concluded that the reopening of the Aberystwyth to Carmarthen line was a viable project, but on purely economic grounds a BCR of only 0.43 could be apportioned to the scheme. However, as we have shown in this document, expanding the catchment areas around each station, providing all new stations with secure parking, and synchronising local bus services to coincide with train timetables, passenger numbers would be significantly increased. This has certainly been the experience of the Borders Railway in Scotland, where passenger usage was significantly under-estimated because no allowance was made for passengers driving or travelling to stations from the immediate surrounding area.

It also appears that Chandler's capital cost estimate has been inflated by a number of ad-hoc add-ons, in addition to unnecessary earthworks to comply with current Network Rail standards for new projects, without any compelling geotechnical evidence to support this extra cost. A massive additional contingency in the form of the *optimism bias* has also been included; this is unreasonable for this project which is significantly less complex than other Network Rail projects where major problems were incurred. TLC's assessment, therefore, is that with an increase in passenger numbers, an enlargement of the population catchment area, and with a revised capital expenditure of around £560 million in 2017 terms or £620 million in 2020 prices (which is 20% less than in the Mott MacDonald Feasibility Study), the project would achieve a break-even BCR of 1.0, or even higher. It is not possible to be more precise with this estimate without further work to take full account of the expanded catchment areas, together with the suggested reduction in capital expenditure.

Whichever cost estimate is accepted, it is nonetheless evident that this will be an expensive project. But it bears comparison with the funds that have been allocated to some road-building schemes elsewhere in Wales, such as the Port Talbot Harbour Way (£107 million for only 4.8 km of carriageway), the Heads of the Valleys A465 upgrade (estimated cost of around £1 billion for 40 km of carriageway), and the projected but now abandoned 'Black Route' around Newport which, had it gone ahead, would have cost in excess of £1 billion. While these are undoubtedly important initiatives, they do little for the people of West Wales and their economic and social well-being. So it is not simply a matter of finance; there is the question of political will. It is TLC's hope and expectation that those whom we elect to represent us will appreciate the enormous benefits that a re-opened railway could bring to this part of Wales, and will do everything possible to bring this project to fruition.

11. Appendices

11.1 Population Figures for Enlarged Catchment Areas

Population statistics for towns or villages within a 8-10 km zone around the stations on the line are shown in Table 5

Towns	2011 census	Estimated in 2018
Aberystwyth		
Llanbadarn	656	662
Penrhyncoch	1316	1298
Bow Street	1572	1445
Sub-total	3544	3405
Llanilar		
Llanrhystud	646	607
Llanfarian	1541	1489
Llangwryfon	596	583
Lledrod	662	680
Sub-total	3445	3359
Tregaron		
Llanddewi Brefi	640	636
Llangeitho	819	727
Pontrhydfendigaid	712	687
Sub-total	2171	2050
Lampeter		
Ystrad Aeron	596	612
Llanfair Clydogau	634	647
Llangybi	653	640
Cwmann	872	936
Sub-total	2755	2835
Llanybydder		
Capel Dewi	1293	1214
Llanwenog	1364	1304
Sub-total	2657	2518
Pencader		
Llandysul	2732	2641
Penrhiw-llan	521	522
Llanpumsaint	734	716
Llanllwni	638	693
Sub-total	4625	4572
TOTAL	19197	18739

Table 5 Population Figures for Settlements in Vicinities of Stations (Source: www.citypopulation.de)

11.2 Assumptions used for Revised Capital Cost Estimate

The capital cost estimate, which was provided by Chandler/KBS and has been included in Chapter 5, page 132, of the Feasibility Study, has been re-evaluated to change the make-up of the estimate. This revised estimate is shown in Table 4 on page of this report. The assumptions used in this revision are detailed in this appendix.

For the “*Direct Construction Costs*”, Chandler’s figures have been used, with the exception of “*Civil Works*”. Unfortunately, no further breakdown has been given for this cost, which Chandler have estimated at £174.1 million. This “*Civil Works*” figure is assumed to include the following:

- bridges;
- drainage & fencing;
- new tunnel and remedial work for existing tunnels;
- associated road works (including at Carmarthen end);
- surcharging/stabilisation work for Cors Caron;
- flood remedial works adjacent to Ystwyth River;
- new track alignments at Aberystwyth end and at other sites along the route;
- reducing the slope angle for existing cuttings and embankments.

It has been assumed, that by maintaining all existing slopes with some limited remedial works where necessary, a reduction of 10% could be made to Chandler’s figure of £174.1 million. This gives a revised estimate of £156.7 million, equivalent to a saving of £17.4 million. According to Mott’s figures given in their “*Earthworks Schedule*”, the quantities of earth and rock to be removed would be 3.8 million cu.m., with a fill requirement for the embankments of 1.2 million cu.m. This is a total of 5 million cu.m., which is equivalent to a cost of £3.50 per cu.m. with the saving assumed.

A comprehensive feasibility study and final business case would be required, and a very generous allowance of £8 million has been included for this. Site investigation costs, which would include bore holes, rock and soil testing, load testing etc., have been estimated at 3% of the direct construction costs. The percentages used to calculate costs for design and project management are the same as those used in Chandler’s estimate.

The Gwili Railway would have to be moved, and it has been assumed that this could be relocated on the old Abergwili Junction to Llandeilo track-bed. An allowance of £2 million has been made to purchase 13 km of the track-bed (equivalent to their existing ownership), with an allowance of £3.5 million for engineering works on the alignment. A pro-rata allowance of £4.4 million, based on the overall estimate for “*Permanent Way*” has been made for moving and re-laying the existing 7 km of track. An additional £2.2 million has been allowed for stations and other infrastructure. This gives the total estimated cost of £12.1 million.

An additional allowance of £12.9 million, calculated at 10% of indirect costs, has been included to cover other unforeseen costs during design and construction.

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Back cover: Train leaving Aberystwyth station



Traws Link Cymru

West Wales Rail Campaign

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