Great Western

Route Utilisation Strategy

March 2010

Foreword

I am delighted to present the Great Western Route Utilisation Strategy (RUS), which sets out the strategic vision for the future of this vital part of the rail network. As well as the Great Western Main Line itself, the strategy covers the network north to Ashchurch and Bicester Town and south to Basingstoke, Salisbury and Dorchester.

This August will see the 175th anniversary of the Great Western Railway. Today, that railway carries tens of millions of passengers a year through the Thames Valley, the West Country and Wales. Working closely with our train operating customers, Network Rail is delivering an ever improving service for those passengers, and for freight users.

More people are choosing to travel by train, and high levels of growth are predicted to continue, particularly around London Paddington and Bristol. Demand for freight is also expected to continue to grow, as it is increasingly recognised as an economically sensible and environmentally efficient form of transport.

This success brings challenges. Already the improvement work has begun – fixing the bottleneck at Reading, redoubling the Cotswold line, increasing the linespeed on the Bristol to Birmingham corridor, preparing for Crossrail, and through development work on the Intercity Express Programme (IEP) and electrification of the Great Western Main Line.

This investment is a massive boost for passengers, businesses and communities along the route. When complete, more trains will run, with better performance and greater environmental efficiency.

Development of this strategy has followed a now well-established process. Initially, an analysis was carried out into the capacity and capability of the existing network and train services taking into account major changes planned over the next 10 years. Future demand was then analysed with a number of “Gaps” identified and options to resolve these gaps appraised. Those which demonstrated the best value for money are included in the strategy.

The dominant issue is the need to provide sufficient capacity on peak services, specifically to and from London but also for Bristol and Exeter. In the short to medium term the approach focuses on enabling longer trains to serve these routes, particularly through the introduction of IEP, which will increase capacity through new rolling stock and an enhanced timetable, but also through train lengthening for local services. The strategy also identifies future opportunities presented by electrification such as a further review of the local network in Bristol building on the analysis of a ‘Bristol Metro’ service.

This RUS was initially published in consultation form in September 2009. Many issues were raised during that consultation that have influenced several aspects of the strategy. Network Rail has led the production of this RUS, however it has been developed with the full input of the rail industry including passenger and freight operators, the Department for Transport, Transport for London, Passenger Focus and London TravelWatch. I thank them all for their contribution.

Iain Coucher
Chief Executive

Executive summary

Introduction

Route Utilisation Strategies (RUSs) seek to establish the strategic direction of the railway from a systematic analysis of future requirements of the network. They seek to balance capacity, passenger and freight demand, operational performance and cost whilst addressing the requirements of funders and stakeholders. Network Rail is developing a programme of RUSs, in conjunction with rail industry partners and wider stakeholders, which when complete, will cover the entire rail network in Great Britain. This programme of RUSs includes a Network RUS which reviews national issues such as stations, depots, rolling stock and electrification as well as presenting scenarios and forecasts for long distance passenger and freight markets with the established Freight RUS providing a strategy to meet anticipated freight demand to 2014. This Great Western RUS provides a further step towards achieving national coverage and has followed the now well-established process.

Scope

The Great Western RUS sets out the strategic vision for a particular part of the rail network. The scope of the RUS is extensive and diverse; the focal element being the Great Western Main Line (GWML) which operates over 320 miles and creates main line links from London to the West of England and South Wales. Extending from this are radial routes to Oxford, the Cotswolds, Birmingham, the South Coast and South West. Branch lines into the London suburbs, to the Devon and Cornish coast and dedicated freight only lines complete the mix of routes considered.

The scope area adjoins the routes of the South West Main Line; Wessex; South and Central Wales and Borders; Chilterns and the West Midlands. The RUS area plays a crucial role in the core cross-country network, linking the South Coast, Thames Valley, West Country, South Wales and South Midlands with the Midlands, Greater Manchester, Yorkshire, the North East and Scotland.

Timeframe

The Great Western RUS primarily focuses on the next 10 years to 2019 but has also considered the implications of growth in demand over the next 30 years in the context of the Government's 2007 White Paper "Delivering a Sustainable Railway".

The period from 1 April 2009 to 31 March 2014 is Network Rail's current Control Period 4 (CP4). Any known commitments to 2014 that have either formed the High Level Output Specification (HLOS) or have committed funding through other funding streams have been included as part of the Great Western RUS base. Such capacity schemes and other enhancements are described further in **Chapter 4**.

CP4 marks a start of a new era for rail in Britain as this is the first review since the passing of the Railways Act 2005, and introduces a new process whereby the Secretary of State issues a High Level Output Specification and a Statement of Funds Available which sets the scene for the next five years. From this, Network Rail has embarked on a national programme of expenditure targeted at building a bigger and better railway through over 500 schemes and projects aimed at providing extra capacity or capability for passengers and freight customers – this is the biggest expansion of Britain's railways since the 1840s.

Within the Great Western RUS scope area there are a significant number of major, high-profile, high-investment enhancement schemes planned or proposed during CP4 which continue into the next control period (Control Period 5 (CP5)) from 2014 to 2019. These major enhancement schemes include the electrification of the Great Western Main Line; the Intercity Express Programme (IEP); European Rail Traffic Management System (ERTMS); the Reading Station Area Redevelopment and Crossrail. Although predominantly within the Thames Valley area, these schemes will resolve a number of current and future issues across the whole of the RUS area. The implementation of these interventions will significantly change the capacity and capability of the network.

Through the inclusion of these improvements in the base, the RUS has been able to identify further prospective “Gaps”. The focus of options to address these gaps being to input recommendations for the longer-term strategy to inform the Department for Transport’s (DfT) next HLOS for CP5.

Process

The starting point for the Great Western RUS has been to analyse the current base position of the network, combined with any committed schemes and known interventions. Demand analysis has been undertaken to ascertain the expected level of growth over the next 10 years taking into account the anticipated drivers of change. The combined analysis identifies where supply and demand is mismatched now, and where it is expected to be mismatched in the future.

The identified gaps have been analysed to understand how best to address them, taking into account any schemes already proposed. In the course of this work, options have been developed on an iterative basis until feasible solutions have been identified with acceptable operational performance that meets whole-industry value-for-money criteria. In some cases there may be further work required to identify additional benefits in order to demonstrate a sufficiently strong economic return.

The Great Western RUS has been developed as a result of considerable analysis and close collaboration between Network Rail, the Department for Transport, the passenger and freight operators, Transport for London, the Office of Rail Regulation, Welsh Assembly Government, Passenger Focus and London TravelWatch.

Gaps

The key themes that have emerged from the analysis of the current railway and what is required of it in the future is capacity (at stations, on trains and of the network), performance pinch-points and local and regional connectivity. The following table presents the gaps identified and taken forward for further analysis under the Great Western RUS process.

1.	Paddington peak capacity
2.	Inner suburban service pattern
3.	Paddington to Reading all day capacity
4.	Paddington to Reading performance
5.	Slough to Windsor all day capacity
6.	Freight capacity and capability: in and around London and north-south
7.	Reading peak capacity
8.	Didcot to Wolvercot Jn performance
9.	West Midlands to South Coast connectivity and all day capacity
10.	Swindon to Gloucester performance
11.	South Wales to South Coast all day capacity
12.	West Midlands to South West connectivity and all day capacity
13.	Bristol peak capacity
14.	Bristol performance
15.	Westbury area performance
16.	Exeter and Plymouth area service pattern
17.	Interurban journey times
18.	Early morning arrivals at key regional centres
19.	Station crowding
20.	Seasonal fluctuations
21.	Impact of Heathrow Airport expansion and western access

A number of strategic gaps were also identified which relate to the overall rail network. These include the Intercity Express Programme, freight train length and network capability, depot capacity and the Seven Day Railway initiative (to improve network availability). These strategic issues are being managed through other industry processes, such as the Strategic Freight Network (SFN) and the Network RUS, and as such are not intended to be duplicated by this RUS. However, elements of these gaps have been included, where necessary, within the appropriate gaps and options analysis of the Great Western RUS. Further details on each of the generic gaps are provided in **Chapter 4** and **Chapter 6**.

In developing the RUS, there were a number of uncertainties. This is especially apparent with regards to the proposed timetables for IEP and Crossrail services. Draft service specifications have been used as a basis for the RUS analysis; however these continue to be developed and are yet to be finalised and confirmed. As such, the additional quantum of services expected from these interventions and their proposed calling patterns has not been explicitly modelled. Further timetable work is scheduled to combine and commit the service specifications, along with the predicted freight growth and pathing requirements, to ensure compatibility and accommodation on the network, and as a result, further infrastructure enhancements may be necessary.

The GWML is currently the second busiest freight corridor into London. This is expected to increase substantially with the levels of predicted growth, particularly for aggregates traffic, required for the construction of the Olympic infrastructure and Crossrail. Analysis has included the current forecasts for freight growth from the Freight RUS and the SFN for various route sections within the RUS area to ensure sufficient network capacity and capability to accommodate growth in passenger and freight markets. The forecasts for freight growth up to 2019 are still subject to agreement and as such, the RUS has continued to use the latest estimates as assumptions for growth up to 2019. However, during the consultation period of the RUS, the forecasts for growth up to 2030 have been confirmed and these have been applied in the RUS analysis.

The gaps and options identified and appraised as part of the Great Western RUS are summarised below with a more detailed account, along with a description and quantification of the gaps and option evaluation, provided in **Chapter 6**.

Gaps 1 to 4 together with Gap 21 and part of Gap 6, freight capacity and capability in the London area, were combined to form one option reviewing the corridor between London Paddington and Reading. A scenario matrix was developed to manage the known proposals for IEP, electrification and Crossrail pre- and post-implementation.

Capacity analysis to 2019 showed sufficient supply to cater for forecast growth on the current Long Distance High Speed (LDHS) services with IEP (either diesel or electric) on the LDHS services and outer suburban services after the implementation of Crossrail. The provision of freight paths in the latest Crossrail timetable proves sufficient to accommodate predicted freight growth as per the SFN forecasts to at least 2030.

The RUS describes the demand forecasting and operational modelling work completed under the scenario matrix and references the ongoing work taking place to deliver electrification, IEP and Crossrail. **Chapters 4** and **9** provide greater detail on these schemes with regards to scope and the effect their implementation will have on the RUS area.

The commitment to the electrification of the GWML provides the opportunity for the extension of Crossrail services west of Maidenhead which could bring significant benefits, by giving the wider Thames Valley direct rail access to central London and the City, while also creating extra capacity at London Paddington for longer distance services. The scheme sponsors, DfT and Transport for London, are reviewing this option.

Electrification will also enable the current Thames Valley suburban services into London Paddington to be operated by electric trains instead of the existing diesel trains.

It is currently proposed that a number of the existing Thameslink four-car electric trains will be transferred onto the GWML, replacing the current two and three-car diesel trains, when the new Thameslink fleet is introduced. These vehicles could then operate on the suburban services between Oxford, Reading and London Paddington by the end of 2016. This proposal is subject to agreement and further review in CP5 in line with the latest rolling stock plan.

All day capacity between Slough and Windsor and Eton Central station was assessed in line with the December 2008 timetable which increased passenger services on the branch from two trains per hour to three trains per hour Monday to Friday. This proved sufficient supply to cater for current and predicted demand to 2019. First Great Western (FGW) revised the operation on Saturdays during the summer months in 2009 to increase capacity to a three-car train to assist with on-train crowding. FGW has been unable to develop a positive business case for increasing the service provision on a Saturday to three trains per hour; they will therefore continue to review the provision of three cars on weekend services as necessary, although this is dependent on rolling stock availability during the summer months.

Capacity analysis on all services into and out of Reading during the peak periods identified that on-train crowding would exist by 2019 on the Reading to Gatwick Airport corridor. This supports, and is consistent with, the analysis undertaken as part of the Sussex RUS which reviewed the service from Gatwick Airport to Redhill. During the consultation period of the Sussex RUS further analysis has been undertaken to review the extension of services from Redhill to Gatwick Airport. There is a requirement of the Greater Western Franchise to provide two trains per hour on a standard pattern between Reading and Gatwick Airport and the potential remodelling at Redhill in CP5 would facilitate this, enabling through services to operate to Gatwick Airport on a more ordered pattern of service. A positive business case to extend these services would improve the service frequency on the route between Reading and Gatwick Airport. However, at present, no case can be found to extend the remaining 14 North Downs services which terminate at Redhill through to Gatwick Airport. The Sussex RUS does, however, recommend that the second hourly service to Gatwick Airport from the North Downs line should be included as an option in the post Thameslink timetabling work on the Redhill corridor as many of the timetable issues could be resolved through a recast of the Brighton Main Line and Redhill corridors.

Further analysis was undertaken by the Great Western RUS on the North Downs route to review on-train crowding, specifically to address perceived crowding at Guildford. The analysis confirms the recommendation to lengthen four peak services (two in each direction) by two-cars to address these overcrowding issues. This enhancement includes the HLOS proposal to lengthen all the Reading to Gatwick Airport services to three cars (as this forms part of the RUS base as a committed scheme). However, all proposals to lengthen services are subject to rolling stock being available. The delivery plan for the extra vehicles is still to be determined with an announcement expected in 2010. The RUS has therefore continued with the initial assumptions made under the HLOS proposals as the latest information available and continued to use these assumptions as part of the RUS base.

Five infrastructure enhancements were proposed to address capacity and performance issues between Didcot and Wolvercot Jn specifically at Didcot East Jn, Didcot North Jn and Oxford. A capacity study assessed the predicted growth in passenger and freight services, using the draft IEP service specification and forecasts of freight growth from the SFN, and the impact this would have on the current infrastructure. From this, the Draft for Consultation recommended further evaluation of the options for enhancing Didcot North Jn to provide the additional capacity necessary to accommodate such growth. This work identified that the infrastructure would only be required should the current level of passenger services be increased with the introduction of an enhanced IEP timetable. The current infrastructure is sufficient to accommodate current and predicted freight growth subject to the existing level of passenger services remaining constant. Should the level of passenger

services increase, then a dynamic loop would be required to enable freight to continue to access Appleford sidings. The infrastructure is therefore dependant on the number of services proposed in the IEP service specification. Further enhancement to Oxford station and the areas into and out of the station area are also recommended as part of the Oxford Area Redevelopment scheme.

On-train crowding was identified as a gap from the North to the South Coast and to the South West on the interurban corridors between Manchester and Bournemouth; Newcastle and Reading; Edinburgh and Plymouth; and Manchester and Bristol Temple Meads. Load factor analysis of the current situation, using the latest passenger counts from May 2009, and that predicted to rise in 2019 with forecast growth has enabled a business case to be developed for additional vehicles. Various scenarios were modelled due to the train diagramming requirements currently being used and with the assumption that these can be further optimised in the future, the RUS identifies that between 8 and 19 additional vehicles in traffic can be supported. The final number of vehicles required will be dependant on the ability to optimise future train diagrams.

To improve connectivity, and assist with capacity issues to the South Coast, the RUS reviewed the option of extending the current Newcastle to Reading service to Southampton and/or Bournemouth. A high level economic appraisal proved that extending to Southampton provided sufficient value for money for further consideration. Timetable analysis was undertaken on an hourly extension and a two-hourly option. The hourly option was discounted due to the significant amount of infrastructure that would be required. The two-hourly option, providing an additional six trains per day in each direction, between Reading and Southampton proved feasible on the current infrastructure and was assessed against the proposed freight growth as per the SFN forecasts to 2019 and 2030. The analysis proved that the extension of the passenger service on a two-hourly basis would not compromise predicted future freight growth to 2030 and that all services could be accommodated on the existing infrastructure. The RUS therefore recommends this option subject to performance modelling of the proposed service extensions in the Basingstoke station area.

Alternative routeings for the existing Newcastle to Reading service have also been reviewed by the Great Western RUS to address connectivity gaps between Coventry and the East Midlands and West Yorkshire. The RUS reviewed the expected level of demand that could be generated should these services be routed via Coventry and/or Leeds instead of via the current routeing of Solihull and Doncaster. This follows on from the initial work on rerouteing the service via Leeds which was undertaken by the Yorkshire and Humber RUS. By routeing the service via Coventry and or/Leeds, demand analysis shows increased train loadings particularly at Coventry and Birmingham New Street, however, the existing train formations on the Newcastle to Reading corridor are sufficient to accommodate this demand with no additional vehicles required. The West Midlands and Chiltern RUS will develop this analysis further by undertaking a detailed timetable study for these routeings to assess track and timetable capacity. The full results, including the economic appraisal, will therefore be presented in the West Midlands and Chiltern RUS.

To improve capacity and performance on the Swindon to Gloucester route, the RUS supports the development of the Swindon to Kemble redoubling scheme with the inclusion of the incremental enhancement of additional signals between Kemble and Standish Jn to improve capacity for normal service provision, as well as for diversionary working as recognised under the Seven Day Railway initiative. The combined scheme is still subject to full funding for its implementation.

Capacity analysis with predicted growth to 2019 for the services between South Wales and the South Coast (specifically the Cardiff to

Portsmouth and Bristol to Weymouth services) identified on-train crowding issues for which the RUS recommends the lengthening of five peak services (by either one or two vehicles) on the Cardiff to Portsmouth route and two peak services (by one vehicle) on the Bristol to Weymouth route. This enhancement is over and above the HLOS proposal for 12 additional vehicles to lengthen services in the West of England. In addition, a review of the service proposition on the Cardiff to Portsmouth route results in the recommendation of one morning and one evening peak service becoming a faster service through the removal of a number of intermediate station calls between Westbury and Bristol Temple Meads. A separate stopping service would be introduced between Westbury and Bristol to cater for passengers at these stations. This option provides additional capacity as well as a significant improvement to journey time.

To address current and predicted capacity issues to 2019 at Bristol Temple Meads the RUS recommends an additional nine vehicles in traffic to lengthen 11 morning and evening peak hour trains. An enhanced cross-Bristol service will also be recommended in the RUS as a longer-term option to provide an additional hourly Bristol Temple Meads to Yate service (subject to third party funding) through the extension of the existing Weston-super-Mare to Bristol Parkway service; and an additional hourly Bath Spa to Bristol Temple Meads shuttle (calling all stations) subject to performance validation with possible extensions to Clifton Down.

Following consultation responses, two further options have been assessed for enhanced Bristol services. The first reviewed an increased frequency on the Severn Beach branch with a half hourly clock face service from Bristol Temple Meads to Avonmouth and incremental to this, an hourly service to Severn Beach. Operationally, it has been proven that these enhanced services can be accommodated on the existing infrastructure. However, in order to accommodate these services, longer turnaround times are experienced at Bristol Temple Meads which are resource-costly. Economic appraisal results show that there is an insufficient Benefit Cost Ratio (BCR) to be able to recommend the enhanced service frequency between Bristol Temple Meads and Severn Beach. However, to further improve the business case, and to maximise the use of rolling stock and staff resources, the option of extending the service to Bath Spa was reviewed. This utilises the long turnaround times at Bristol Temple Meads and enables a cross-Bristol service to operate with no further rolling stock or resource costs. The option would provide an additional hourly service from Avonmouth to Bath Spa, calling all stations. This option achieves a BCR of 1.8 which is above the recommendation threshold. There are therefore three alternative options available for services from Bath Spa to Bristol Temple Meads with possible through service opportunities:

- Bristol Temple Meads to Bath Spa
- Clifton Down to Bath Spa
- Avonmouth to Bath Spa

The RUS recommends the Bristol Temple Meads to Bath Spa shuttle but notes the marginal case for the alternative options of extending the service to Avonmouth or Clifton Down and it is therefore recommended that these options are considered in the future as part of timetable reviews associated with electrification and IEP. It is appreciated that there are concerns over the potential negative impact on operational performance with regard to services turning around at Bath Spa and this option is therefore subject to performance modelling and should be reviewed in line with opportunities available from the electrification of the Great Western Main Line. The Bath Spa capacity upgrade which is currently progressing to GRIP[1] stage 4 (Single Option Development) will increase capacity in the station by reducing platform reoccupation times and reducing signalling headways. This will therefore assist in improving performance.

1 GRIP being Network Rail's "Guide to Railway Investment Projects" and the process by which investment schemes are managed

The second option identified as a new gap during the consultation process was the lack of connectivity between Bristol Temple Meads and Gloucester via the Severn Tunnel on the South Wales Main Line. To address this, a new direct service was assessed from Bristol Temple Meads, calling at Filton Abbey Wood, Severn Tunnel Jn, Chepstow, Lydney and Gloucester. Unfortunately, due to the distance of almost 70 miles and the necessary rolling stock and operational resources needed to operate this new service, the BCR was less than 1 and therefore failed to achieve the necessary level to enable the RUS to recommend it.

The Draft for Consultation also recommended an hourly service from Westbury to either Chippenham or Swindon subject to the further development of these schemes by the scheme promoters. However, during the consultation period it became apparent that the passenger figures used in the analysis were distorted due to a discrepancy in purchasing of tickets at Melksham for travel between Bath and Trowbridge. The economic appraisal has therefore been remodelled, using the latest passenger data available, with the hourly Westbury to Swindon service achieving a sufficient BCR to be able to be recommended but the option for a Westbury to Chippenham service offers poor value for money (mainly due to the infrastructure costs for the required bay platform at Chippenham). There are still concerns over the validity of the demand data and it is evident that the business case for these schemes is highly sensitive to the level of passenger demand, particularly at Melksham where footfall is currently low and the effect of a significant service enhancement on demand is uncertain. The RUS therefore recommends that the scheme promoter develops these options further by undertaking a detailed review of the local area demand and identifying the most optimum service pattern. This can then be modelled, for operational and performance viability, with a full business case completed.

To improve capacity and performance into Bristol Temple Meads from the north, east and south west approaches, the RUS reviewed four infrastructure enhancements taking cognisance of the proposed IEP service pattern and potential freight growth. The RUS recommends the provision of four tracks between Bristol Temple Meads and Parson Street through the extension and conversion to passenger use of the carriage line from Bristol Temple Meads to Bedminster rejoining the main line just beyond Parson Street.

The development of the business case for the option of a three or four track section between Dr Days Jn and Filton Abbey Wood has been completed during the consultation period of the Great Western RUS to enable a complete business case to be provided incorporating capacity, journey times, performance and Seven Day Railway benefits. This presents sufficient BCRs for the RUS to be able to recommend this scheme, with both the options of a three or four track section to be progressed.

It is recommended that capacity and performance at Westbury station is improved through the provision of an additional platform face at Westbury by creating an island platform from the existing Platform 1. There are benefits from implementing this scheme as part of the mitigation plan for Crossrail and the Reading Station Area Redevelopment works as it provides a viable diversionary route during the construction period. Under this proposal, the platform needs to be operational by early 2011. The business case for the scheme would be enhanced to include performance, capacity and diversionary benefits but is subject to funding.

To improve connectivity between Exeter and Plymouth, various options were reviewed to extend current long distance services beyond Bristol Temple Meads to Exeter and Plymouth along with amendments to the current local service proposition. The current IEP proposal could potentially introduce a standard pattern throughout the day from Bristol Temple Meads

to Exeter, Plymouth and Penzance. This will address the longer distance connectivity gap whilst introducing a standard pattern timetable.

The Great Western RUS Draft for Consultation recommended a change to the local area service pattern with the introduction of a half hourly Paignton to Exmouth service and an hourly Barnstaple to St James Park service commencing in 2018 extending cross-Exeter journey opportunities. However, during the consultation period this has been reviewed in line with FGW replacement services west of Exeter, and taking cognisance of consultation responses, a new option is recommended. This maintains the existing hourly services between Barnstaple and Exmouth and Paignton and Exmouth and introduces an additional hourly service between Paignton and St James Park. With the improved frequency and crowding relief, the business case is sufficient to be able to recommend the implementation of this scheme at the earlier date of 2016.

The RUS also reviewed the extension of this new Paignton to St James Park service to Axminster, calling at Pinhoe, Honiton and the new Cranbrook station, to improve connectivity and to achieve the aspiration of a half hourly Exeter St Davids to Axminster service. However, in line with the analysis that was previously undertaken, the scheme requires infrastructure works which the business case fails to support. An alternative option was reviewed, which would provide a two-hourly service through extending from St James Park to Axminster on alternate hours, which can be achieved on the current infrastructure. However, the appraisal results generate a BCR of 1.2 which is beneath the necessary threshold of 1.5 to be able to recommend it. The analysis did prove that the additional service is operationally feasible, and identified the required infrastructure in order to achieve an additional hourly service. Although there is not a sufficient business case at present to be able to recommend the options, the proposals should be reviewed with third party funding opportunities and in line with predicted growth and patronage of the new Cranbrook station as this could potentially result in a positive business case in the future.

To address interurban journey times, the development of a linespeed increase to 125mph between Bristol Temple Meads and Bridgwater is recommended. The opportunity for raising the Permanent Speed Restrictions on the route between Gloucester and Severn Tunnel Jn has been further reviewed during the consultation period and will be taken forward for development under the Seven Day Railway programme. This follows on from the process of route classifications under the Seven Day Railway initiative, where the route has been identified as a key diversionary route providing diversionary benefits for the Bristol to Birmingham and London to South Wales services, and by improving the linespeed, can assist in achieving the Seven Day Railway targets for reduced journey times on diversionary routes. These are further discussed in **Chapter 4** and **Chapter 6**.

With electrification and the current IEP proposals, journey time improvements could also be achieved between South Wales and London Paddington through the reduction of station calls and the increased acceleration and braking capability of the new trains. Proposals for changing the calling patterns in the West of England formed First Great Western's timetable offer in May 2009 with further changes in December 2009. This work is also ongoing as part of the timetable process, with proposed changes for 2010 highlighted in **Chapter 4**.

Earlier arrivals from London Paddington to Plymouth were reviewed. Following a high level economic appraisal of introducing an earlier service, the gap was discounted due to the weak business case. However, FGW is currently developing a scheme, which is subject to Service Level Commitment consultation, to provide a direct early morning London Paddington to Paignton service via the Berks and Hants line. This would deliver an earlier morning arrival into Exeter, Paignton and, through a connection, to Plymouth.

The RUS reviewed the proposed station capacity enhancement schemes for London Paddington, Ealing Broadway, Reading, Oxford and Bristol Temple Meads and concluded that the enhancements would address current passenger congestion issues and provide sufficient capacity to cater for predicted growth. Options for improving Windsor and Eton Central station included provision of ticket gates and the widening of the current platform, but these failed to generate sufficient user benefits and are therefore not recommended.

The RUS reviewed the Devon and Cornwall branch lines where the service offered through the summer differed to that provided through the winter, in particular assessing those branch lines where LDHS services also operated, namely to Newquay and Paignton.

For Newquay, the capacity analysis showed that there is sufficient capacity on the LDHS services on a summer Saturday to 2019 whilst being able to accommodate an estimated 35 percent growth in passenger journeys. On summer Saturdays, there is no local service provision at the intermediate stations on the line from Par to Newquay as the current LDHS service operates non-stop from Par to Newquay. The RUS analysed the operational requirements to provide both a LDHS service and a local stopping service, however, the capital and operational investment required to accommodate this resulted in an insufficient business case to be able to recommend it.

Capacity analysis on the local and long distance services into, and out of, Paignton has been completed during the consultation period using passenger counts undertaken during August 2009. The current levels of demand, projected to 2019 with predicted growth, show that with the proposed train lengthening opportunities for the long distance interurban services between Plymouth and Edinburgh and Manchester and Bristol Temple Meads/ Paignton, this provides sufficient capacity to accommodate predicted growth in demand on both weekends and summer periods to at least 2019. For the local services, the capacity analysis has enabled the proposed change to the service provision with the additional Paignton to St James Park service to be introduced at an early stage in 2016 rather than 2018 as per the previous option and recommendation in the Draft for Consultation. This is because the capacity information has supported the business case for a revised service pattern to be operated during the week and at weekends and is sufficient enough to achieve the necessary BCR of 1.5 by 2016. With this change in service frequency, no further interventions are required.

From the above, it is clear that the outcomes of the option appraisal stage provide recommendations for the RUS strategy. The most acute issue evident is accommodating the growth in commuter and leisure journeys at various points across the Great Western RUS area. These are predominantly into London Paddington, Reading and Bristol Temple Meads as the key stations on the route and additionally to, from and within Devon and Cornwall.

Options were developed as potential interventions to bridge the identified gaps with the strategy primarily seeking to address the growth in passenger and freight demand progressively over time, identifying changes to service provision and the infrastructure required to meet such growth whilst maintaining performance. The strategy can therefore be summarised with the following recommendations:

Recommendations to 2019:

- **Implement committed schemes as planned:**
  - HLOS capacity and performance metrics
  - HLOS capacity programme (Twyford and Maidenhead relief line platform lengthening[2]; the Cotswold line redoubling and Westerleigh Jn to Barnt Green linespeed improvements)
  - Electrification of the Great Western Main Line (Paddington to Bristol/Swansea, Newbury/Oxford)
  - Intercity Express Programme
  - European Rail Traffic Management System
  - Reading Station Area Redevelopment
  - Reading Green Park
  - Southampton to West Coast gauge enhancement and diversionary route via Andover and Laverstock
  - Evergreen III (Bicester Chord)
  - Crossrail
  - Up and down goods loops and the south facing bay platform at Oxford station
  - Bath Spa capacity upgrade.
- **RUS recommendations:**
  - Train lengthening to provide additional capacity on the following corridors: Reading to Gatwick Airport, Plymouth to Edinburgh, Manchester to Bournemouth, Manchester to Bristol Temple Meads/ Paignton, Cardiff to Portsmouth, Cardiff to Taunton and Gloucester to Weymouth
  - Improve connectivity through service changes with a two-hourly extension of the Newcastle to Reading service to Southampton and enhancements for cross-Bristol and cross-Exeter services
  - Improve capacity and performance through infrastructure schemes at Oxford, Swindon to Gloucester, Westbury, Dr Days Jn to Filton Abbey Wood and from Bristol Temple Meads to Parson Street
  - Reduce journey times between Bristol Temple Meads and Bridgwater through linespeed improvements, Gloucester to Severn Tunnel Jn through a linespeed review and between Bristol Temple Meads and Westbury through changes to the service provision.

2 Should the HLOS capacity metric for London be met by the rolling stock plan, this project would not be required for HLOS purposes

Beyond 2019

The RUS considers in detail gaps, options and resulting interventions over the 10-year period to 2019. Beyond this point the RUS takes a longer-term view, acknowledging the level of uncertainly over demand in this longer timeframe. The Government's "Delivering a Sustainable Railway" White Paper (2007) suggests a general doubling of both passenger and freight traffic nationally over a 30-year period; however it is recognised there may be wide variations on individual routes or parts of routes according to local circumstances. The RUS reviews future requirements in the context of the next 30 years and considers what may be required, this is presented in **Chapter 9**.

The strategy

The Great Western RUS Draft for Consultation was published in September 2009. The draft and this final document have been developed as a result of considerable analysis and close collaboration between the Stakeholder Management Group (SMG) and Network Rail. The Great Western RUS is the rail industry's strategy, not solely that of Network Rail.

We are grateful to all those who responded to the Draft for Consultation, and we hope that where possible, within our terms of reference, we have been able to take account of genuine concerns.

Subject to final establishment by the Office of Rail Regulation, this strategy is intended to inform the DfT's High Level Output Specification for CP5. There are a small number of elements of the final strategy that can be implemented at an earlier date where possible and Network Rail will work to implement these aspects during CP4.

This RUS, together with all the other RUSs published to date, is available electronically at **www.networkrail.co.uk**

Contents


Bristol Parkway

1. Background

1.1 Introduction to Route Utilisation Strategies

1.1.1

Following the Rail Review in 2004 and the Railways Act 2005, the Office of Rail Regulation (ORR) modified Network Rail's network licence in June 2005 to require the establishment of Route Utilisation Strategies (RUSs) across the network. Simultaneously, ORR published guidelines on RUSs. A RUS is defined in Condition 1 of the network licence as, in respect of the network or a part of the network[1], a strategy which will promote the route utilisation objective. The route utilisation objective is defined as:

> "the effective and efficient use and development of the capacity available on the network, consistent with funding that is, or is reasonably likely to become, available".

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

1.1.2

The ORR guidelines explain how Network Rail should consider the position of the railway funding authorities, their statements, key outputs and any options they would wish to see tested. Such strategies should address:

- network capacity and railway service performance
- train and station capacity including crowding issues
- the trade-offs between different uses of the network (eg. between different types of passenger and freight services)
- rolling stock issues including deployment, train capacity and capability, depot and stabling facilities
- how maintenance and renewals work can be carried out while minimising disruption to the network
- opportunities from using new technology
- opportunities to improve safety.

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

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

1.1.3
The guidelines also set out principles for RUS development and explain how Network Rail should consider the position of the railway funding authorities, the likely changes in demand and the potential for changes in supply. Network Rail has developed a RUS Manual which consists of a consultation guide and a technical guide. These explain the processes used to comply with the Licence Condition and the guidelines. These and other documents relating to individual RUSs and the overall RUS programme, are available on Network Rail's website at **www.networkrail.co.uk**.

1.1.4
The process of RUS production is designed to be inclusive. Joint working is encouraged between industry parties, who share ownership of each RUS through its industry Stakeholder Management Group (SMG). In order to ensure passengers' interests are represented the SMG also includes Passenger Focus and London TravelWatch (where relevant).

1.1.5
There is also extensive informal consultation outside the rail industry by means of regular briefings to a Wider Stakeholder Group (WSG). The roles and members of both the SMG and WSG are detailed further in **Chapter 2**.

1.1.6
The ORR guidelines require options to be appraised. This is initially undertaken using the Department for Transport's (DfT) appraisal criteria. To support this appraisal work RUSs seek to capture implications for all industry parties and wider societal implications in order to understand which options maximise net industry and societal benefit, rather than that of any individual organisation or affected group.

1.1.7
RUSs occupy a particular place in the planning activity for the rail industry. They use available input from processes such as the DfT's Regional Planning Assessments, the Wales Rail Planning Assessment, and Transport Scotland's Scottish Planning Assessment. The recommendations of a RUS and the evidence of relationships and dependencies revealed in the work to reach them, in turn form an input to decisions made by industry funders and suppliers on issues such as franchise specifications, investment plans or the High Level Output Specification (HLOS).

1.1.8
Network Rail will take account of the recommendations from RUSs when carrying out its activities; in particular they will be used to help inform the allocation of capacity on the network through application of the normal Network Code processes.

1.1.9
The ORR will take account of established RUSs, and those in preparation, when exercising its functions.

1.2 Document structure

1.2.1

This document starts by outlining in **Chapter 2**, the dimensions of the Great Western RUS and the geographical context within which it is developed. It also describes the linkage to other associated work streams and studies which relate to the RUS.

1.2.2

Chapter 3 describes the railway today covering passenger and freight demand and the capability of the infrastructure to meet that demand. Gaps which already exist between demand and capacity are identified.

1.2.3

In **Chapter 4** the committed and uncommitted schemes proposed for the future are explained along with known train service amendments for future timetable revisions.

1.2.4

Chapter 5 summarises the main planning documents of relevance to this RUS together with their vision for the role of the railway over the next 30 years and analyses the rail passenger demand and freight traffic that is likely to arise.

1.2.5

In **Chapter 6** gaps between forecast demand and current capability are identified. Options for bridging the gaps pinpointed in the previous chapters are listed, discussed and given an initial appraisal of their likely costs and benefits.

1.2.6

Chapter 7 describes the consultation process, including its purpose and a summary of the responses received and how these are taken into account in the final document.

1.2.7

The conclusions emerging from the option analysis are presented in **Chapter 8**, together with a view of how the future strategy might take shape.

1.2.8

Chapter 9 describes the longer-term scenario and expands on developments up to 2019 and beyond.

1.2.9

Finally, **Chapter 10** identifies the next steps and mechanisms for implementing the recommendations in the RUS.

1.2.10

Supporting data is contained in the appendices to this document. All information is available electronically from Network Rail's website **www.networkrail.co.uk**.


First

2. Dimensions

2.1 Introduction

2.1.1

This chapter details the geographic scope of the Great Western Route Utilisation Strategy (RUS), its purpose, time horizon, the planning context in which it is set, and the linkages to other studies along with details of the management group and stakeholder briefings.

2.2 Purpose

2.2.1

The strategies that emerge through the RUSs have a number of purposes; they inform:

- the optimisation of the output specification for rail infrastructure renewals and enhancements
- the identification of ways in which capacity could be used more efficiently, in the context of the railway and wider public transport
- the development of the Government's High Level Output Specification (HLOS) for the next control period
- address specific socio-economic developments, growth and employment.

2.2.2

The Great Western RUS will therefore:

- propose options to achieve the most efficient and effective use of the existing rail network and identify cost effective opportunities to improve it where appropriate
- enable Network Rail to develop an informed renewals, maintenance and enhancements programme in line with the Department for Transport's aspirations and the reasonable requirements of train operators and other key stakeholders
- enable local and Regional Transport Plans and freight plans to reflect a realistic view of the future rail network.

2.3 Stakeholders

2.3.1

The Great Western RUS has been managed through a Stakeholder Management Group (SMG), the steering group for the strategy, who met on various occasions at key stages during the development of this RUS.

2.3.2

The group included the train operating companies (Arriva Trains Wales, Chiltern Railways, CrossCountry, First Great Western, Heathrow Express and South West Trains), freight operating companies (specifically DB Schenker and Freightliner), Network Rail, the Association of Train Operating Companies, the Department for Transport, Transport for London, Crossrail Limited, Welsh Assembly Government, Passenger Focus, London TravelWatch and the Office of Rail Regulation (as an observer).

2.3.3

A Wider Stakeholder Group (WSG) was also established, including representatives from local authorities, statutory bodies, community rail partnerships, rail user groups and other stakeholders. A number of wider stakeholder briefings were held during the process of the Great Western RUS, the purpose of which was to inform the WSG of the developments and progress of the RUS.

2.3.4

In April 2008, introductory briefings took place at Reading, Bristol and Plymouth where the context, scope and objectives of the RUS were outlined along with the standard RUS processes and programme. In June 2008,

baseline exhibitions were held at the same locations to enable stakeholders to review the results of the baseline exercise and share their ideas and insights on the current and future network. This feedback, along with the subsequent further documentation provided by many, provided valuable input into the process of gap identification and subsequent optioneering. The baseline information from these exhibitions is available on Network Rail's website at **www.networkrail.co.uk**.

2.3.5
An interim briefing was later held in Bristol (November 2008) to update the WSG on current progress of the Great Western RUS and present the identified gaps being taken forward for further analysis and appraisal. To launch the Great Western RUS Draft for Consultation, a WSG presentation was held in September 2009 with further briefings scheduled for the final RUS in March 2010.

2.3.6
In addition to the above, a number of individual meetings were held with various stakeholders, both within the SMG and WSG, as required to discuss their aspirations and views and to present developments.

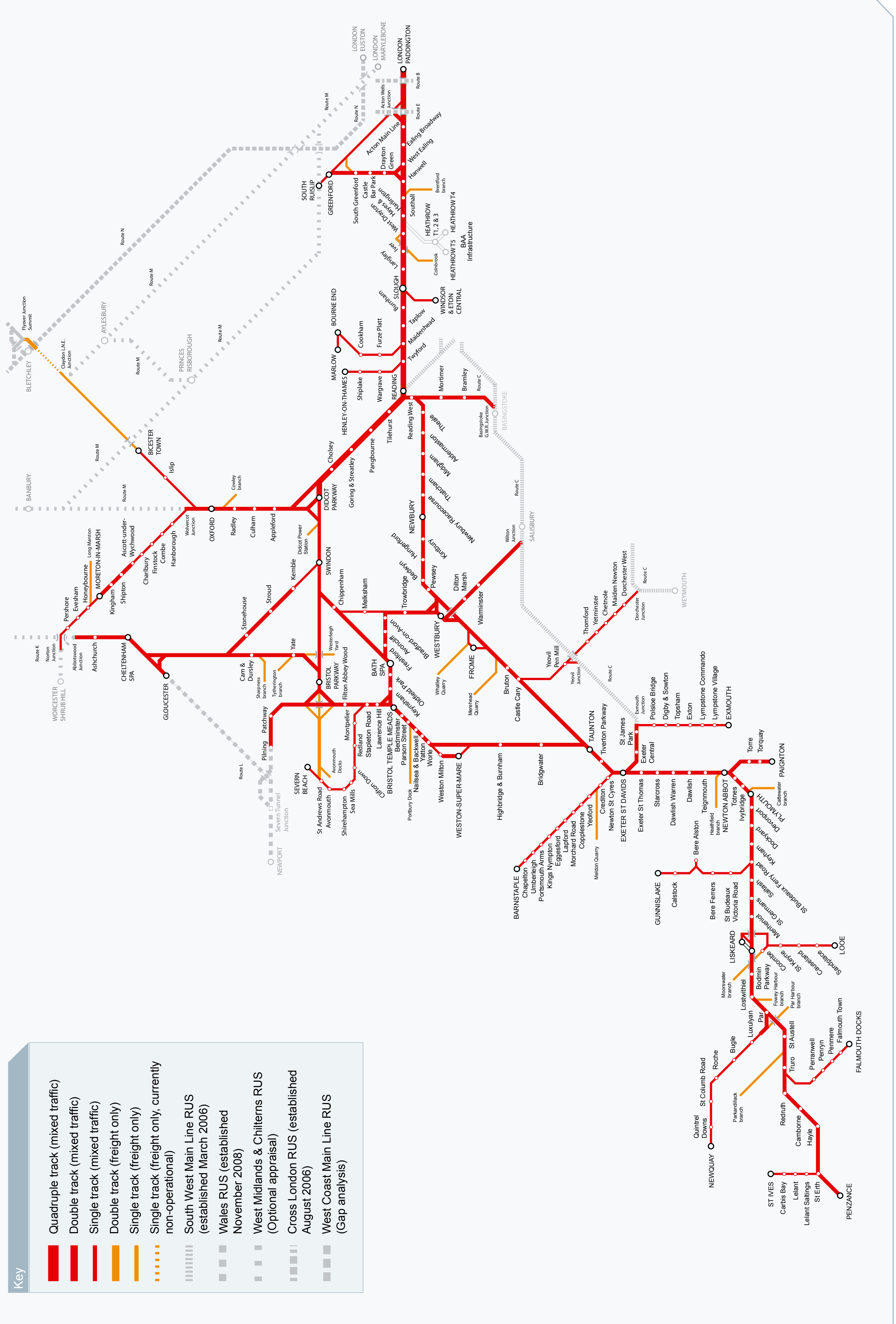
2.4 Geographic scope

2.4.1
Figure 2.1 provides an illustration of the geographic area of the Great Western RUS. The scope area includes lines on the Strategic Route J: London and West as far as the boundary of the Wales RUS at Pilning and Strategic Route K: West of England. The RUS also covers lines on Strategic Route C: Wessex to the boundary of the South West Main Line RUS and to the boundaries of the West Midlands and Chilterns RUS (Strategic Routes M at Norton Jn and N at Bletchley).

2.4.2
The defined scope area of the Great Western RUS therefore includes the following routes:

- London Paddington to:
  - South Ruislip
  - Heathrow Airport
  - Oxford and the Cotswold line (as far as Norton Jn, east of Worcester)
  - Cheltenham Spa (via Swindon)
  - Pilning (via Bristol Parkway)
  - Bristol Temple Meads (via Bath Spa and via Bristol Parkway)
  - Penzance (via Castle Cary and via Bristol Temple Meads)
- West Ealing to Greenford
- Slough to Windsor and Eton Central
- Maidenhead to Marlow
- Twyford to Henley-on-Thames
- Reading to Basingstoke G.W.R Jn
- Oxford to Bicester Town/Bletchley
- Abbotswood Jn (southeast of Worcester) to Taunton (including via Gloucester/Severn Tunnel Jn and via Weston-super-Mare)
- Severn Beach branch
- Thingley Jn to Bradford Jn
- Pilning (exclusive) via Bathampton Jn and Westbury to Wilton Jn, Dorchester Jn and Yeovil Jn
- Barnstaple to Exmouth (via Exeter)
- Newton Abbot to Paignton
- Plymouth to Gunnislake
- Liskeard to Looe

Figure 2.1 – Map of Great Western scope area



- Par to Newquay
- Truro to Falmouth
- St Erth to St Ives
- Freight branches (Brentford, Colnbrook, Cowley, Long Marston, Sharpness Docks, Tytherington, Avonmouth, Portbury. Whatley, Merehead, Meldon, Heathfield, Cattewater, Moorswater, Fowey, Par Harbour and Parkandillack).

2.5 Scope of services

2.5.1

The RUS considers all services that use these routes for all or part of their journeys (including diversionary routes) to the extent necessary to achieve the route utilisation objective regardless of whether or not the physical infrastructure is within the boundaries of the scope area of the Great Western RUS.

2.5.2

This RUS will therefore include appropriate analysis of those traffic generators outside the scope area which have a significant effect on the pattern of demand within the scope area, for example services such as those between Cardiff and Portsmouth.

2.6 Linkage to other RUSs

2.6.1

Network Rail is continuing to develop a programme of RUSs which, once complete, will cover the rail network of Great Britain. As previously mentioned, the Great Western RUS interfaces with other parts of the network where other RUSs have already been established. These are the South West Main Line RUS; the Wales RUS and to some extent the Cross London RUS. The Great Western RUS also interfaces with the recently published Sussex RUS. This RUS draws on input and analysis from these studies. Figure 2.2 presents an illustration of the geographic area and where the relationships exist with other RUSs.

2.6.2

There are further boundary issues between the Great Western RUS and the West Midlands and Chilterns RUS (under development). As such, these RUSs interlink in programme, scope area and services with particular regard to the CrossCountry service group.

2.6.3

Due to the interlinking of these geographic areas and services which operate across routes, a number of cross boundary issues have arisen. The Great Western RUS has led the analysis on the following services:

- Cardiff to Portsmouth
- Reading to Gatwick Airport
- West Midlands to the South West and the South Coast.

2.6.4

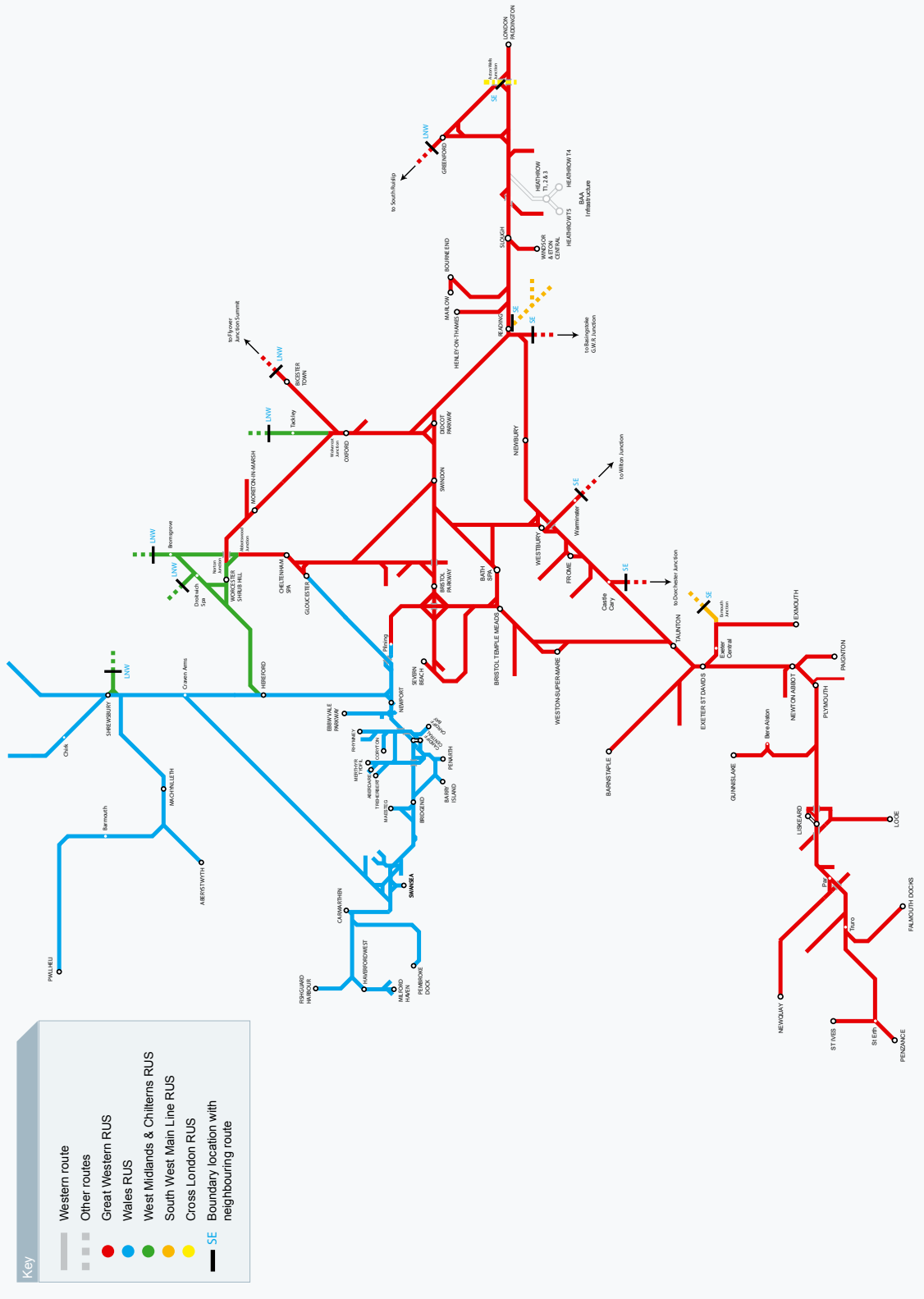
The Great Western RUS also considers input and analysis nationally from both the Freight RUS and the Strategic Freight Network as well as emerging strategies from the high level network-wide RUS assessing national electrification issues; the national rolling stock and depot strategy and station development.

2.7 Linkage to other studies

2.7.1

To be successful, a RUS cannot be considered in isolation. The Great Western RUS is related to a number of other strategies and policies covering rail and other transport modes, land use planning and economics for the area. Several studies have been underway whilst this document has been in production, most notably the draft Regional Spatial Strategy for the South West and the High Level Output Specification Rolling Stock plan. The publication of these documents is ongoing, and whilst every effort has been made to incorporate the draft details there may be subsequent changes following their final publication.

Figure 2.2 – Map of Great Western RUS scope area with other RUS boundaries



2.7.2

The main documents which have informed the RUS include:

- the **South West** and **Thames Valley Regional Planning Assessments (RPA)**, published in May 2007 and June 2007 respectively. The RPA provides a medium to long-term planning framework for rail. Within this framework, the Great Western RUS is intended to provide a more detailed strategy over a longer term of 30 years. Department for Transport involvement in development of this RUS ensures broad alignment between these studies
- the draft **Regional Spatial Strategy (RSS) for the South West** and the **Regional Spatial Strategy (RSS) for the South East** (known as the South East Plan) (covering the period of 2006 – 2026) and the **Regional Economic Strategy (RES) for South West England** (covering the period of 2006 – 2015), and the **Regional Economic Strategy (RES) for the South East** (covering the period of 2006 – 2016), provide detailed supportive information with regard to growth and development in the region; the economic framework, and the strategic policies which will help shape this.

The West Midlands and Chiltern RUS, as the lead for the West Midlands, will consider the West Midlands Regional Planning Assessment and Regional Spatial Strategy. The established Wales RUS incorporated the Wales Transport Plan and South East Wales Transport Alliance plans.

2.7.3

Other influential documents include:

- Delivering a Sustainable Railway White Paper (2007)
- High Level Output Specification (HLOS)
- Rolling Stock Plan
- Transport for London Rail Corridor Plan
- London Plan
- The Crossrail Act
- Heathrow Airport Surface Access Strategy
- The Air Transport White Paper
- Civil Aviation Authority Passenger Survey (2007)
- South West Council's Rail Prospectus (previously the Regional Assembly)
- The Regional Network Report for South West
- Local Transport Plans
- Delivering a Sustainable Transport System (DaSTS).

2.7.4

More specific studies and proposals which have been undertaken by various stakeholders have also contributed supportive information to the RUS. These are:

- consultancy studies analysing capacity at London Paddington and Reading stations
- Strategic Freight Network (SFN) freight forecasts
- First Great Western's HLOS Capacity Study for the West of England
- The West of England Partnership's Bristol Metro proposals
- North Somerset Council's Portishead Rail Line Study
- South West Regional Development Agency (SWRDA) Funding advice 2009 - 2019
- Devon County Council's Regional Funding Allocation Expression of Interest for Devon Metro
- passenger surveys undertaken by user groups and customer panels specifically at Windsor and Eton Central and on the Devon and Cornwall Branch lines
- Passenger Focus "Getting to the train" surveys (March 2009).

2.8 RUS timeframe

2.8.1

The Great Western RUS covers the 10-year period to 2019 in detail and then describes broader, high level strategic issues and interventions through to 2039.

The output will be the rail industry's preferred strategy for the next railway regulatory Control Periods 5 (2014 – 2019) and 6 (2019 – 2024) in the context of strategic priorities whilst considering likely requirements over a 30-year period.

3. Current demand, capacity and delivery

3.1 Introduction

3.1.1

In this chapter, the current function and capability of the rail network in the Great Western Route Utilisation Strategy (RUS) area is described. Profiles are provided for both passenger and freight operations, as well as information about the current infrastructure, capacity and capability; how it performs and how it is maintained.

3.2 Train Operating Companies

3.2.1

At present, seven passenger train operators run scheduled services over the Great Western RUS area – in 2008/09, passenger train miles equated to 87 percent of the annual train mileage accumulated over the scope area. The passenger operators on the route are:

- First Great Western (FGW), the principal operator within the RUS area, operates a mix of long distance high speed, interurban and semi-fast outer and inner suburban, regional and local branch line services. These services are operated across the entire geographic scope of the RUS
- CrossCountry operate main line services from the North and Midlands to the South Coast via Oxford and Reading and to the South West and South Wales via Cheltenham
- Arriva Trains Wales operate services between Swansea, Cardiff and Cheltenham impacting on the Great Western RUS area particularly with the Cardiff to Cheltenham service
- Stagecoach South Western Trains (trading as South West Trains) operates services fringeing on the RUS area with the London Waterloo to Exeter St Davids, London Waterloo to Bristol Temple Meads services and London Waterloo to Reading services
- Heathrow Express operates non-stop express services, and the Heathrow Connect stopping service jointly operated with FGW, between London Paddington and Heathrow Airport
- Chiltern Railways operates one service each day to London Paddington from Gerrards Cross and from London Paddington to Princes Risborough
- London Midland operates services which adjoin the RUS area from the West Midlands to Gloucester via Worcester.

3.2.2

Although the scope area of the RUS specifies the boundaries of the infrastructure, any passenger services that spend all or part of their journey within the RUS geography are included within the scope of the Great Western RUS. The following cross boundary services are therefore included:

- London Paddington to Cardiff/Swansea
- Cardiff to Nottingham
- Cardiff to Portsmouth
- Reading to Gatwick Airport
- CrossCountry services between the South West and South Coast to the Midlands and the North
- London Waterloo to Exeter St Davids.

3.2.3
A number of Community Rail Partnerships operate within the Great Western RUS area; those which are members of the Association of Community Rail Partnerships (ACORP) are listed below:

- Cotswold Line Promotion Group (Oxford – Worcester – Hereford)
- Severnside Community Rail Partnership (Lines around Bristol)
- Heart of Wessex Rail Partnership (Bristol – Weymouth)
- Devon and Cornwall Rail Partnership (Exeter – Barnstaple/Exmouth; Par – Newquay; Truro – Falmouth; Plymouth – Gunnislake; St Erth – St Ives).

3.3 Current passenger market profile

3.3.1
Within the Great Western RUS area, the main markets for rail are identified as long, medium and short distance commuting into London and to a lesser extent Reading and Bristol; interurban travel between main centres such as Bristol, Exeter and Plymouth towards London, the Midlands, the North East and Scotland; inter-regional and interurban travel; leisure and tourism; access to airports and the social dimension of local branch lines and rural locations.

3.3.2
The passenger service structure can be broken down into distinct groups, which integrate at varying locations throughout the route and reflect the different markets served.

3.3.3
FGW operates interurban services between London Paddington and South Wales and London Paddington and the greater Bristol area and to Oxford and the Cotswold line, to Cheltenham, and to the far West of England. CrossCountry's longer distance intercity services from the North and Midlands provide direct links to the South Coast via Oxford and Reading and to the South West and South Wales via Cheltenham.

3.3.4
FGW also operate inner suburban services from London Paddington to as far as Slough, outer suburban services to Oxford and the Cotswolds, to Newbury/Bedwyn, and between Reading and Basingstoke, branch line services throughout the Thames Valley and the joint operation with Heathrow Express of Heathrow Connect services to Heathrow Airport. Services between Swindon and Cheltenham and Swindon and Westbury also operate.

3.3.5
Between Plymouth and Penzance passenger train services are mostly operated by FGW. CrossCountry has a limited presence west of Plymouth, although this is stronger in the summer months. An hourly service from London Waterloo to Exeter St Davids (via Salisbury) is operated by South West Trains.

3.3.6
FGW operates a structured cross-Bristol local network incorporating services between Worcester/Cheltenham and Westbury/ Southampton/Weymouth and between Cardiff and Taunton and Bristol Parkway and Weston-super-Mare. FGW's hourly semi-fast service between Cardiff and Portsmouth via Bristol Temple Meads and Bath Spa, and the Severn Beach branch line service add to the local Bristol network.

3.3.7
CrossCountry operates main line services from Cardiff to Nottingham via Birmingham, providing further journey opportunities to the North and Scotland. Arriva Trains Wales operates services between Swansea, Cardiff and Cheltenham providing a connection to the long distance services at Cheltenham for travel further north.

3.3.8
The most intensively used Devon and Cornwall branches to Exmouth, Falmouth and St Ives, enjoy half hourly frequencies whilst the other West of England branches have hourly or less frequent interval services.

3.4 Current passenger service provision

3.4.1
The following diagrams depict a standard hour service provision, representing the busiest hour with additional services operating in the peak periods, divided into the following geographic segments:

- Great Western Main Line (Figure 3.1)
- Thames Valley (Figure 3.2)
- Wiltshire, Somerset and South Gloucestershire (Figure 3.3)
- Worcestershire, Oxfordshire, Gloucestershire and North Wiltshire (Figure 3.4)
- Somerset, Devon and Cornwall (Figure 3.5).

Figure 3.1 – Great Western Main Line standard hour service provision

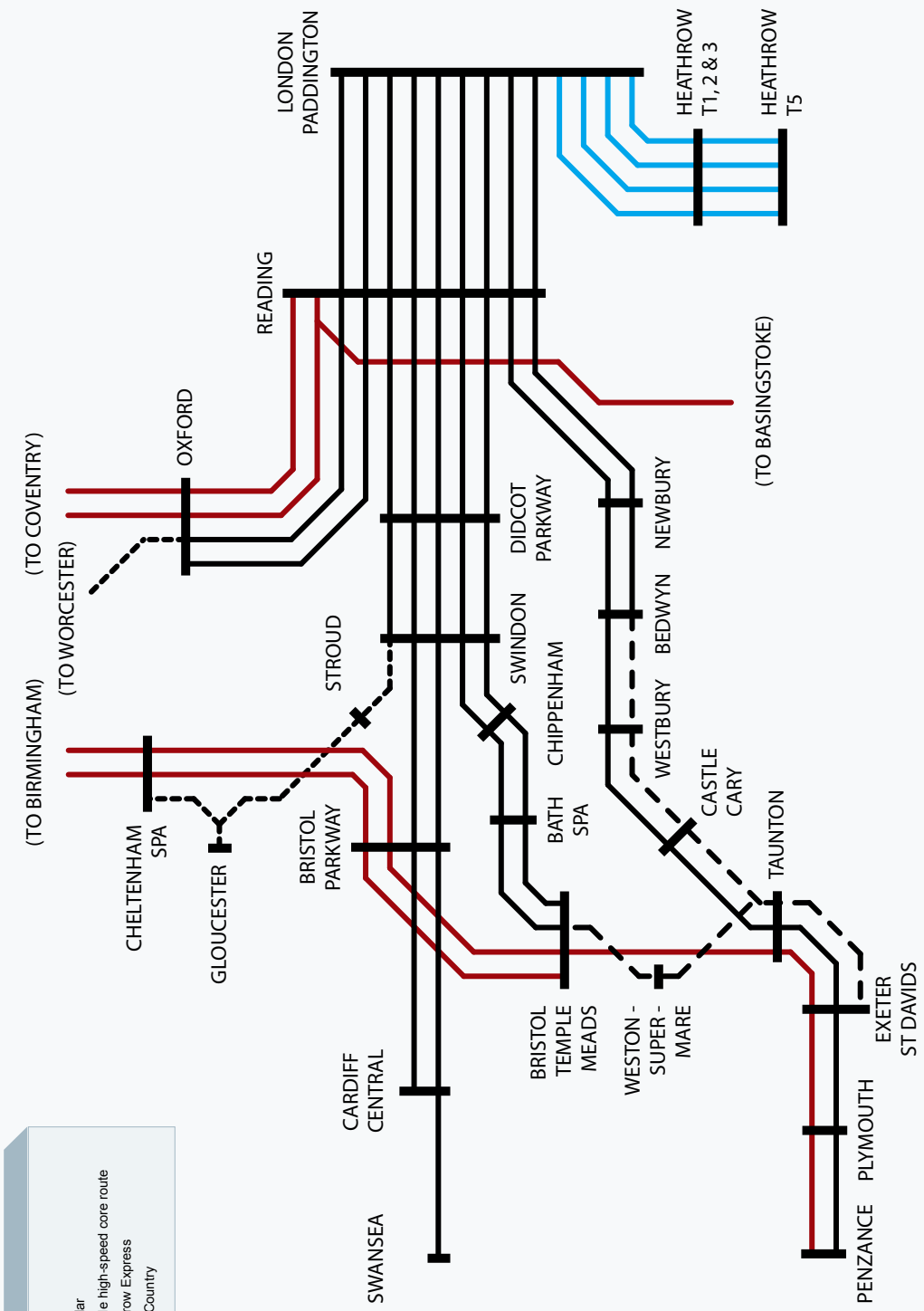


Figure 3.2 – Thames Valley (Relief Line/Stopping Services) standard hour service provision

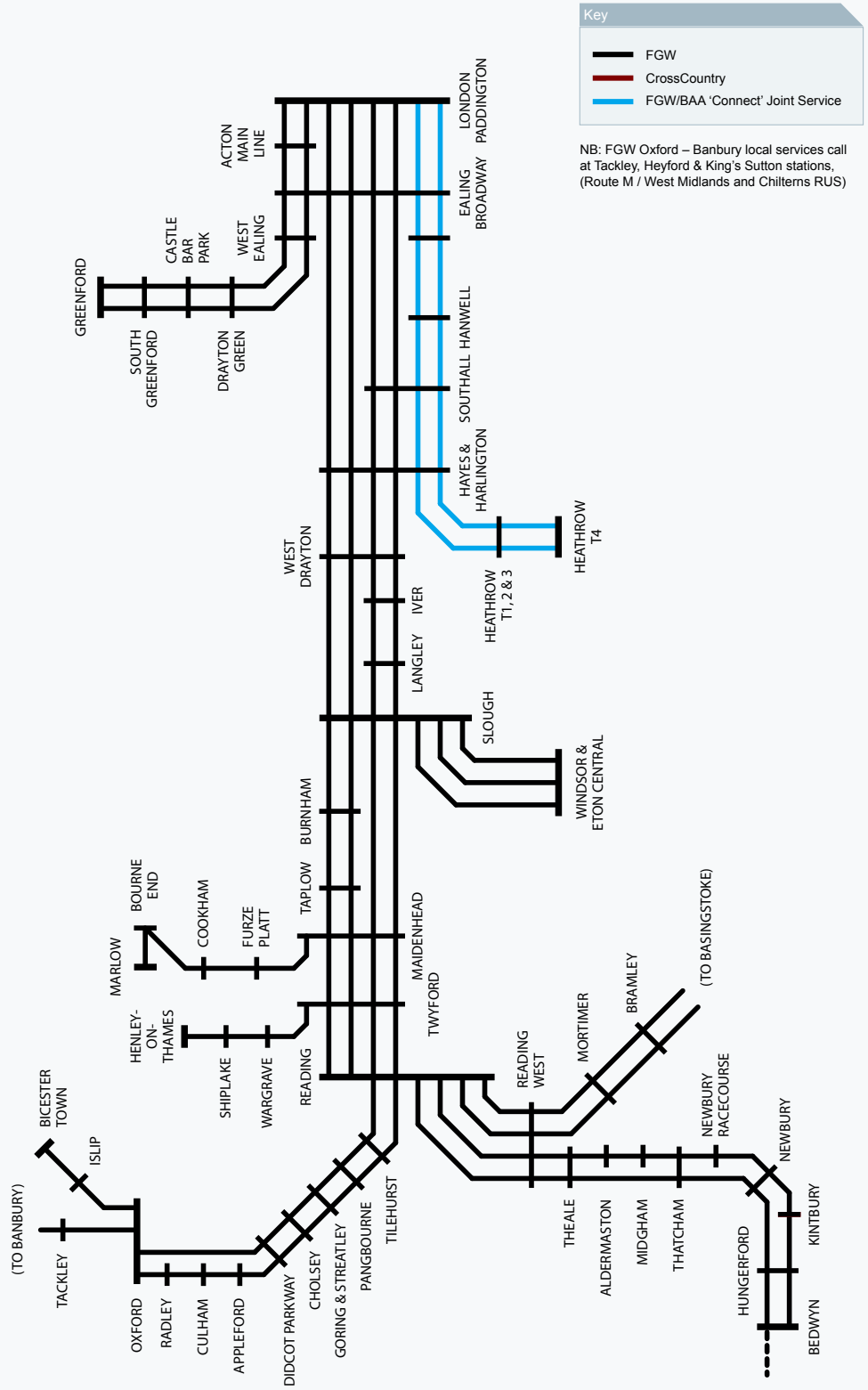


Figure 3.3 – Wiltshire, Somerset and South Gloucestershire standard hour service provision

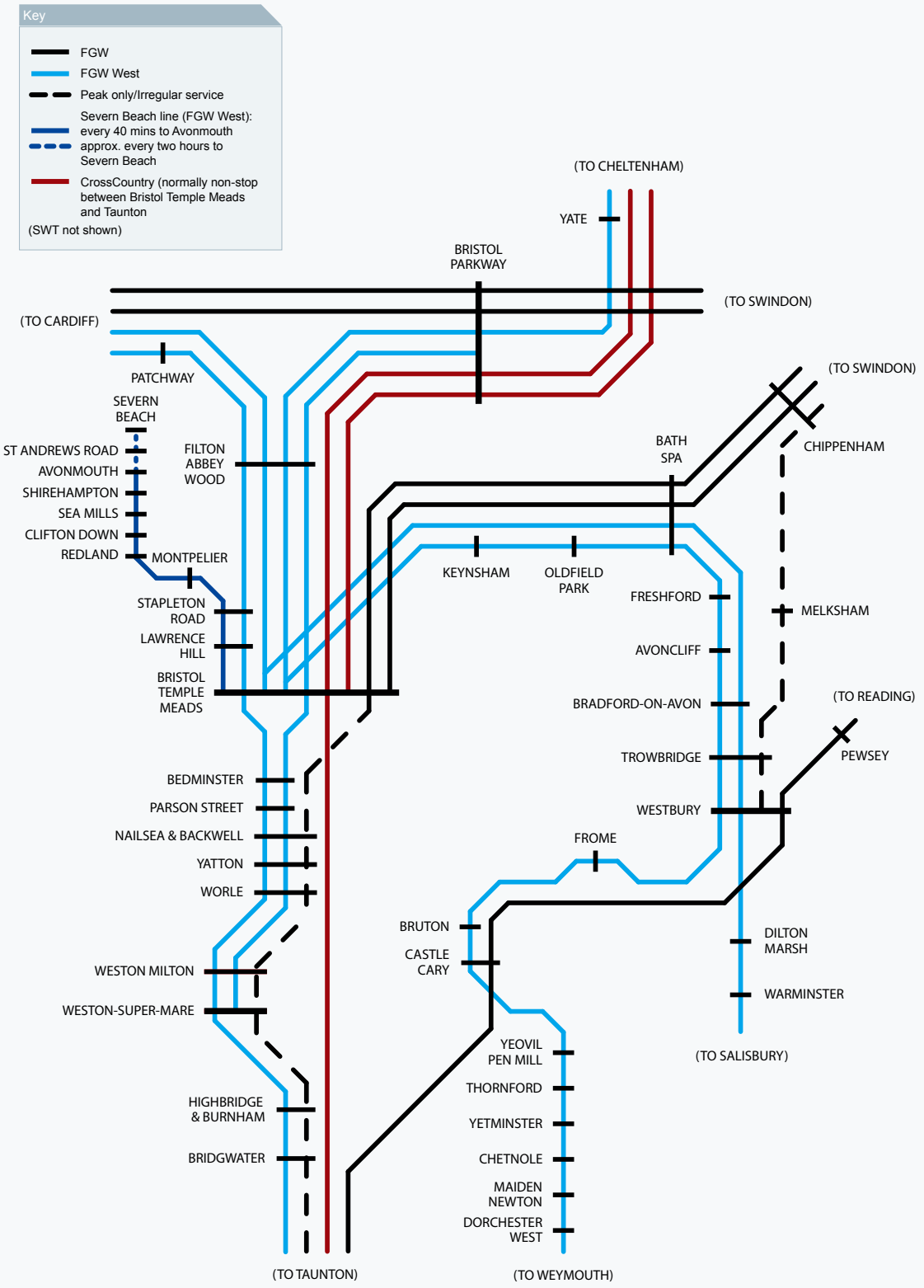


Figure 3.4 – Worcestershire, Oxfordshire, Gloucestershire and North Wiltshire standard hour service provision

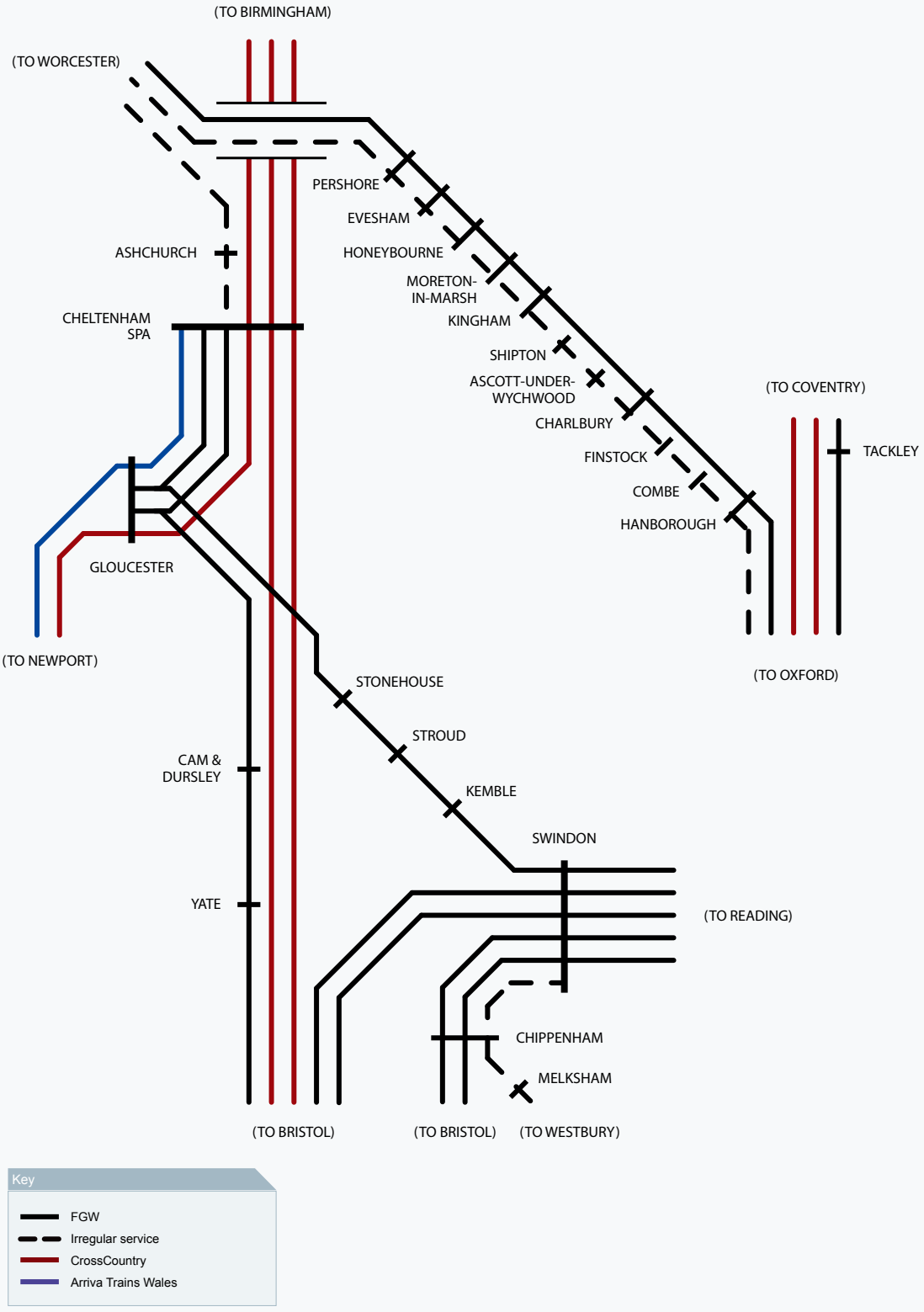
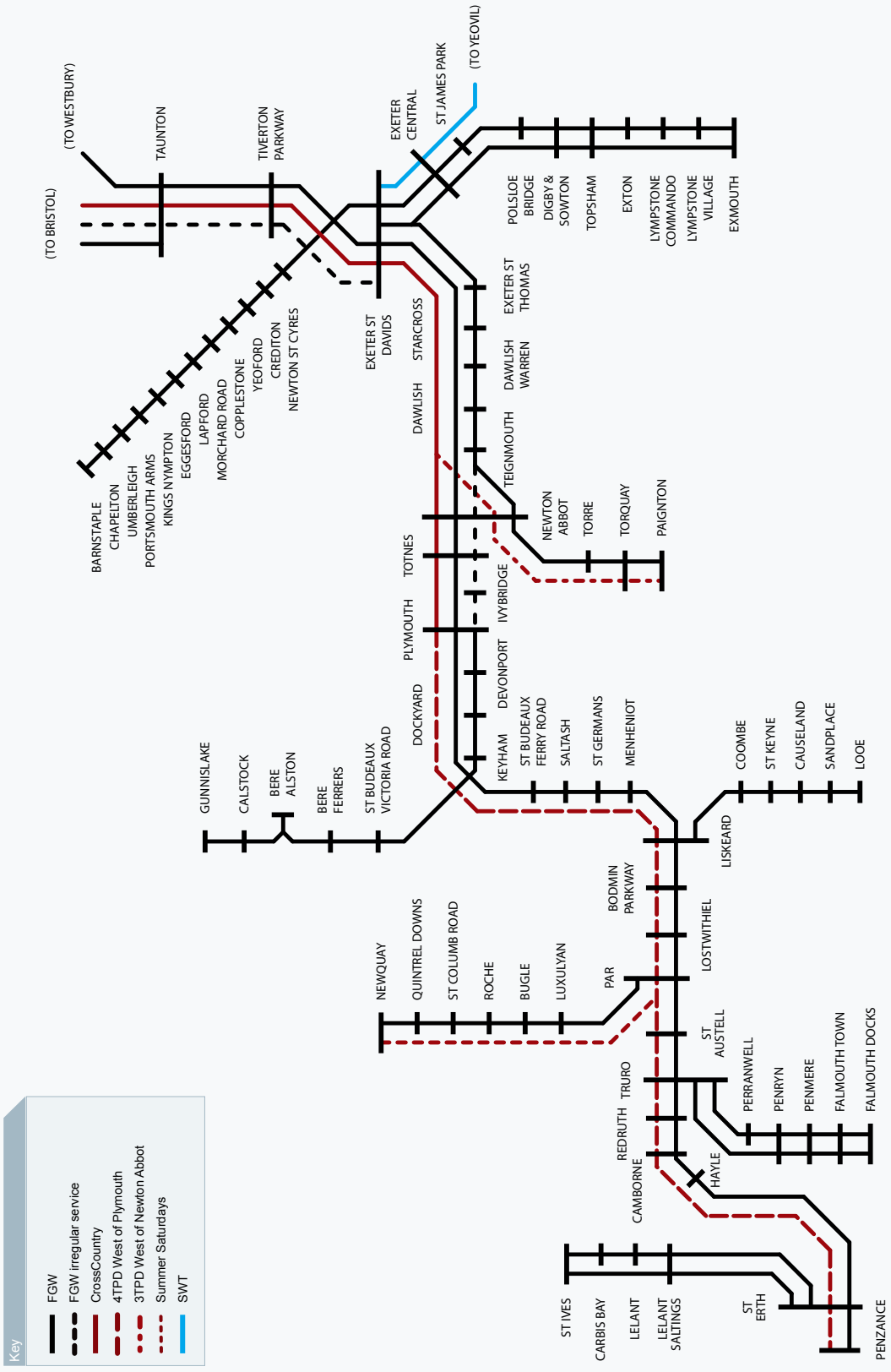


Figure 3.5 – Somerset, Devon and Cornwall standard hour service provision



3.5 Track capacity

3.5.1

The Capacity Utilisation Index (CUI) is a measure of how much of the planning capacity of a section of railway is being utilised by the current timetable. In terms of capacity utilisation, the majority of the rail network in the Great Western RUS area, over 1,000 route miles in total, can be classified as medium to low use. However, main line capacity on the Great Western Main Line (GWML) from London Paddington to Reading, through to Oxford and Reading to Cogload Jn near Taunton (commonly known as the Berks and Hants route) reaches over 80 percent capacity for the majority of the day. Figure 3.6 presents the capacity utilisation of the track, using the December 2007 timetable, for the morning high-peak hour (08:00-08:59).

3.5.2

Capacity on the GWML is constrained by the mix of 125mph high speed services and 90mph outer suburban services and freight. Through services from the Thames Valley branches and the High Speed Trains (HST) calling at Slough, reduce the main line capacity due to the weaving movements required between the main lines and the relief lines. Relief line capacity is constrained by a number of factors including the close proximity of some stations, the variable stopping patterns of local passenger trains and the mix of freight trains. Nearly all freight trains through the inner London area of the route requires access to and from Acton Yard via a single lead connection crossing the relief lines.

3.5.3

Paddington station operates to near capacity throughout the day and to full capacity at peak times with accessibility for long interurban style trains restricted by a number of shorter platforms on the north side of the station and the dedication of two platforms for the electric Heathrow Express. Platforms 3 to 12 are electrified.

3.5.4

Between Reading and London Paddington the route is operating at or near capacity for large parts of the day with a CUI of about 80 percent, increasing in the peak and shoulder peak periods. Reading station area is a critical “crossroads” on the east-west and north-south axes for both passenger and freight flows and the lack of platforms and through capacity, allied with the aforementioned Paddington constraints, prevent train service growth. The area is further restricted at Reading West Jn where long north–south axis freight services have to cross the GWML at grade. The current Reading Station Area Redevelopment programme will assist in providing additional platforms and through-capacity in addition to grade separation at Reading West, helping to address these constraints.

3.5.5

There is a high take-up of paths between Reading and Newbury, where services from the West of England have to fit between intensive passenger and freight movements (between Reading and Southcote Jn) on the immediately adjacent Basingstoke section of the GWML. This also influences how capacity is shared westwards along the route towards Taunton.

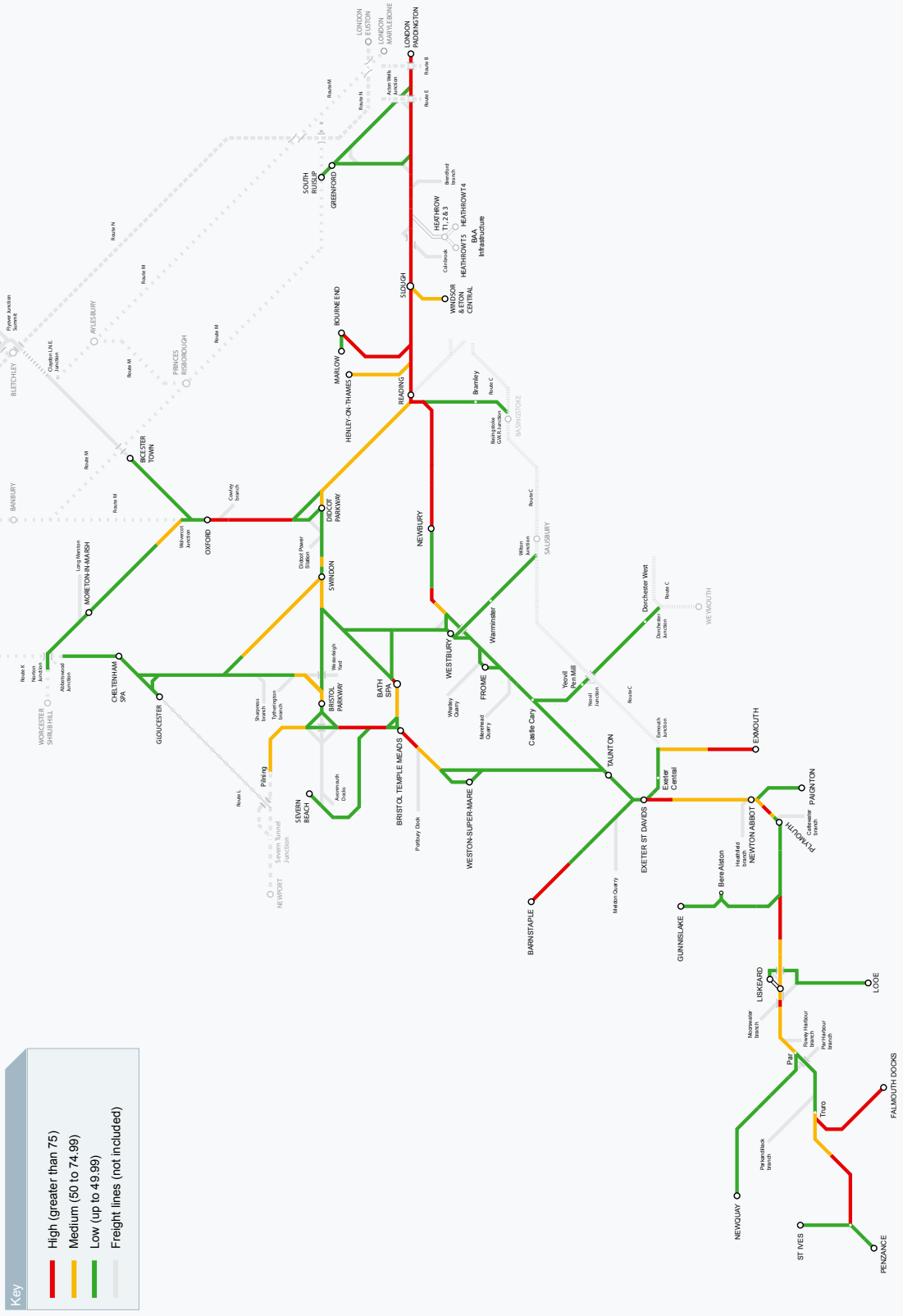
3.5.6

Between Didcot and Oxford the mix of non-stop passenger and freight services with local services calling at lightly used stations reduces the ability to maximise capacity (CUI is about 87 percent). The current layout at Oxford station necessitates empty stock movements having to cross at the north end of the station between arrival and departure, which restricts flexibility of operation.

3.5.7

The intermittent four tracking between Didcot and Swindon further restricts the forecast mix and volume of passenger and freight traffic over the route.

Figure 3.6 – Capacity utilisation
(08:00 - 09:00hrs, based on December 2007 timetable)



3.5.8
Capacity is constrained within the area by a number of lengthy single line sections, notably the Cotswold line and between Swindon and Kemble and the Weston-super-Mare loop. The Swindon to Gloucester line is also a main diversionary route to and from South Wales if the normal route via the Severn Tunnel is closed.

3.5.9
With the increasing number of freight services emanating from the Avonmouth terminal complex the route between Stoke Gifford towards Westerleigh Jn can become severely congested due to the track sharing of two distinct main line passenger flows with the east-west South Wales to London and north-south CrossCountry services. This also impacts on the route further east towards Didcot with further congestion expected following the introduction of the Intercity Express Programme (IEP). The impact of which will be significantly greater on this section with the proposed IEP depot at Stoke Gifford, Bristol.

3.5.10
The lack of spare capacity on the route, particularly in the Severn Tunnel/Bristol Parkway, Filton Bank and Thames Valley corridors, is evident at times of perturbation making service recovery difficult and resulting in greatly extended journey times over restrictive diversionary routes. This results in a number of identifiable pinch-point locations that are significant in terms of capacity constraints and performance delays through restricting operational flexibility and tending to cause performance problems in terms of out of course running. They also cause sub-optimisation of pathing opportunities and occasionally extended journey times where single line conflicts occur. However, with the Newport Area Signalling Renewal capacity enhancements have been achieved at Severn Tunnel Junction and with the Reading Station Area Redevelopment enhancements will be delivered on the constrained areas of the Thames Valley corridors.

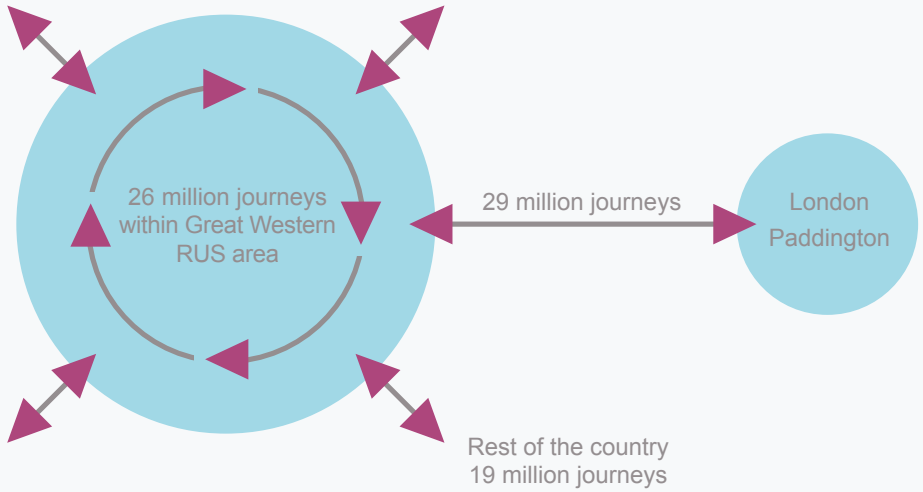
3.5.11
The single track Devon branches run at, or close to capacity, as dictated by passing loop provision, whilst the Cornish branches except those to St. Ives and Falmouth operate less intensely. In the case of the St. Ives and Falmouth branches, utilisation has been increased to the maximum possible level as a result of the Community Rail initiatives. Holiday traffic is a significant element of the passenger market in the coastal resorts.

3.6 Current passenger demand

3.6.1
The total number of rail journeys made to, from and within the Great Western RUS area has increased from 52 million in 1998 to approximately 74 million in 2007, equating to an average growth rate of four percent per annum.

3.6.2
Around 40 percent of these rail journeys made in 2007/08 were between London Paddington and the Great Western RUS area. Journeys made within the RUS area have grown the most rapidly, averaging 4.6 percent per annum. Figures 3.7 and 3.8 show the split of these journeys by year and their growth rates over the nine year period.

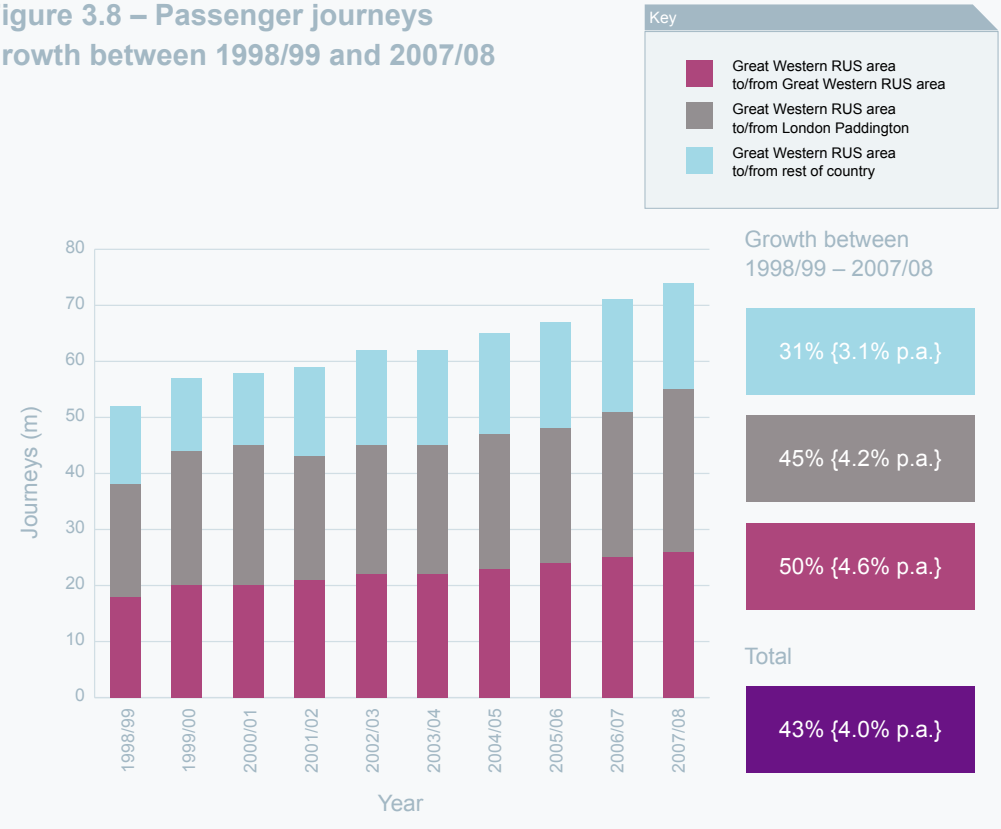
Figure 3.7 – Rail journeys to, from and within the RUS area (2007/08)



Source: RIFF 1.4 and MOIRA OR17 (Western) database

Note: Rover tickets and travelcards sold at outlets other than National Rail stations are not included

Figure 3.8 – Passenger journeys growth between 1998/99 and 2007/08



Source: RIFF 1.4 and MOIRA OR17 (Western) database

Note: Rover tickets and travelcards sold at outlets other than National Rail stations are not included

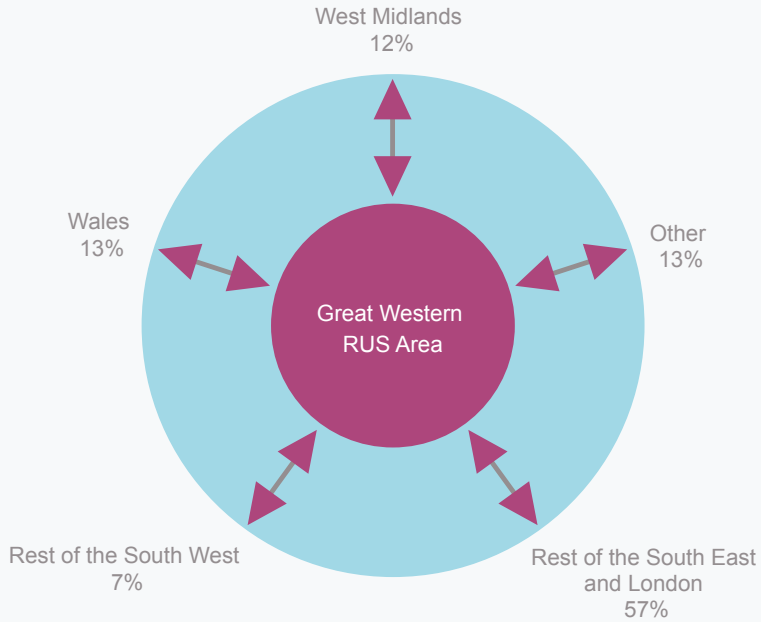
3.6.3

Figure 3.9 shows the breakdown of passenger demand between the RUS area and other regions outside the scope of the RUS. Approximately 57 percent of external demand was to the South East and greater London outside the RUS area with a further 12 percent of journeys to or from the West Midlands.

3.6.4

Within the Great Western RUS area, the main markets for rail are identified as long, medium and short distance commuting into London and to a lesser extent Reading and Bristol and the interurban flows between main centres within and outside the RUS area. The level of rail demand in the RUS area varies considerably by time of day, journey purpose and route. The busiest days for long distance services are Fridays followed by Sundays. Demand is greatest when commuters travel and thus the RUS has focused on the train loading on weekdays in the morning and evening peaks. For the long distance services, it is recognised that the evening peak period is as busy and sometimes busier, than the morning.

Figure 3.9 – External demand to or from the RUS area, split by region (2007/08)



Source: RIFF 1.4 and MOIRA OR17 (Western) database

Figure 3.10 – Top 10 LDHS journeys to or from London Paddington (2007/08)

Flows	Journeys (million)
Reading	4.6
Didcot Parkway	1.1
Swindon	1.0
Bristol Temple Meads	0.9
Bath Spa	0.8
Cardiff Central	0.7
Bristol Parkway	0.6
Newbury	0.6
Exeter St Davids	0.4
Chippenham	0.4

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

3.6.5
In 2007/08, 29 million rail passengers travelled between London Paddington and the RUS area for business, commuting and leisure purposes. Figure 3.10 shows the top ten flows between London Paddington and those areas served by the Long Distance High Speed services (LDHS).

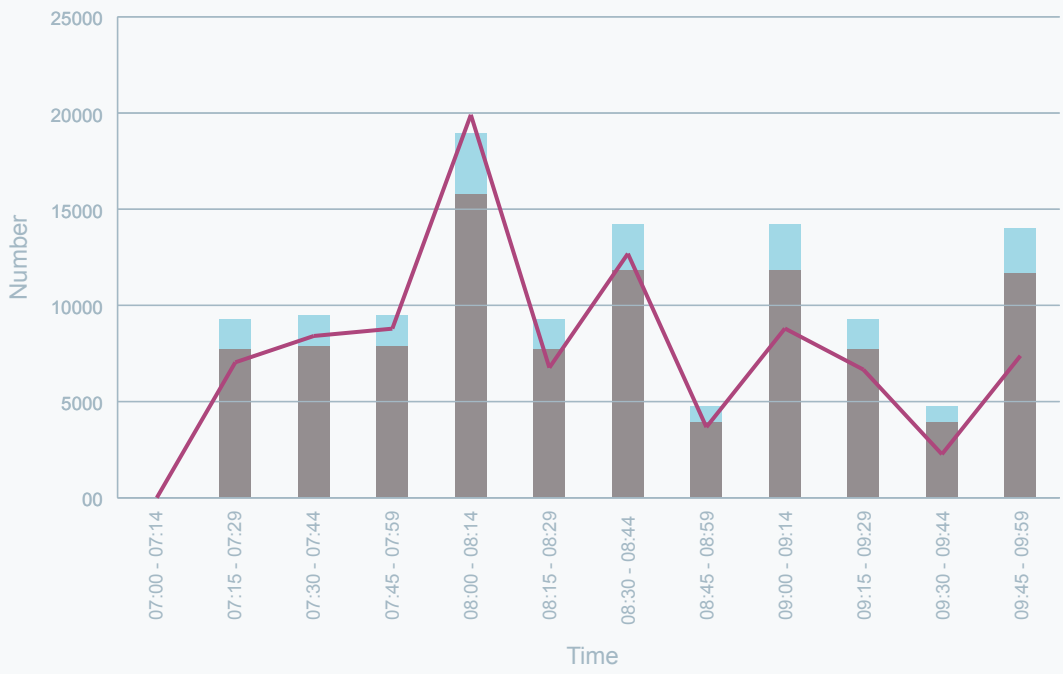
3.6.6
Demand into London on the LDHS services varies by time of day and day of the week. The busiest time period is the weekday morning three-hour peak (between 07:00 and 09:59) with arrivals at London Paddington, reflecting the significance of the longer distance commuting market into London.

3.6.7
Figure 3.11 illustrates the ratio of passengers to seats and between passengers and total capacity (which includes seating and standing allowance[1]) for LDHS services arriving at London Paddington in 15 minute segments as per the current service pattern during the three-hour morning peak period on a typical weekday in 2008/09. These include standard class seats and passengers with standard class tickets only.

3.6.8
The busiest time period is between 08:00 and 08:15 where the number of passengers exceeds both seating and standing capacity. In 2008/09, the average passenger to seat ratio for LDHS services arriving in the morning three-hour peak is 94 percent. The average passenger to seat ratio in the high-peak hour (between 08:00 and 08:59) is 109 percent and this implies that the busiest services experience overcrowding with many passengers standing for more than 20 minutes.

1 On the LDHS services, standing allowance has been estimated at a ratio of 1.2 times the number of standard class seats, as per the HLOS definition

Figure 3.11 – Morning peak arrivals of LDHS passengers at London Paddington, weekday average 2008/09



Source: Passengers in excess of capacity (PIXC) count conducted in autumn 2008 (supplied by FGW)

3.6.9
London Paddington is the focal point of demand in the RUS area, with the top five suburban flows to and from London Paddington being Slough, Maidenhead, Oxford, Ealing Broadway and Hayes and Harlington highlighting the concentration of demand within the Thames Valley area. Figure 3.12 illustrates the significance of the inner and outer suburban services supporting the shorter commuter journeys into London from the Thames Valley.[2]

3.6.10
The average passengers to seating ratio for suburban services arriving at London Paddington in the three-hour peak is 104 percent, increasing to 127 percent during the high-peak hour. Total passengers to total capacity (includes seating and standing allowance) ratio during the three-hour peak is 78 percent and 95 percent in the high-peak hour. Figure 3.13 visually illustrates the passenger to seats and capacity ratios for the suburban services into London Paddington.

2 This does not include the number of rail journeys made on Heathrow Express services

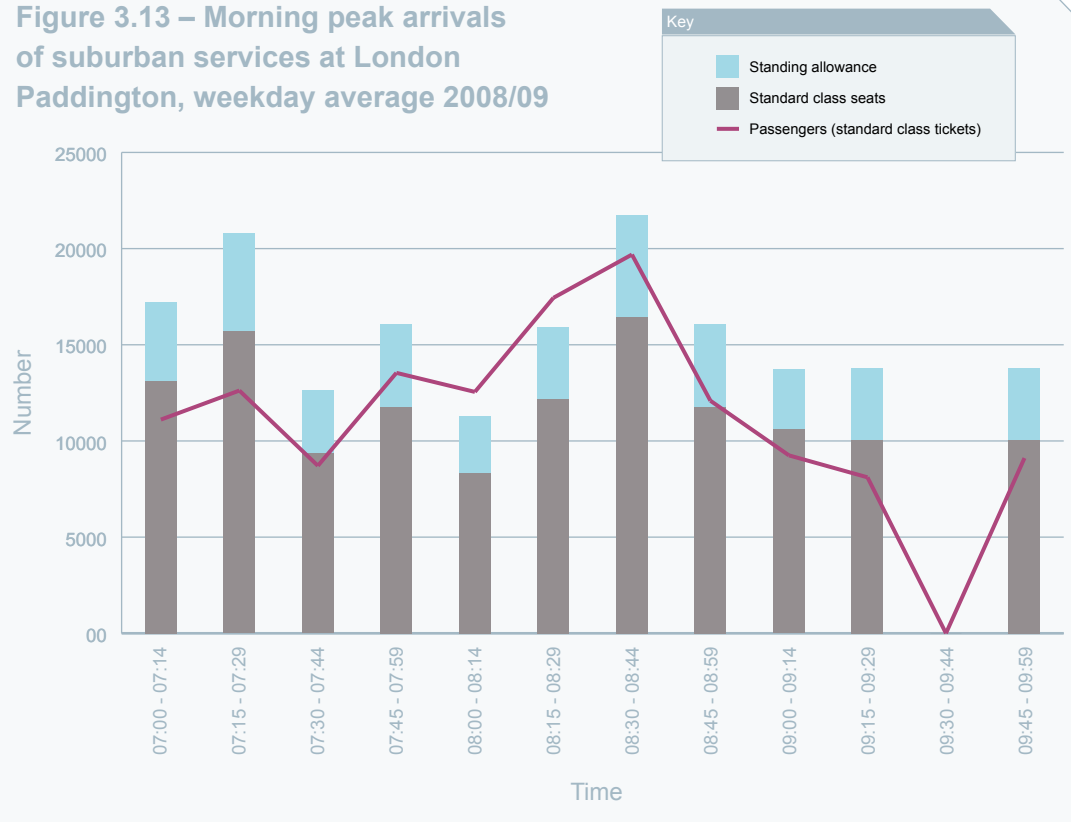
Figure 3.12 – Top 10 rail journeys to or from London Paddington in 2007/08 (suburban services)

Flows	Journeys (million)
Slough	2.0
Maidenhead	1.6
Oxford	1.5
Ealing Broadway	1.0
Hayes and Harlington	1.0
Newbury	0.6
West Drayton	0.6
West Ealing	0.6
Twyford	0.5
Windsor and Eton Central	0.4

Source: MOIRA OR17 (Western version)

Note: Transport for London (TfL) travelcards sold at outlets other than national rail stations are not included[3].

Figure 3.13 – Morning peak arrivals of suburban services at London Paddington, weekday average 2008/09



Source: Passengers in excess of capacity (PIXC) count conducted in autumn 2008 (supplied by FGW)

Note: No suburban train arrived between 09.30-09.44 on the day the count was conducted. Passenger loadings were recorded on train arrival at the station with the highest loadings on route to Paddington.

Count includes Heathrow Connect and excludes Heathrow Express.

3 Transport for London (TfL) estimate that approximately three million journeys in the RUS area to London are made using TfL travelcards

3.6.11

Between 08:00 and 08:30, the number of passengers exceeds both the seating and standing capacity as shown in Figure 3.13. Count data proves that a number of services have more than 20 percent of passengers in excess of seating and standing capacity. In the shoulder peaks, there is sufficient seating and standing capacity to meet current demand.

3.6.12

The top five non-London flows within the Great Western RUS area also reflects the significance of the Thames Valley as shown in Figure 3.14. Figure 3.15 shows the top five non-London flows (greater than 20 miles) to or from outside the RUS area in 2007/08. This indicates considerable demand for rail journeys to and from locations such as Bristol and South Wales.

Figure 3.14 – Top five non-London flows within the RUS area (2007/08)

	Flows	Journeys
1	Bristol Temple Meads – Bath Spa	968000
2	Slough – Windsor and Eton Central	597000
3	Reading – Maidenhead	510000
4	Reading – Slough	465000
5	Reading – Oxford	433000

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

Figure 3.15 – Top five non-London flows to outside the RUS area (2007/08)

	Flows	Journeys
1	Bristol Temple Meads – Cardiff Central	416000
2	Oxford – Banbury	313000
3	Bristol Temple Meads – Newport Gwent	176000
4	Bristol Parkway – Cardiff Central	147000
5	Reading – Guildford	129000

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

3.6.13

The RUS has also considered other key urban interchanges outside the London area. The most significant stations are Reading, Bristol Temple Meads, Exeter and Plymouth. These are discussed in turn below:

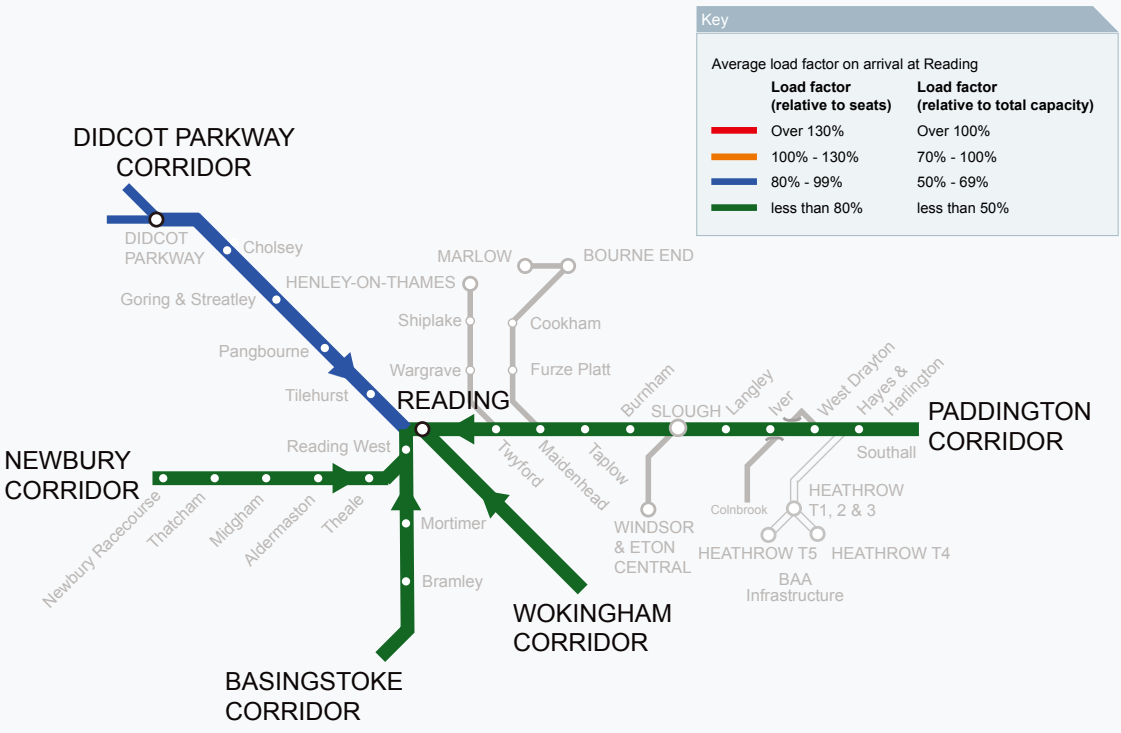
3.6.14

Reading is both a major attractor and generator of rail demand in the RUS area. Many passengers commute from Reading to London each morning due to its close proximity to the capital and the mix of services available with both Long Distance High Speed services and suburban services. It is estimated that 95 percent of passengers travelling from Reading to London Paddington use the LDHS services which offer fast, non-stop journeys. The suburban services, while slower, provide access to intermediate stations on the relief lines providing opportunities for commuting, business and leisure purposes and for interchanges to the London Underground at Ealing Broadway.

3.6.15

Figure 3.16 illustrates the average passenger to seat ratios and the average passenger to total capacity ratios (includes both seating and standard allowances) for services arriving at Reading in the morning three-hour peak period. Figure 3.17 presents these ratios for the morning high-peak hour. This shows sufficient capacity on all corridors (except Basingstoke) to meet current demand in both the one-hour and three-hour peak periods for services arriving at Reading. On the Basingstoke to Reading services in the high-peak hour, the passenger to seat ratio on arrival at Reading reaches 105 percent therefore some passengers will stand within the available standing capacity. However, the ratio between passengers and total capacity is 84 percent thereby proving sufficient total capacity is available to accommodate current demand on the Basingstoke to Reading corridor in the high-peak.

Figure 3.16 – Average load factors on weekday arrivals at Reading in 2007, morning three-hour peak (07:00-09:59)



Note: Total capacity includes seats and standing allowance

Figure 3.17– Average load factors on weekday arrivals at Reading in 2007, morning high-peak hour (08:00-08:59)

Note: Total capacity includes seats and standing allowance

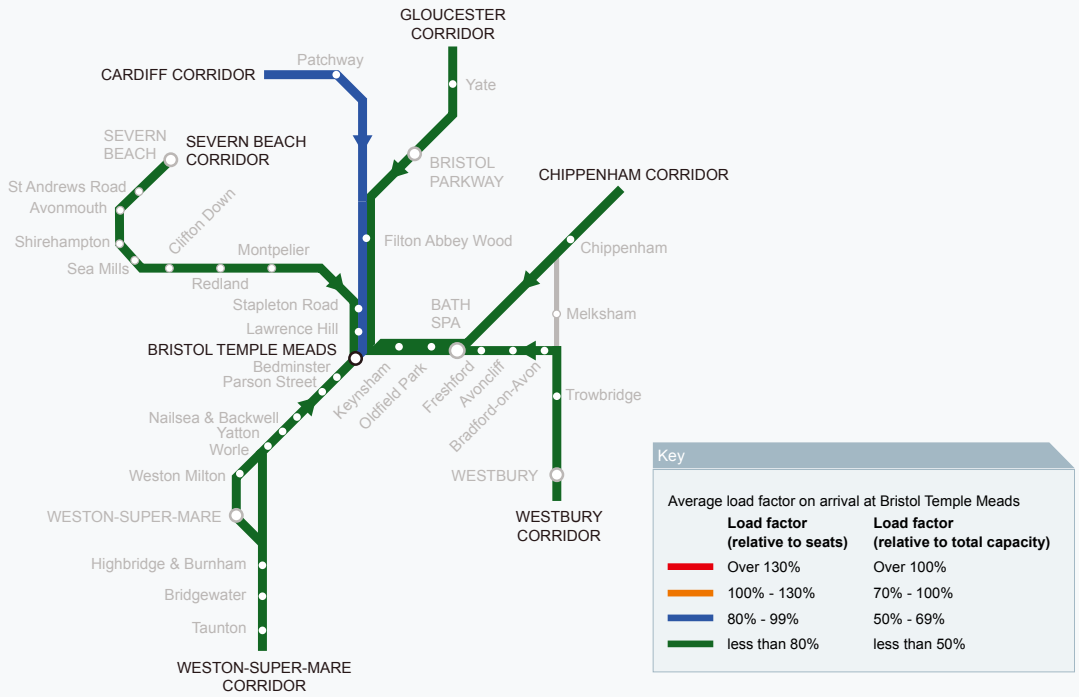
3.6.16

Bristol is the largest urban centre in the South West Government region providing employment, education opportunities and leisure activities. In 2007, approximately seven million passenger rail journeys started or ended at Bristol Temple Meads, a 75 percent increase from four million in 1998. Trips to Bristol by rail, particularly for commuting purposes, have become increasingly more attractive in recent years as a result of an improved train service and increased road congestion, and car parking costs, into and around the city centre.

3.6.17

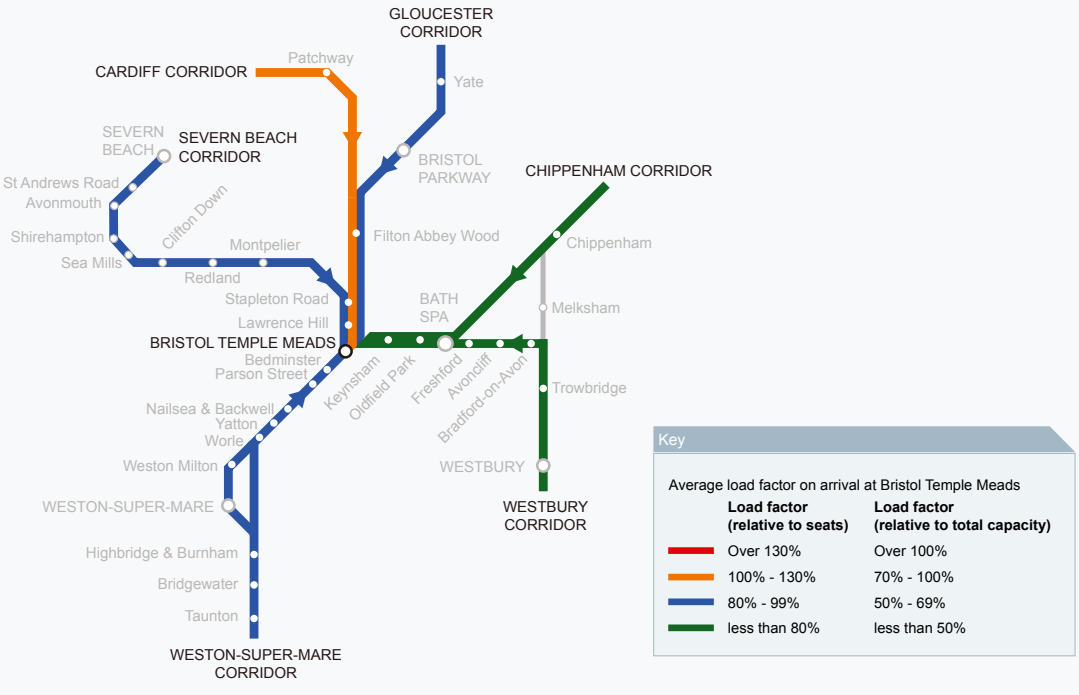
The level of rail demand varies considerably by time of day with demand at its highest level in the high-peak hour. Figure 3.18 illustrates the ratios of passengers to seats and to total capacity (includes both seating and standard allowances) at Bristol Temple Meads for trains arriving in the three-hour peak period. This shows that total capacity provided across the three-hour peak period is sufficient to meet demand as of 2007/08.

Figure 3.18 – Average load factors on weekday arrivals at Bristol Temple Meads in 2007, morning three-hour peak (07:00-09:59)



Note: Total capacity includes seats and standing allowance

Figure 3.19 – Average load factors on weekday arrivals at Bristol Temple Meads in 2007, morning high-peak hour (08:00-08:59)



Note: Total capacity includes seats and standing allowance

3.6.18

Figure 3.19 shows that all corridors except the Cardiff to Bristol corridor have both a passenger to seat and total capacity ratio of less than 100 percent. However, it should be noted that this is a level of average loadings and within this average a number of services would have passengers standing in the high-peak hour. The Cardiff to Bristol corridor has a 95 percent passenger to total capacity ratio during the high-peak hour and there is evidence that on the busiest services, some services are in excess of the available capacity.

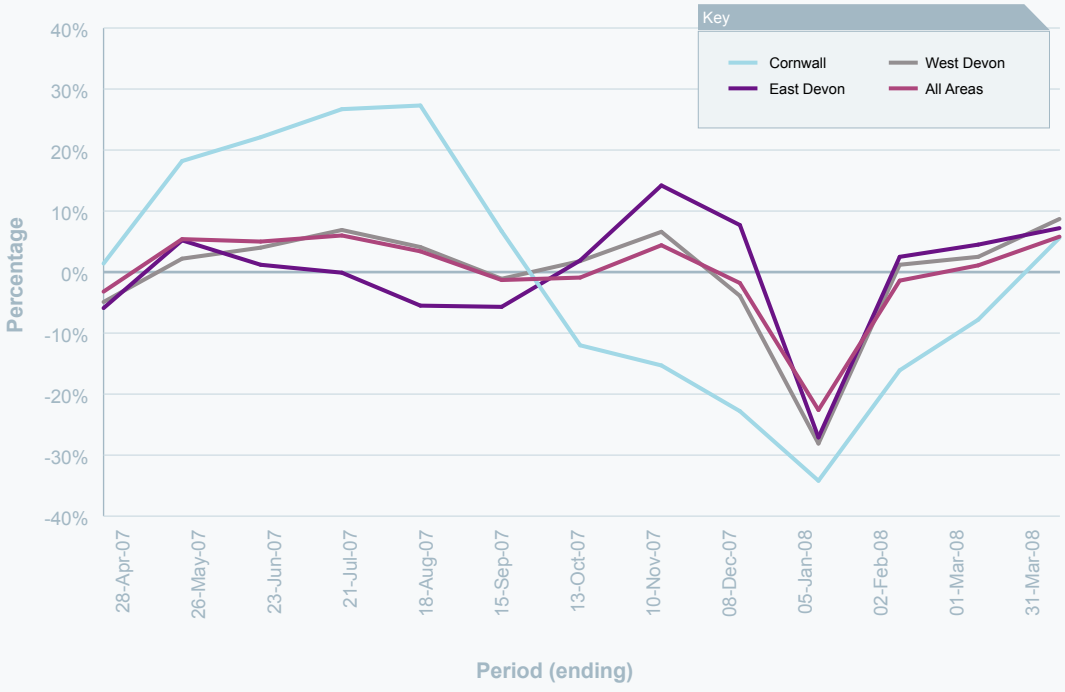
3.6.19

Exeter and Plymouth are the key regional centres in Devon and play an important role in supporting regional economic growth. Total rail demand to Exeter and Plymouth has increased rapidly in the last decade. Demand for rail at Exeter St Davids was approximately two million passenger rail journeys per year in 2007, which represents an increase of 30 percent from 1998. Plymouth experienced a higher level of growth with passenger rail journeys increasing by 50 percent from 1.3 million in 1998 to around two million in 2007.

3.6.20

In Devon and Cornwall, holiday traffic is a significant element of the overall rail passenger market. Tourism produces seasonal variations in rail demand to popular tourist destinations. Figure 3.20 shows how the demand to Devon and Cornwall fluctuates during the year with the four-weekly demand for each period compared against the annual average ranging from eight percent to -30 percent over the course of 2007/08. The high peak summer months (July and August) generate up to 28 percent more demand than the annual average and falling to below -30 per cent over Christmas and the New Year.

Figure 3.20 – Seasonal variations in rail demand to/from Devon and Cornwall (2007/08)



Source: LENNON ticket sales (2007/08)

3.6.21

Demand for local services (excluding the Long Distance High Speed services) on the Devon and Cornwall branch lines has also increased substantially from 1.7 million journeys in 2001 to 2.5 million journeys in 2008, an increase of 50 percent.[4] Figure 3.21 shows the total rail journeys (excluding the Long Distance High Speed services) made on the branch lines between 2001 and 2008. For totality, journeys on the Exeter to Exmouth line have also been included even though this is not classified as a branch line.

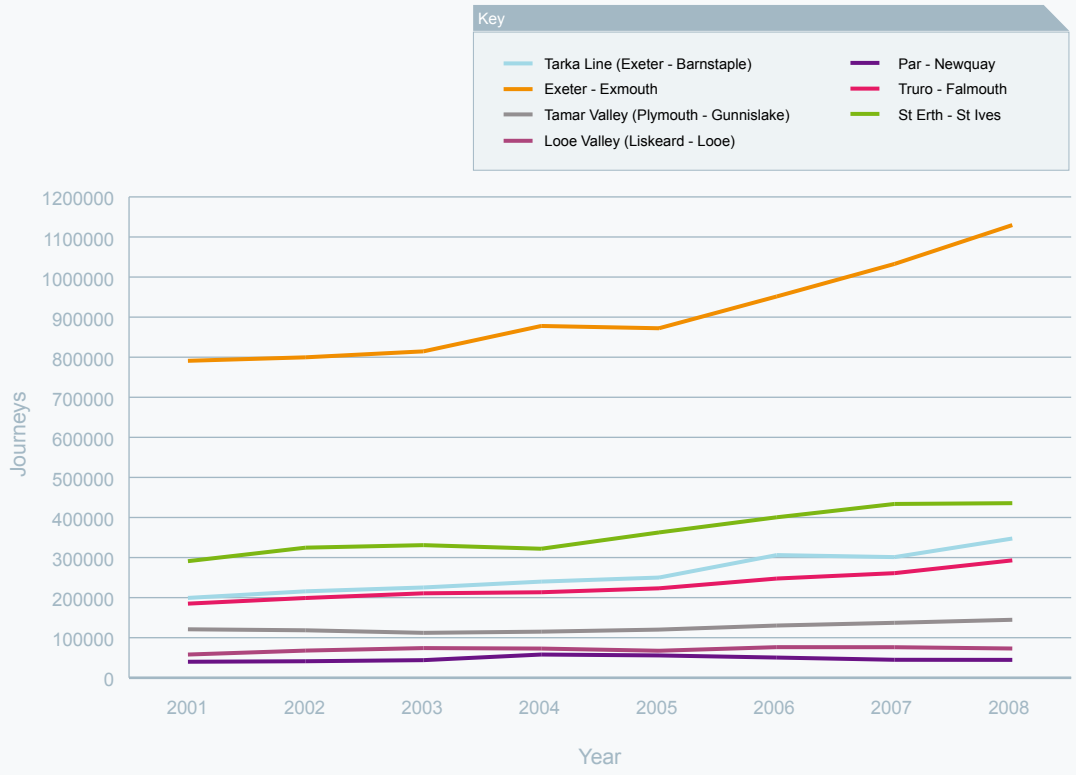
3.6.22

Of all the branches, the Exeter to Barnstaple line has experienced the greatest growth with a 74 percent increase in passengers since 2001. It is still experiencing the highest growth per year with an eight percent increase during the year to 2008. The reduction in journeys on the Par to Newquay branch shown in Figure 3.21 is due to the introduction of through high speed train services and demand for these are not included, the figure therefore only presents demand for local services.

3.6.23

London Heathrow is the largest airport in the country with around 70 million passengers per annum and is included within the Great Western RUS area. With the opening of Terminal 5 in 2008, the airport's capacity grew to accommodate a further 30 million passengers per year and it is predicted that passenger demand will increase by a further 15 percent by 2013.

Figure 3.21 – Demand for rail on the branch lines in Devon and Cornwall



Source: LENNON (rail) ticket sales data, excluding long distance high speed services
Figures contain Carnets and Lelant Salting P&R

4 These do not include rail journeys made on the Exeter and Exmouth Line

3.6.24

Around 83 percent of passengers travelling to Heathrow Airport travel from London and the wider South East region. Various means of transport serve the airport with rail access available through London Underground and through Heathrow Express and the Heathrow Connect service. Heathrow Airport is the biggest employment site within the United Kingdom with more than 315 organisations employing 74,000 staff. Staff are encouraged to use public transport with the airport aiming to improve travel choices for staff with initiatives such as free buses around the airport campus and a staff travel card with up to 50 percent discounts on some routes. Whilst Heathrow Express provides a faster premium fare shuttle service from London Paddington, the Heathrow Connect services offer a local stopping service to stations along the route attracting the commuter market and airport employees.

3.6.25

Figure 3.22 illustrates demand for Heathrow Express services by journey purpose. In 2006, five million passengers travelled on Heathrow Express representing a nine percent increase from 2000.

3.6.26

Evidence suggests that the busiest days for Heathrow Express are Tuesdays and Fridays supporting the predominant use of the service for business purposes. For services arriving into London Paddington, the morning high-peak hour between 08:00 and 08:59 is the busiest and for those services departing London Paddington for Heathrow Airport the three-hour evening peak between 16:00 and 18:59 is the busiest.

Figure 3.22 – Total journeys on Heathrow Express by journey purpose

Source: Data supplied by Heathrow Express

3.7 Freight Operating Companies

3.7.1

There are currently eight licensed freight operators who have access contracts across the whole of the rail network. These are;

- DB Schenker Rail (UK) Limited, the largest rail freight operator in Great Britain, with a licence to operate European services. DB Schenker operate trains for a wide range of markets and are structured into four market-based groups: Energy (includes coal), Construction (which includes domestic waste), Industrial (which includes metals and petroleum) and Network (which includes international, automotive, express parcels services and rail infrastructure services)
- Freightliner Group has two divisions: Freightliner Limited and Freightliner Heavy Haul. Freightliner Limited is the largest haulier of containerised traffic, predominantly for the deep sea market; whilst Freightliner Heavy Haul is a significant conveyor of bulk goods, predominantly coal, construction materials and waste. It also operates rail infrastructure services
- First GBRf, formerly GB Railfreight, is also a significant operator of deep sea container trains and rail infrastructure services. They also run a number of services for bulk market customers including coal and gypsum
- Direct Rail Services operates traffic for the nuclear power industry in Great Britain. In the last few years the company has expanded into running services for the domestic intermodal and short sea intermodal markets
- Fastline Freight are an established provider of rail infrastructure services
- Colas Rail provides rail freight haulage for all market sectors throughout the UK and Europe
- West Coast Railway specialise in operating charter trains, both in its own right and on behalf of tour operators throughout the UK and has a licence for freight operations
- Serco Rail predominantly provides engineering services to Network Rail with the national measurement train and Omnicom (the national survey train).

3.8 Current freight market profile

3.8.1

Significant volumes of freight are carried over the RUS area, with an estimated 7,000 million tonnes transported per annum. The Great Western Main Line is the second busiest corridor for freight into London after the West Coast Main Line. In the Great Western RUS area there are around 45 freight terminals handling over 12 different commodities as shown in Figure 3.23. In addition to these flows, which have origins or destinations within the RUS area, other freight traffic traverses the area to destinations in South Wales and to the North of England and Scotland.

3.8.2

The major commodities transported within the Great Western RUS area are aggregates, coal, containers and steel. Figure 3.24 illustrates the principal freight flows and includes the locations of the quarries on the route; the main quarries being Merehead, Whatley and Meldon.

3.8.3

The main markets served within the RUS area are presented below:

3.8.4

Aggregates for the construction industry mainly originate in the Mendips, with others originating from outside the RUS area, and account for much of the freight traffic between the West Country and London with terminals at Paddington, Acton, Brentford, Hayes, West Drayton, Thorney Mill, Colnbrook and others to the south and east of London. The aggregate flows between the Mendips and London are the heaviest freight flows nationally and can reach six million tonnes each year, equating to 4,400 tonnes per train. Other terminals served are at Theale, Wootton Bassett, Appleford and Oxford Banbury Road.

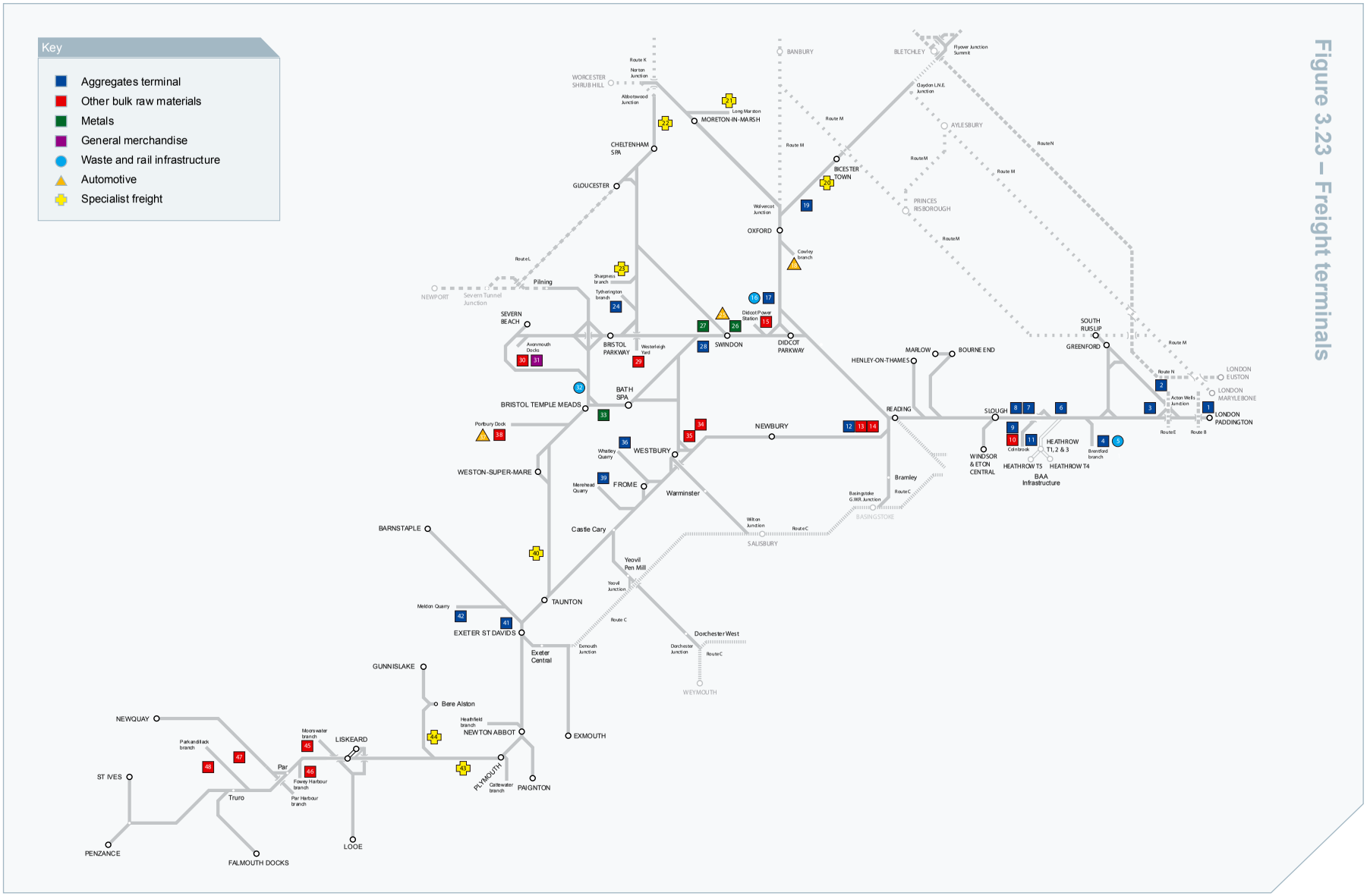
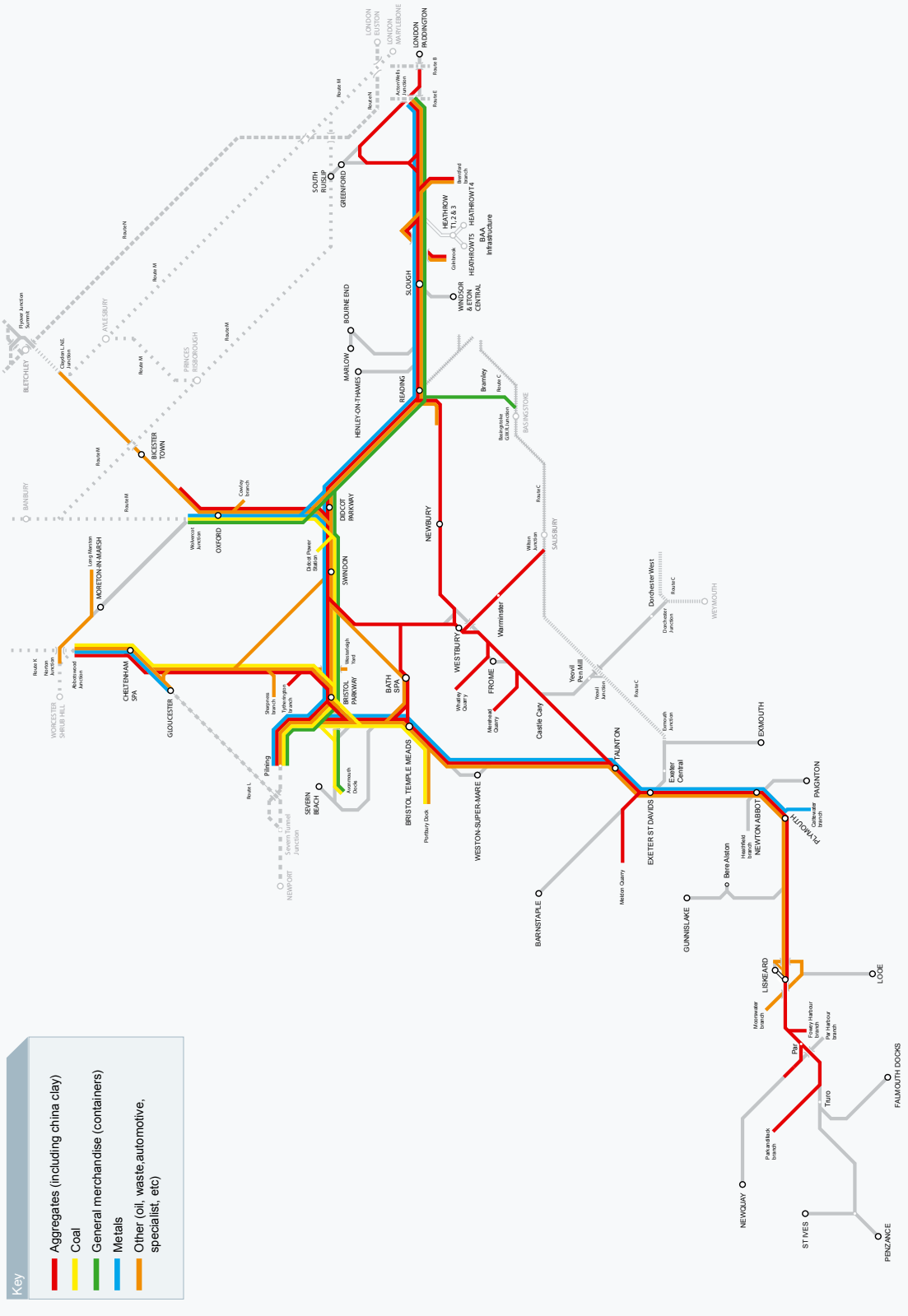


Figure 3.23 – Freight terminals

Figure 3.24 – Freight flows by commodity



3.8.5
The route between the south coast port of Southampton and the West Coast Main Line via Basingstoke, Reading and Oxford is the key route for deep sea container services, generating significant volumes of container traffic for the West Midlands, the North and Scotland. The Freight RUS, published in March 2007, highlighted a specific "gap" with the gauge clearance requirements on this route. This is discussed further in **Chapter 4** with the committed scheme to enhance the gauge on this route. Avonmouth has limited container movements, however the proposal by the Bristol Port Company to construct a new container terminal development at Avonmouth is discussed further in **Chapter 5** under future freight growth.

3.8.6
The metals market includes large volumes of steel transported from South Wales to a variety of terminals throughout the UK. Steel production and treatment facilities at Llanwern and Port Talbot generate significant numbers of trains each day.

3.8.7
Automotive manufacturing is centred In Swindon (Honda) and Oxford Cowley (BMW). Train loads of export cars run via the Channel Tunnel and Purfleet Docks respectively. The automotive import market is mainly based on the Port of Bristol's Portbury and Avonmouth terminals. Daily trains between Dagenham (in east London) and Bridgend cater for Ford traffic. A rail terminal at Swindon Hawksworth handles imported steel for car manufacture.

3.8.8
Didcot Power station is the only rail served coal fired power station within the RUS area. At present, the plant is non-EU compliant as it is not fitted with Flue Gas Desulphurisation (FGD) equipment. Unless a dispensation is granted it is likely that this station will cease coal burning operations by 2015. Whilst Aberthaw Power station lies within the scope of the Wales RUS, it will continue to be served from Avonmouth and Portbury Docks.

The influence of South Wales on freight traffic is significant on this route due to the many impacts that through traffic has on the area. It is therefore important not to consider these flows in isolation. The coal fired Uskmouth power station in South Wales is mainly supplied locally from Newport docks, with some flows from Bristol.

3.8.9
Petroleum traffic generates up to five trains per week crossing the route from Milford Haven to either Westerleigh or Theale.
A flow operates between Lindsey Oil Refinery (Immingham) and Westerleigh five times a week and between Lindsey Oil Refinery and Theale three times a week. There is also a planned train once a week from Port Clarence to Westerleigh and other irregular movements between Lindsey Oil Refinery and Didcot Power station. There is one oil train per day from Lindsey Oil Refinery to Colnbrook.

3.8.10
Daily train loads of containerised waste to landfill sites at Appleford and Calvert originate from Brentford and Bristol.

3.8.11
Freight traffic generated in Cornwall is predominantly china clay, mostly exported locally through the Port of Fowey, but with some longer distance traffic also. Cement traffic from Hope (Peak District) runs to Moorswater on the Looe Branch. Aggregates traffic runs from Burngullow to east London.

3.8.12
Network Rail infrastructure traffic operates across the RUS area, mainly serviced from the Westbury Local Distribution Centre (LDC).

3.9 Freight capacity and capability

3.9.1

The busiest part of the network is between Reading and Acton as can be seen in Figure 3.25 which illustrates the daily number of scheduled freight paths in the Great Western RUS area by route section. The diagram shows all Working Timetable (WTT) paths, as at May 2009, of which only a percentage are actually used every day. The diagram does not illustrate trains which are short-term plan special movements, and therefore shows an average capacity utilisation position.

3.9.2

The Freight RUS presents a view of the freight growth and alterations in existing traffic flows that could reasonably be expected to occur on the network by 2014 and presents a strategy to address the key issues that arise in accommodating these changes. These predictions form part of the baseline and are used as a basis for future demand and are therefore considered further in **Chapter 5** along with the extrapolated freight forecasts to 2019 and 2030.

3.9.3

The Freight RUS recommends a proactive strategy for the development of priority core and diversionary routes to accommodate W10 gauge. This will facilitate the growth of rail's share of the market for haulage of 9ft 6in containers on conventional deck height wagons. Loading gauge defines the maximum height and width of vehicles that can be safely accommodated without fouling structures such as bridges and platforms. Within the RUS area loading gauge predominantly ranges from W6 to W8, as shown in Figure 3.26.

3.9.4

The Strategic Freight Network (SFN) builds on the earlier work in the Freight RUS by seeking to create a network of core and diversionary routes on the heaviest used lines, with capability of gauge and train length available for expected growth. This forms part of the High Level Output Specification (HLOS) for Control Period 4 which introduces the SFN, funding the development of a number of schemes, detailed in **Chapter 4**.

3.9.5

Route Availability (RA) is a system for determining which types of locomotive and rolling stock can travel over any given section of route and is normally determined by the strength of underline bridges in relation to axle load and speed. The RA of a specific route is determined by the carrying capability of both its structure and track. As shown in Figure 3.26, most of the RUS area is classified as RA8 which permits axle loads up to 22 tonnes per axle. Only in certain specially controlled circumstances, can trains receive derogation to operate heavier axle loads over lower categorised routes.

3.9.6

The range of loop lengths within the RUS area varies from 186 metres at Eggesford (although rarely used for freight) to 1447 metres at Milton. Ten percent of the loops in the RUS scope area are long enough to accommodate the longest freight trains of 775 metres, with the majority of loops between 500 metres and 775 metres. Freight operators have aspirations for loops to be at least 775 metres, to accommodate 121 SLUs (Standard Length Units). Freight operators are engaged in a number of initiatives to improve path take-up and the efficiency of operations. All operators are seeking to maximise the use of each path on the network by running trains which are longer, heavier and in some cases potentially bigger (both in weight and height). The SFN is leading the assessment of the capability of the network and identifying where interventions may be required to enable longer and/or heavier trains to operate in order to manage predicted growth. A number of train lengthening studies are underway, including a review of the Southampton to West Coast Main Line corridor. This is discussed further in **Chapter 4**.

Figure 3.25 – Freight train paths (May 2009 WTT)

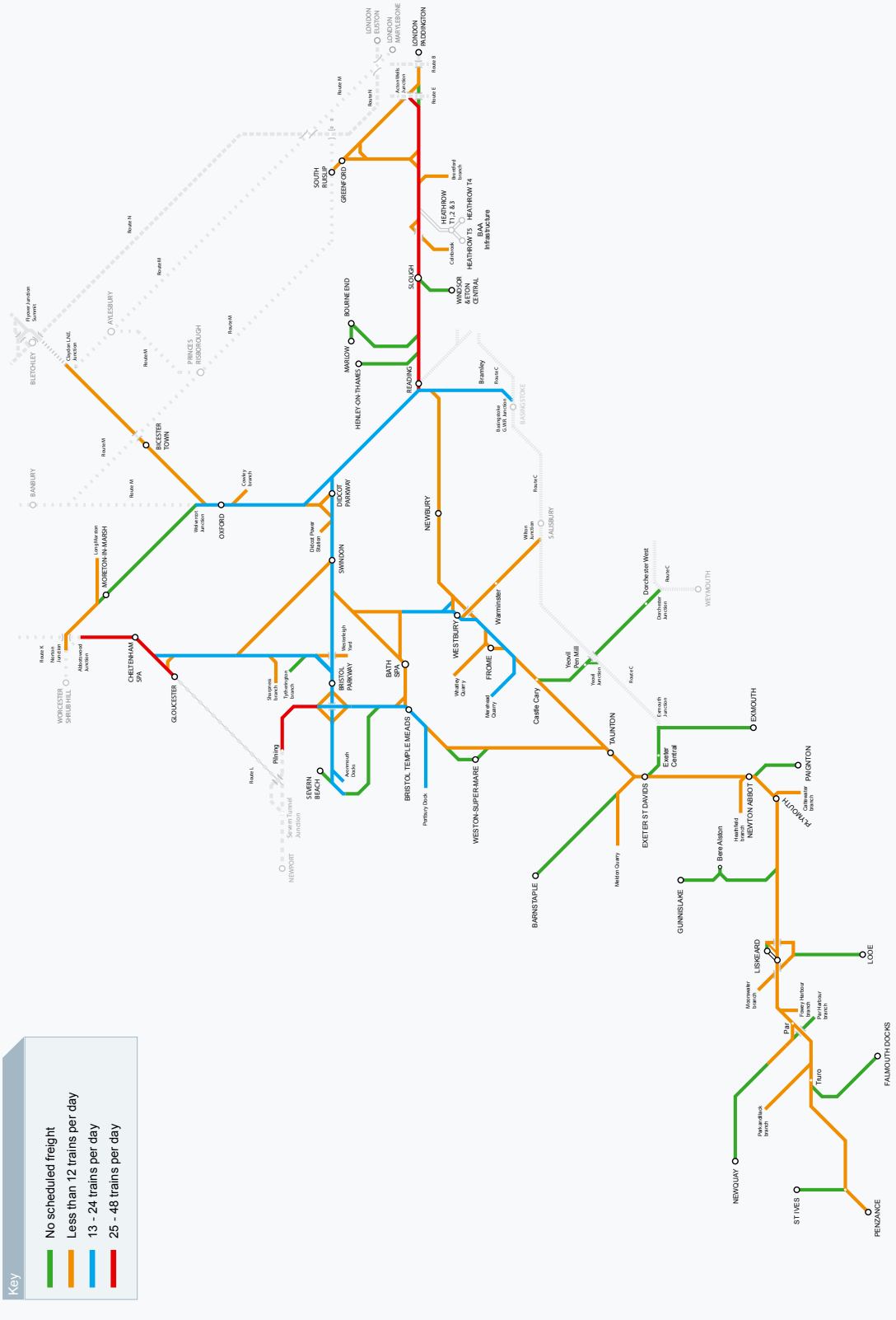
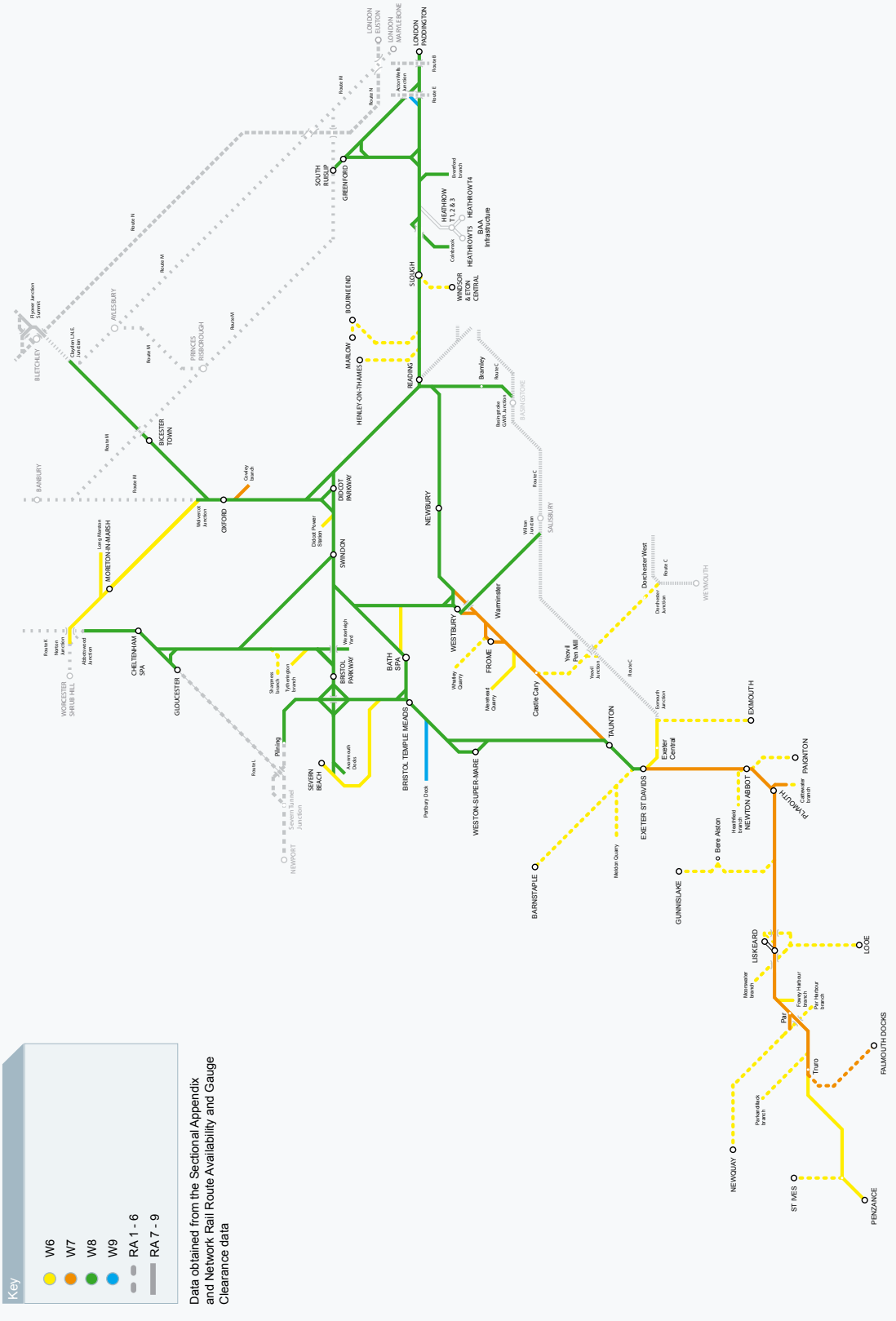


Figure 3.26 – Loading gauge and route availability



3.10 Current RUS Infrastructure

3.10.1

The infrastructure characteristics in the scope area of the Great Western RUS vary widely, depending on the location, historical service demands and recent developments. This has resulted in different levels of route capability, represented across the area by the track configuration of the network from east to west as it changes from four tracks to two tracks and then to a single line. 70 percent of the route is two tracks with only 12 percent comprising four track sections. This is illustrated in **Chapter 2**, Figure 2.1.

3.10.2

The principal infrastructure characteristics analysed as part of the baseline exercise includes linespeeds, planning headways, electrification, platform lengths, station facilities (including car parking) and rolling stock depots and stabling.

3.10.3

Linespeeds vary greatly, from the high speed sections of 100 – 125mph to the rural branch lines where the majority of speeds are within the 40 – 75mph band with some areas falling below 35mph. Figure 3.27 illustrates the differing linespeeds across the RUS area.

3.10.4

A variety of signalling systems also feature across the Great Western RUS area, which again, reflects the historical differences in demand and service levels for each area. Planning headways are a measure of how closely (in time) one train can follow another with the range reaching from two minutes to over 10 minutes across the RUS scope area as shown in Figure 3.28.

3.10.5

Currently, there is a limited amount of electrification within the RUS area, with the line between London Paddington and Airport Jn being the only electrified section. The lines between Airport Jn and Heathrow Airport are also electrified but these are owned by BAA. With Crossrail, the limit of electrification will extend to Maidenhead and with the commitment to the electrification of the Great Western Main Line the route from London Paddington to Oxford, Newbury and Bristol (via Bath Spa and Bristol Parkway) will be electrified by 2016. This will be extended to Swansea by 2017. These developments are discussed further in **Chapter 4** under committed schemes and with recent developments in **Chapter 9**.

3.10.6

The length of platforms also vary along a line of route, this means the train length and service provided can be constrained by the shortest platform, or Selective Door Opening (SDO) has to be deployed. The shortest and longest platform lengths across the RUS scope area are indicated in Figure 3.29. Platform lengths across the RUS area vary and can accommodate a mixture of two-, three-, and four-car train configurations and longer two power car plus eight-coach High Speed Train (HST) formations. The constraint of short platforms is particularly evident in the Thames Valley making it difficult to deliver much needed passenger capacity through train lengthening.

3.11 Stations

3.11.1

Appendix A provides a detailed list of station facilities at the 197 stations located within the Great Western RUS area (including the station classification) and the integration with other modes of transport as per the latest National Rail data. Stations are deeply entwined with their local community and effectively act as the gateway to both town and railway. The ease with which passengers can get to stations determines the attractiveness of rail travel relative to other modes. The draft Regional Spatial Strategy for the South West promotes the aim of providing safer, more attractive stations with improved interchange facilities and services and enhanced car parking capacity going forwards. Car parking availability and utilisation is also presented in **Appendix A** along with accessibility to the station and interchange opportunities with other modes of transport.

Figure 3.27 – Linespeeds

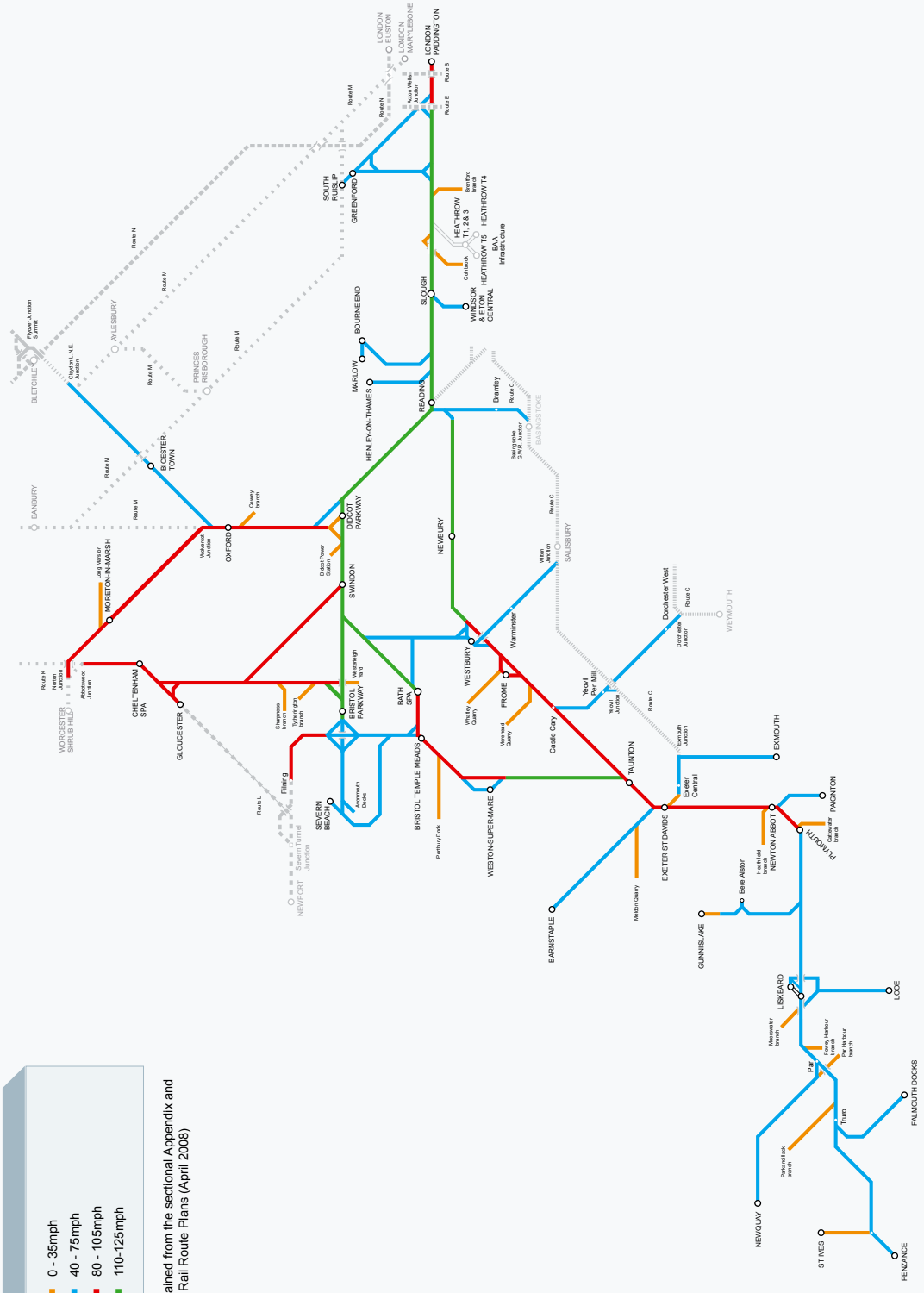
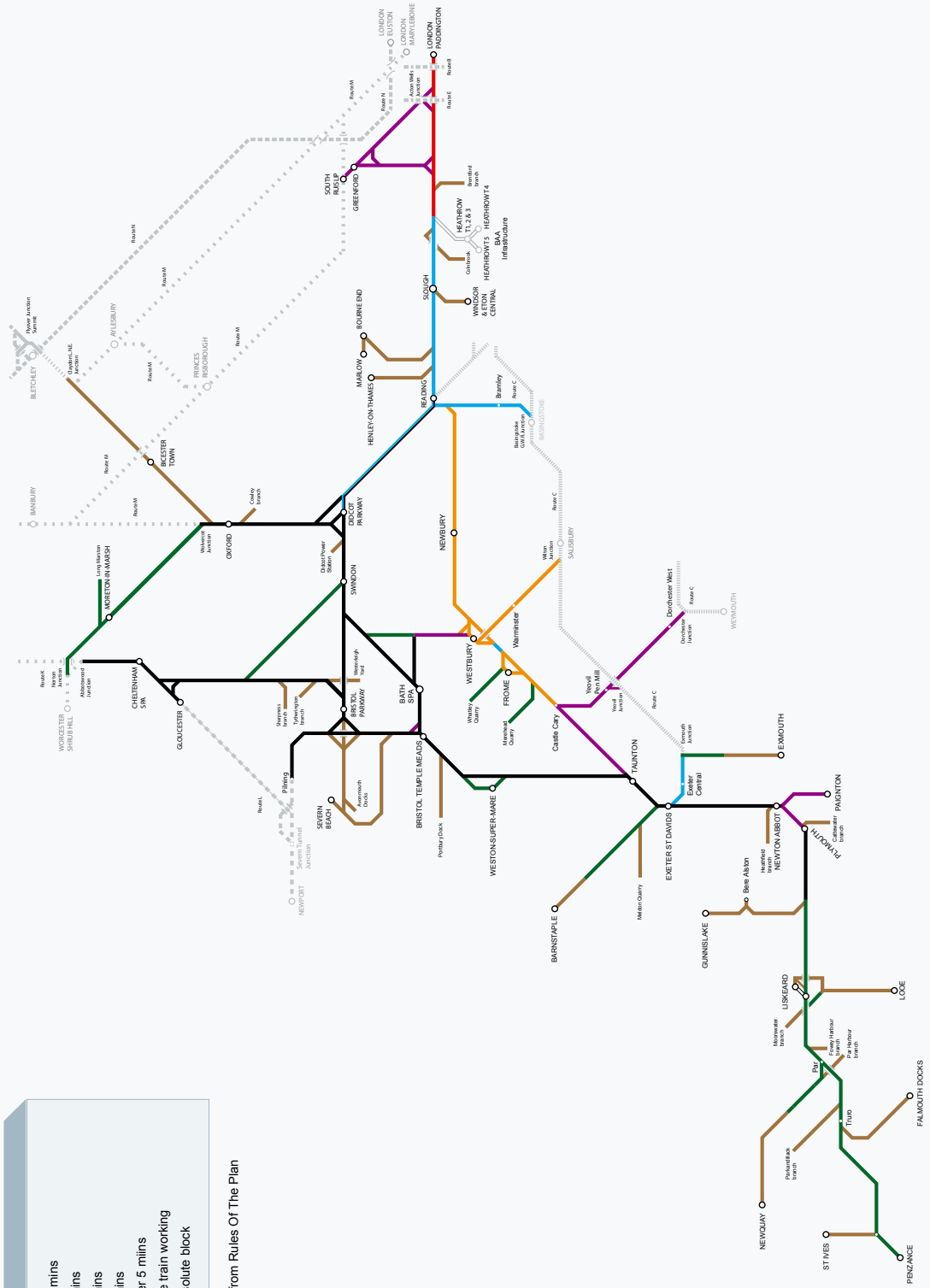
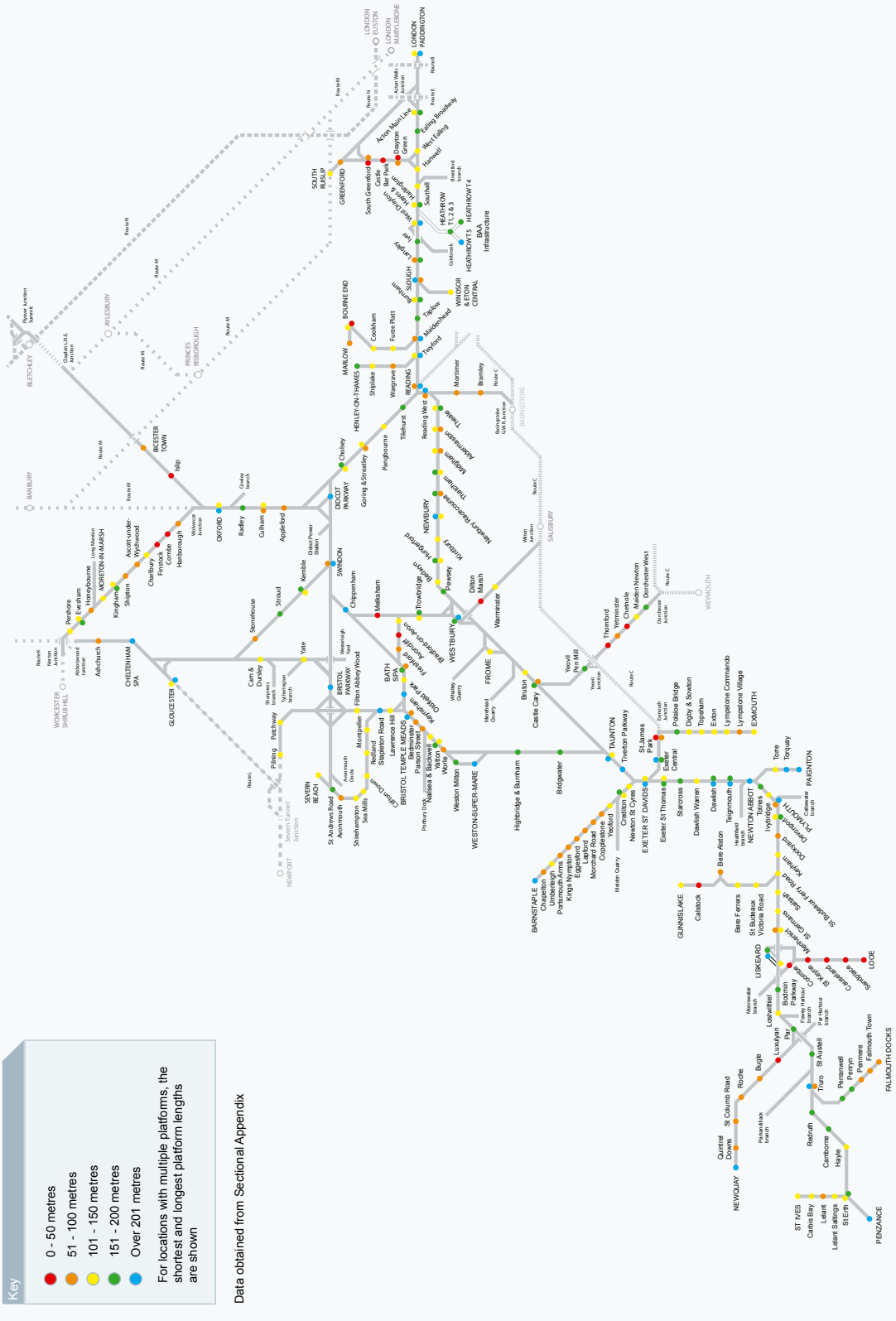


Figure 3.28 – Planning headways



Data obtained from Rules Of The Plan

Figure 3.29 – Platform lengths



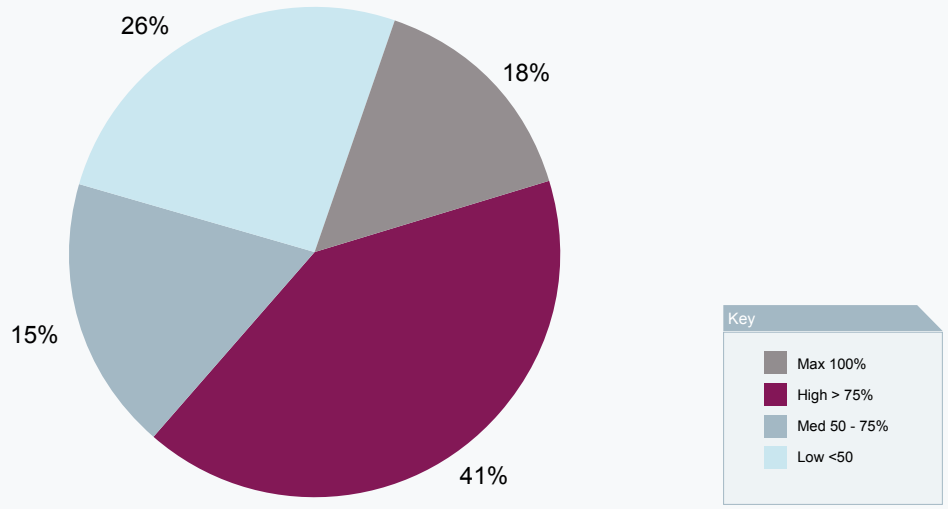
3.11.2

A number of key transport interchanges exist within the RUS area. Various stations have direct access to the London Underground Network (Paddington, Ealing Broadway and Greenford). Key multimodal interchanges include Paddington, Reading and Bristol Temple Meads for air travel with rail/bus interchanges existing at many other stations. Network Rail and the station operators continue to work with local authorities to develop these facilities. Schemes at Didcot Parkway and Swindon are currently being developed to improve the bus/rail interchange whilst the draft Regional Spatial Strategy for the South West notes Exeter St Davids and Exeter Central as key stations for the development of transport interchange facilities going forwards. Pilot schemes for through rail/bus tickets are being developed with bus operators across the area to enable continuous use of rail tickets on the bus network with initial trials due to take place in Bristol.

3.11.3

It is noted that lack of station car parking capacity is a widespread issue which occurs at many of the main regional centres. Car park occupancy data identifies 18 percent of car parks within the RUS area as being at 100 percent utilisation, with a further 41 percent of car parks with utilisation of over 75 percent as shown in Figure 3.30. It is thus a key issue if access to the network is not to be deterred suppressing future passenger demand.

Figure 3.30 – Car park occupancy analysis (2008/09)



Source: First Great Western

3.11.4
A number of schemes (either as stand alone or as part of a major station enhancement) are underway to provide additional car parking capacity, specifically reviewing those car parks with 100 percent utilisation. This is being achieved through various means such as remodelling of the car park layout (Gloucester and Taunton), creation of a multi-storey car park or additional decking (Bristol Temple Meads and Bristol Parkway), and acquired spaces in adjoining developments or through overflow car parks (Bath Spa and Tiverton Parkway) or through the potential acquisition of additional land (Totnes). Network Rail, with the station operator, will continue to review and assess opportunities for increasing car park capacity at all stations across the RUS area.

3.11.5
There are many station enhancement projects in development sponsored by the train operating companies, third parties, through the National Station Improvement Programme or Access for All which aim to address station facilities including expansions to car parks. Those committed schemes are discussed further in **Chapter 4**.

3.11.6
A number of recent studies have been published which have, or propose to, review the current station facilities across the network and propose actions for station improvements going forwards. In November 2009, Network Rail launched their new initiative 'Action Stations'. This is a 10-point plan to deliver better stations and facilities for passengers aimed at getting the public talking about the future of stations. The plan has been outlined as a guide for what stations should be for the next 20 years:

1. be safe, secure and easy to use
2. provide the information needed for passengers to plan their journeys
3. allow quick and easy transfer to other forms of transport
4. attract people to use the rail network
5. have a positive impact on the environment
6. be places people want to work, shop and travel
7. showcase British design and safeguard our heritage
8. provide a hub for other modes of transport
9. act as a catalyst for the development of major cities
10. anticipate the changing and dynamic needs of our passengers.

3.11.7
A great deal has been achieved to date, and working with industry partners, work continues to improve stations for passengers through major station redevelopments (London Paddington, Reading, Gatwick Airport, Oxford, Newport, Cardiff Central and Cardiff Queen Street), Access for All and the National Stations Improvement Programme.

3.11.8
£3.25 billion has been secured by Network Rail over the next five years for investment in the operation, maintenance and improvement of stations. Where possible, Network Rail will combine forces with the train operating companies, local councils, regional development agencies, passenger groups and other third parties to encourage and maximise this investment at stations.
To deliver the stations that people want, and to make sure the future investment choices are the right ones that people want and value the most, the Action Stations campaign has been established to engage the public and hear their views. This will collate public thoughts on the 10-point plan, what areas are the priorities and how these can best be delivered. The findings will be compiled and analysed ahead of the publication of the Action Stations report in April 2010. This document will then contribute towards the Network RUS (Stations).

3.11.9
The Stations RUS will nationally review station capacity, for current passenger throughput and for that predicted over the 10-year timeframe and station facilities, setting out the key facilities appropriate for each category of station. This will include an exploration of the relationship of facilities at concourse and platform level, car parking provision, interchange facilities and safety. A new stations guide 'Investment in Stations, a guide for promoters and developers' was completed in June 2008 for guidance on the process for new stations for third parties.

3.11.10
The Station Champions report 'Better Rail Stations' (November 2009) was published by the Department for Transport with the objective of advising on ways to improve stations. The focus of the review was on getting the basic facilities right as well as the broader role of stations in the future. This was completed through a review of the existing station facilities and their station categorisation. Station priorities should be focused on improving access, information, facilities and environment and the report recommends the extension of the National Stations Improvement Programme and the Access for All funding beyond 2014 to provide funding for 'catching-up' stations to the minimum standard.

3.11.11
The report recommends a minimum station standard and facilities at each category of station, identifying priorities for problem stations and proposing a longer term vision. All stations are categorised under a standard industry categorisation. Category A refers to national hub stations or major stations, category B is for a regional hub stations, category C is an important feeder station with categories D to F referring to medium (staffed), small (staffed) and small (unstaffed) respectively. The report notes the continuation of the existing categorisation with the categorisation of stations under category B previously referred to as regional hub stations renamed to interchange stations to better reflect the role of these stations as transport interchanges. It is within this category that there is the most deficiency in the standard of the stations and where funding should be prioritised to upgrade the facilities to the minimum standard. Within the RUS area, Didcot Parkway has been identified as a category B station for priority upgrades. Current schemes are proposed at Didcot Parkway in conjunction with the local authority and under the National Stations Improvement Programme (see **Chapter 4** for further NSIP schemes).

3.11.12
Rail stations cannot be planned in isolation and should be developed as transport hubs in close collaboration with local authorities, the report recommends the revision of the 'Manual for Streets' to offer better access to stations for pedestrians, cyclists and public transport. Car parking schemes with 'premium parking' initiatives should be reviewed and joint initiatives should be undertaken with local authorities for seamless rail/bus interchanges with closer relocation of bus stations and ticketing, 'loading islands' for taxis and cycle access, storage and segregated cycle routes around the station areas.

3.11.13
For the longer-term, the report recommends that larger stations should become the Hubs and Super Hubs for transport activities becoming the natural place to locate bus/tram stations and incorporating local bus feeder services, cycle storage and park and ride car parks. The medium and small stations should evolve into community hubs. The forthcoming Stations RUS is targeted to review long-term car parking plans and the upgrading of station facilities.

3.11.14
Figure 3.31 highlights the top 10 most used stations within the RUS area during 2007/08.

3.11.15
The least used stations within the RUS area with less than 1000 passengers per annum during 2007/08 are presented in Figure 3.32.

Figure 3.31 – Top 10 most used stations in 2007/08

Stations	Passenger (millions) per annum
London Paddington	29.1
Reading	17.0
Bristol Temple Meads	7.4
Slough	5.5
Oxford	4.7
Bath	4.3
Maidenhead	3.9
Ealing Broadway	3.5
Swindon	2.6
Didcot Parkway	2.6

Source: LENNON (rail) ticket sales (excluding interchange)
Note: Transport for London (TfL) travelcards sold at outlets other than National Rail stations are not included

Figure 3.32 – Top 10 least used stations in 2007/08

Stations	Passengers per annum	Branch Line
Newton St Cyres	889	Barnstaple
Quintrel Downs	794	Newquay
Sandplace	788	Looe
Portsmouth Arms	667	Barnstaple
Lelant Saltings	653	St Ives
St Keyne	618	Looe
Dorchester West	416	Heart of Wessex
Lelant	250	St Ives
Chapleton	120	Barnstaple
Coombe Halt	32	Looe

Source: LENNON (rail) ticket sales (excluding interchange)
Note: Rover tickets are not included

3.11.16

Figure 3.32 excludes journeys made on Rover tickets which may have an impact on the actual level of footfall at some of the stations. This is particularly evident for Lelant Saltings which is the Park and Ride station for St Ives with rover tickets sold for the day for the St Ives branch line. This is similarly the case for Dorchester West, with ticket sales being grouped to 'Dorchester stations'. Most of the low footfall stations serve rural areas where other public transport is limited. The service level varies at each station, according to demand and the ability to serve the station economically, but in all cases is provided by a local stopping service where minimal gains in terms of journey time, resource utilisation or performance would be achieved if the stop were eliminated.

3.11.17

All of the low footfall stations listed above are on a designated Community Rail line. The strategy proposed for these stations is therefore for review through the Community Rail Partnership and in conjunction with the Community Rail Route Plans. For the St Ives branch line, Cornwall Council are currently progressing a scheme for delivery in 2011, which redevelops St Erth station and creates a Park and Ride facility for St Ives. This will in effect remove the need for trains to call at Lelant Saltings as this is currently the station where passengers drive to and catch the train. The opportunities for those stations on the St Ives branch shall therefore be considered in line with the station developments and proposed park and ride facility.

3.12 Train maintenance depots and stabling

3.12.1

The principal maintenance depots in the Great Western RUS area are at Old Oak Common (London), Reading, St Phillips Marsh (Bristol), Exeter, Laira (Plymouth) and Long Rock (Penzance). These depots are operated by FGW. There is a depot at Landore (Swansea) but this is outside the scope of the Great Western RUS area.

3.12.2

Each of the depots is different and performs a specific role, based on its location, facilities, processes and assigned rolling stock. Each depot has been developed to operate on a variety of activities which include overnight servicing, maintenance, modifications, repairs, tyre turning and cleaning. Each depot has a different layout, with variables such as track layout, berths and stabling roads which dictate the workflow through the site.

3.12.3

The other major depot in the RUS area is that of Heathrow Express at Old Oak Common (London) adjacent to FGW's HST depot.

3.12.4

In addition to the depots, the stabling of FGW vehicles occurs at station areas in Paddington, Oxford, Cheltenham, Gloucester, Westbury, Bristol Temple Meads, Exeter and Plymouth. South West Trains use the network sidings at Exeter New Yard, Exeter St Davids and CrossCountry stable at Barton Hill (Bristol), Laira (Plymouth) and Long Rock (Penzance).

3.12.5

As part of the Reading Station Area Redevelopment works, the existing maintenance depots at Reading Triangle will be demolished and a new depot built on the Reading West Jn sidings to accommodate existing vehicle fleet, the proposed additional vehicles to deliver the extra capacity to meet the High Level Output Specification (HLOS) targets and the Intercity Express Programme (IEP).

3.12.6
Adjacent to the Great Western Main Line, near Old Oak Common the currently disused North Pole depot, vacated following the move of Eurostar from London Waterloo to St Pancras, has been identified for stabling and maintenance of the IEP trains in the London area. Crossrail will concentrate its maintenance activities at Old Oak Common.

3.12.7
There are also a number of freight maintenance depots and sites within the Great Western RUS area where freight operators conduct servicing and light maintenance. These include Acton, Didcot, Avonmouth, Barton Hill, Stoke Gifford, Westbury, Merehead Quarry, Taunton Fairwater, Newton Abbot, St Blazey and Fowey.

3.12.8
Figure 3.33 illustrates the current locations for depots, stabling and maintenance in the RUS area for both passenger and freight operators and also includes the proposed Track Renewals Recycling Centre at Westbury.

3.12.9
Nationally a depot strategy is being developed in order to accommodate the additional vehicles procured as part of the HLOS. This will affect depots across the RUS area which may need to be enhanced or have additional facilities provided, depending on the specification of the new units, facilities at current depots may need to be reviewed as an integral part of the fleet replacement programme. The Network RUS is examining the rolling stock and maintenance depot strategies. However, with the new depot being constructed as part of the Reading Station Area Redevelopment this is expected to be sufficient for rolling stock in the Thames Valley area. For any additional vehicles in the West of England, opportunities for maintenance capabilities may arise at existing depots following the introduction of IEP maintenance facilities at Bristol. This is subject to review with IEP and the final allocation of vehicles.

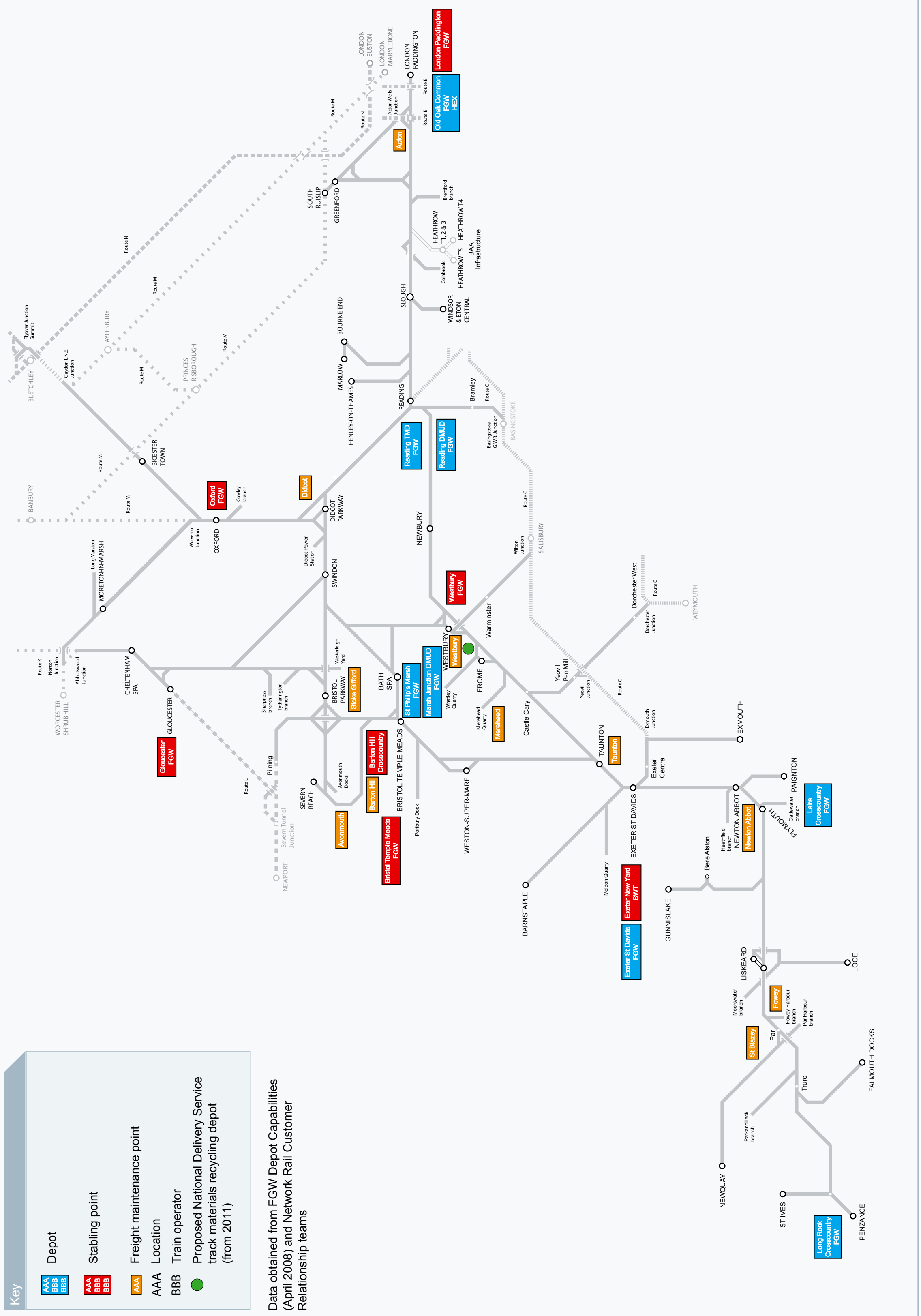
3.13 Engineering access

3.13.1
Currently there are three types of possessions for engineering access within the RUS area: normal possessions taken overnight during “white periods” when no trains are scheduled to run; cyclical possessions, which are taken for maintenance on a route section generally on a four, eight or 12-week cycle; and abnormal possessions, which are generally taken as required over a weekend in order to carry out renewal and enhancement works. Both the cyclical and the abnormal possessions often require diversions of passenger and freight services on some of the key routes.

3.13.2
With the mixture of traffic and routes within the RUS area, engineering access varies from heavily restricted on the Great Western Main Line (as a result of franchise commitments and Heathrow Express contract requirements), to a reasonable match to requirements on the branches lines. The current access arrangements around the various route sections are briefly described below. These will be continually reviewed going forwards in line with Seven Day Railway initiatives and taking account of changes following electrification and resignalling.

3.13.3
The vast majority of renewals and enhancement work is undertaken at weekends and the track possession plan is constructed on a route wide basis to ensure that on all weekends at least one route is available from London to Bristol and South Wales, and north–south coast CrossCountry and freight services can continue to operate. The main considerations include no concurrent possessions from Southcote Jn to Exeter, or Bristol to Cogload Jn and Bathampton Jn to Bristol, or Bathampton Jn to Westbury. In addition there are restrictions on Friday night possessions throughout the summer to cater for the holiday market. This possession strategy also needs to intertwine with other key routes throughout the rest of the country, particularly Didcot North to the Midlands and Reading to Basingstoke.

Figure 3.33 – Depots, stabling and freight maintenance points



3.13.4
On the four track section between Didcot and London Paddington a permanent two track timetable solution is established whereby access to two track sections is provided overnight for up to eight hours with standardised weave patterns between main and relief lines. Access at Airport Jn, at Slough and at Reading is reduced to five hours only and weekend access is essential for the maintenance of these heavily used junctions.

3.13.5
Although fitted with reversible signalling, the section from Didcot to Swindon requires extended journey times when the line is closed for renewal activity due to the area being two-aspect signalling. This restricts the running speed of trains due to the longer block sections. The Seven Day Railway initiative is investigating how adjacent line opening techniques can apply on this section to improve maintenance activities.

3.13.6
Although outside the scope of the RUS a key asset in the area is the Severn Tunnel, where the extreme and aggressive environment necessitates a specific cyclical renewal programme to maintain performance and safety. A six-year cycle requires a full renewal of the track and a detailed civil engineering inspection takes place. This puts additional strain on the diversionary route via Gloucester which adds at least one hour to the journey time. The Severn Tunnel is maintained on a recurring midweek night frequency with reversible working over one line.

3.13.7
On the rest of the route, access for maintenance is available on overnight possessions with consent from affected operators and with an alternative route for services made available. For example when both lines are blocked between Wootton Bassett Jn and North Somerset Jn, trains will run via Bristol Parkway.

3.13.8
Weekend double line blockades are employed for any major significant renewals or maintenance works. Track renewals will continue on the Bristol to Exeter route, primarily to the south of Taunton, and on the Berks and Hants route through 2010. This will be achieved through a combination of weekend and midweek possessions and continuous use of the High Output Track Renewals system in order to achieve the outputs required for renewal of the ballast and track. The system will require overnight single line working of sections of route with retimings and limited diversions of overnight services and stock moves. Conventional renewal will apply where operational restrictions (e.g. level crossings, stations and junctions) prevent the use of High Output Track Renewals. Network Rail's High Output equipment is currently based at Taunton Fairwater Yard to allow rapid and frequent transit to the renewal sites on the route.

3.13.9
For some parts of the area, only one line may be blocked at a time and therefore single line working will be operated, for example weeknights between Cogload Jn and Plymouth, on Filton Bank and between Gloucester and Abbotswood Jn.

3.13.10
All possessions are organised to ensure that access to freight terminals is normally available, for example Southcote Jn to Westbury and between Westbury and East Somerset one line is available for access to the quarries.

3.13.11
A different approach to heavy maintenance on the numerous West of England branches has been developed where workload requirements are such as to warrant extended midweek blockades and bus substitution by agreement with the operator. This current policy will continue in Devon and Cornwall where necessary but on a reducing basis. On the Torbay line, work is mainly carried out during school half term holidays.

3.13.12
In 2009, works commenced for the remodelling and rebuilding of Reading station area. This is likely to involve weekend and bank holiday journey disruption and diversions during the construction period. However, every effort will be made to reduce disruption to passengers and freight operators to a minimum. Mitigation plans are being put in place by the project teams to ensure both passenger and freight services can operate during the period of remodelling. Services will not be affected on Monday to Fridays, as the majority of infrastructure work is programmed for weekends or during planned blockades.

3.13.13
Across the Great Western RUS area, a number of generic issues affecting engineering access at present have been identified – many of which are being reviewed as part of the Seven Day Railway initiative:

- growing demand for more services at weekends and particularly on Sundays
- whilst there are often diversionary routes available when lines are closed for maintenance, diversion of freight services is usually more restricted due to the limitations of gauge and route availability
- the potential for growth in freight traffic in both existing and new flows could put pressure on maintenance regimes as presently conducted
- the diversion of services to an alternative route has a knock-on impact on services that normally use that route
- the diversion of services extends passenger journey times and also reduces the quantity of passenger carrying capacity.

3.13.14
It is recognised that with the predicted growth in passenger and freight traffic, maintenance and renewal plans will need to be reviewed to align with this and this will be reflected in revised engineering access strategies.

3.14 Seven Day Railway

3.14.1
The Seven Day Railway initiative seeks to balance the need for improved late night and weekend services with the need for engineering access by providing a consistent and reiterated timetable. The concept is being developed by Network Rail with industry stakeholders by examining appropriate route sections.

3.14.2
The initiative is designed to increase current levels of network availability by keeping passengers on trains rather than rail replacement buses during engineering works and providing a through route for freight services. For passengers, the Seven Day Railway will mean:

- A steady decrease in the number of rail replacement buses, on key routes, rail replacement buses will only be used by exception
- Complete end-to-end weekend travel between key centres on trains and not buses.

For freight operators, current service levels will be maintained by using single line working and diversionary routes to provide a through path for freight trains and through implementing a consistent midweek cyclic access pattern. For train operators, the ability to operate the full working timetable without the need to replan services and diagrams will be achieved as will the opportunity to operate new services, particularly at weekends, where potential has been identified.

3.14.3
A coordinated approach has been developed to ensure consistency between the Western Seven Day Railway work packages and the identified gaps and options under the RUS – the results of this are discussed further in **Chapter 6**. Further details on the objective of the Seven Day Railway initiative and national and specific Western schemes being reviewed are presented in **Chapter 4** under committed schemes and further in **Chapter 8**.

3.15 Performance

3.15.1

There are three principal measures used to monitor performance: Public Performance Measure (PPM) delay minutes and Cancellations and Significant Lateness (CaSL). PPM provides a national metric for overall passenger train punctuality and reliability and is expressed as a percentage of all trains arriving on time at destination compared to the total number of trains planned.

3.15.2

Figures 3.34 and 3.35 show the PPM moving annual average on a period by period basis against the target PPM for all First Great Western services (combined for high speed services, London and Thames Valley services and services in the West) and CrossCountry services, as the two predominant Train Operating Companies (TOC) in the RUS area. This presents historical PPM from 2005/06 up to the latest PPM available in 2009/10.

3.15.3

Both operators have experienced a similar trajectory over the last four years, with seasonality evident in the trend for the autumn, although the impact of this is declining. The lowest point for PPM was in 2005/06 with FGW reaching 75.21 percent and CrossCountry at 73.58 percent. With improvement projects such as the Joint Performance Improvement Plans (JPIP) and timetable reviews, between Network Rail and the train operators, many disruptive issues have been targeted for mitigation and have managed to reduce their impact. For both operators, the last two years has seen dramatic improvements in performance levels across the vast majority of routes with FGW experiencing record punctuality levels in the last year. Current Moving Annual Average (MAA) for PPM is 92.09 percent for FGW and 90.60 percent for CrossCountry against targets of 91.37 percent and 89.81 percent respectively.

3.15.4

From the start of Control Period 4 (CP4), a Freight Performance Measure (FPM) has been introduced to freight services which is equivalent to the Public Performance Measure for passenger services and provides quantifiable performance data to be used to identify and recommend mitigations and improvements for the performance of freight services. The Office of Rail Regulation determination states that there must be a reduction in delays of 25 percent to freight services by 31 March 2014. Figures 3.36 to Figure 3.38 present the FPM for the main freight operators in the RUS area, DB Schenker and Freightliner (spilt between Freightliner Intermodal and Freight liner Heavy Haul) against the FPM target. This shows a performance improvement consistent with that of the passenger operators and reflective of general improvement in performance noted above. The improvement in FPM can also be attributed in part to the reduced impact of congestion on the network resulting from the operation of fewer trains as a result of the economic downturn.

3.15.5

Current initiatives to improve performance of freight include continued joint working between Network Rail and the freight operators to identify and mitigate delay at key nodes on the network, to facilitate more consistent operation of freight services and to minimise their impact on and from passenger services. A number of targeted infrastructure improvements are also under consideration to improve general freight performance. The FPM target for freight operators is 72.74 percent for DB Schenker who are currently achieving a higher level of performance with FPM at 76.29 percent. Freightliner FPM stands at 77.41 percent for the Intermodal traffic, and 70.72 percent for the Heavy Haul business.

Appendix B presents the PPM and FPM charts for the remaining TOCs and FOCs that operate over the Great Western RUS area.

Figure 3.34 – Public Performance Measure for all First Great Western services

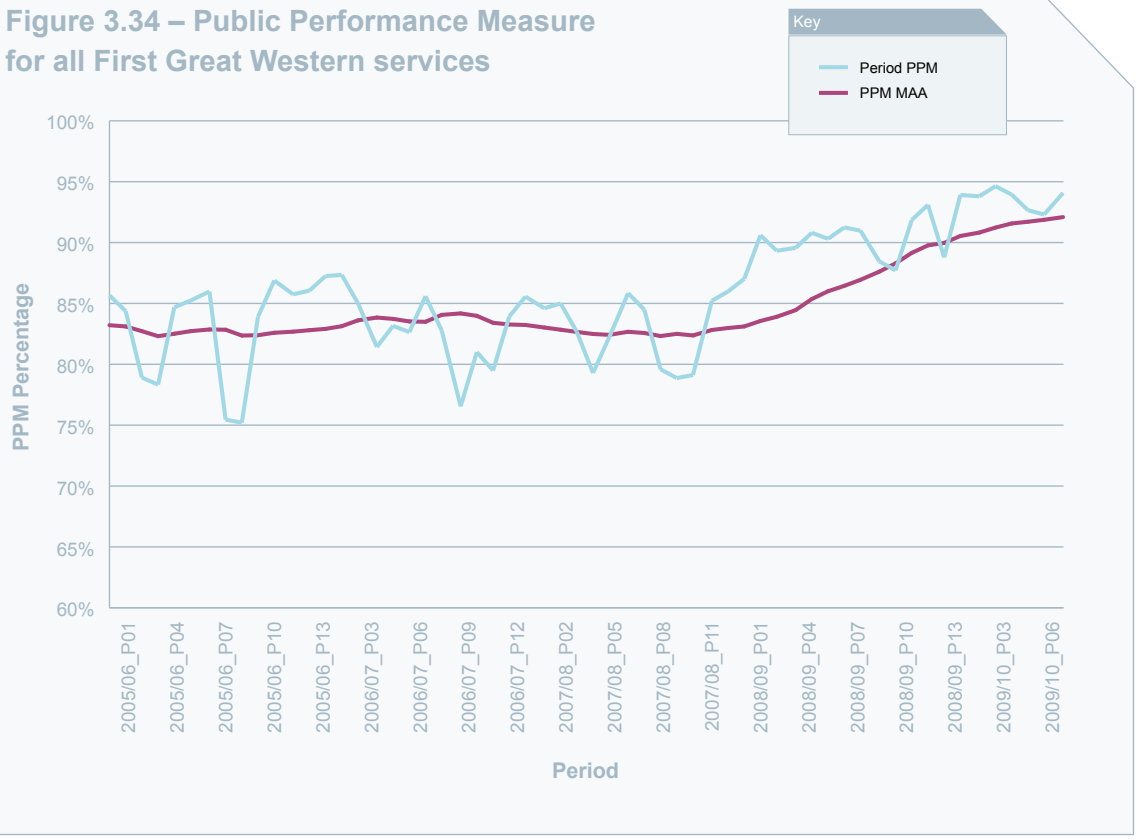


Figure 3.35 – Public Performance Measure for CrossCountry

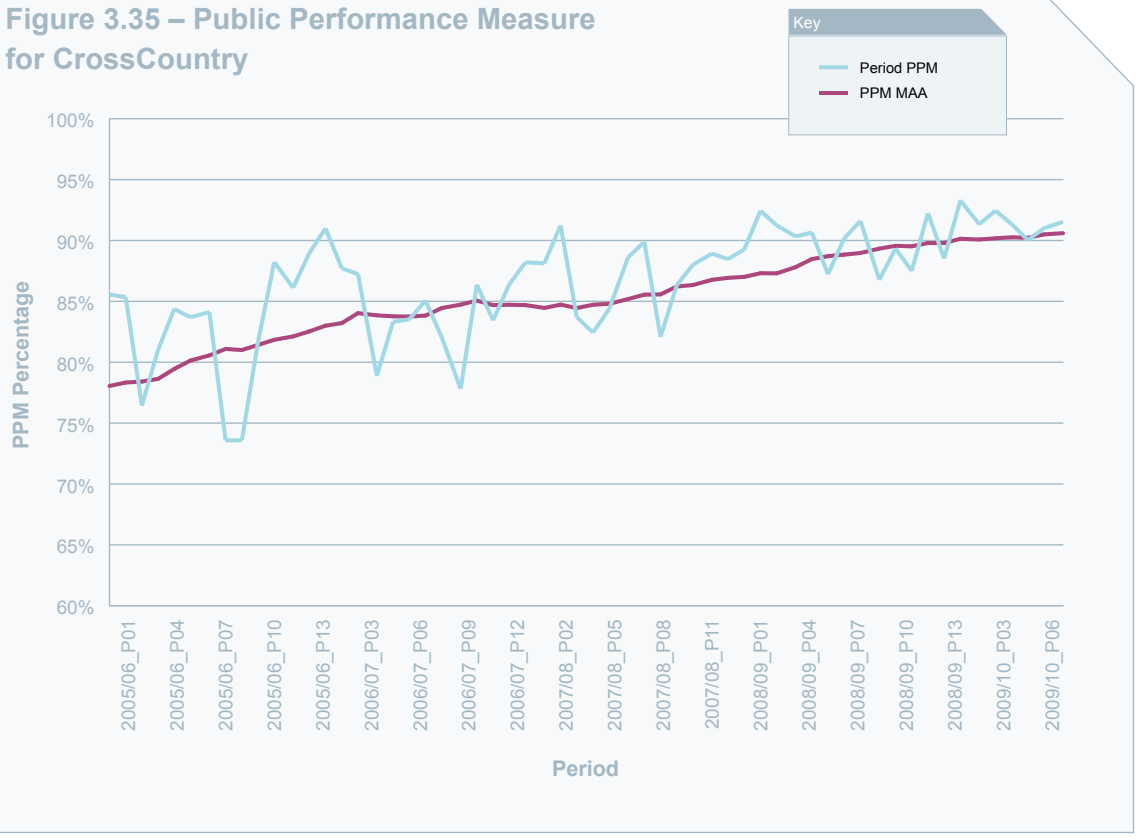


Figure 3.36 – Freight Performance Measure for DB Schenker

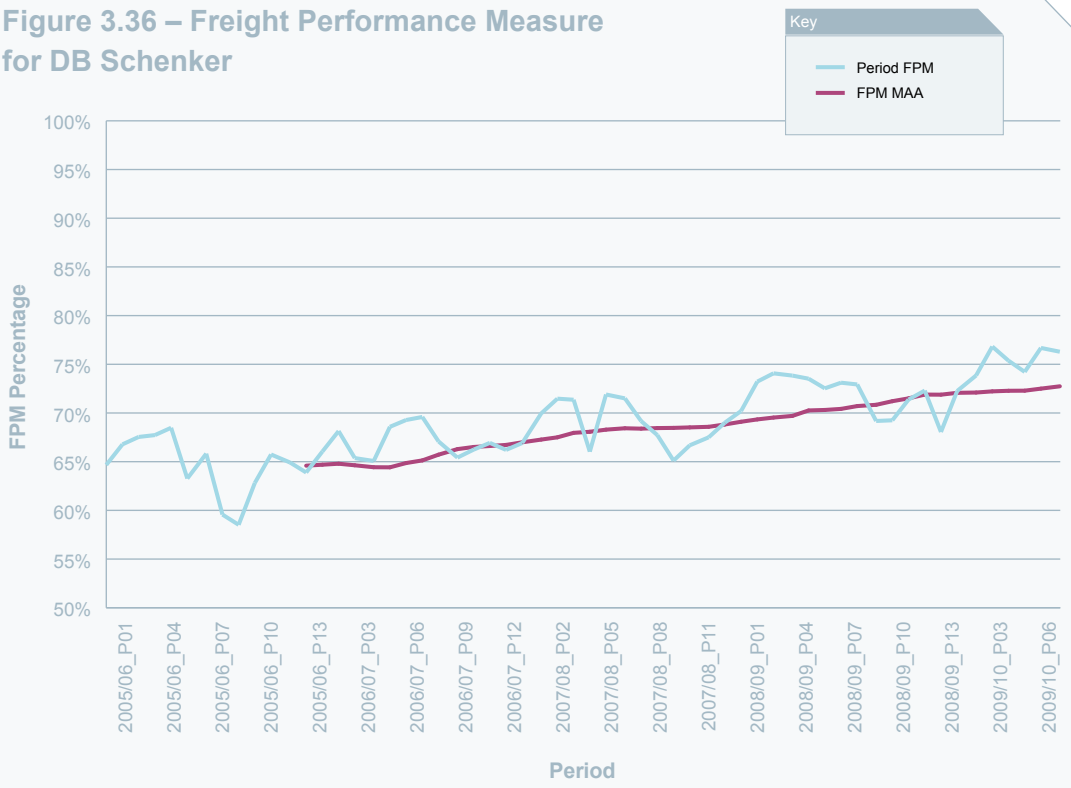


Figure 3.37 – Freight Performance Measure for Freightliner Intermodal

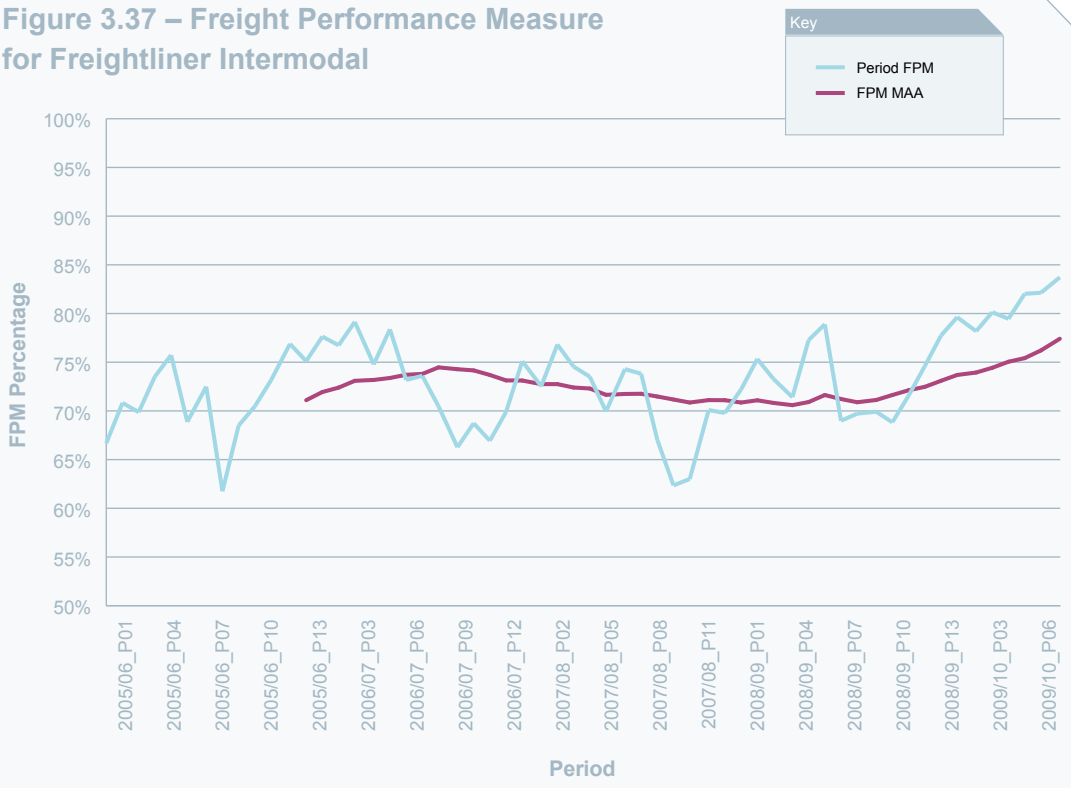
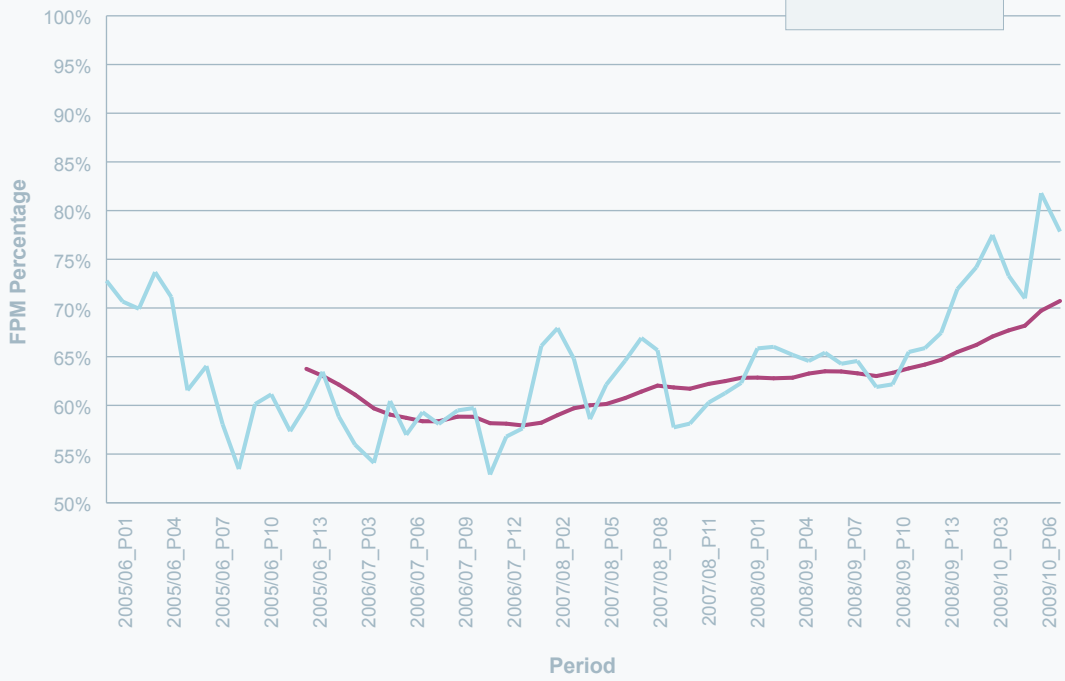


Figure 3.38 – Freight Performance Measure for Freightliner Heavy Haul



3.15.6
Delay is categorised into two types: primary and reactionary delay. Primary delay is delay caused directly to a train by an incident; reactionary delay is delay which is indirectly caused to other trains as a result of such an incident. The RUS does not consider primary delays (those that occur due to a problem with the infrastructure or the train itself e.g. points failure, vandalism or shortage of train crew) and focuses on reactionary delay. This is because primary delays are addressed through other industry processes, such as the Joint Performance Improvement Plans and the CP4 Performance Delivery Plan which focus on reducing these incidents at source.

3.15.7
In order to establish the performance baseline for the Great Western RUS area, the current level of performance and the historical trend for both PPM and delay minutes was assessed using data from 2006/07 and 2007/08 extracted from the data warehouse 'Performance Systems Strategy' (PSS). This has been revised to include data for 2008/09 and the most recent data available for 2009/10 (to September 2009).

3.15.8
Sub areas were defined through the geographic split of the RUS scope area into 10 summary areas, aligned with strategic route sections to aid analysis. A representation of overall performance and level of delay for the whole RUS area and per sub area was provided, this included both passenger and freight delay. The summary sections are presented in Figure 3.39.

Figure 3.39 – Geographical split of Great Western RUS area

Summary area reference	Summary area name	Strategic Route Sections
GW01	Paddington – Didcot	13.01, 13.02, 13.03
GW02	Didcot – Pilning (via Badminton)	13.04
GW03	Greater Bristol and Westbury	4.02, 4.04, 4.05, 4.06, 13.06, 13.12, 13.15, 13.22
GW04	Reading – Cogload Jn	12.01, 13.11
GW05	Bristol – Birmingham Line	13.08
GW06	Cogload Jn – Penzance	12.02, 12.03, 12.04
GW07	Oxfordshire and North Cotswolds	13.07, 13.13, 13.21, 16.05
GW08	Thames Valley branches	13.09, 13.10, 13.18, 13.19, 13.20
GW09	Devon and Cornwall branches	12.05, 12.06, 12.07, 12.08, 12.09, 12.10, 12.11, 12.12, 12.13
GW10	Wales	13.05, 13.14, 13.16, 13.24

Note: freight locations in sub-sections 4.06, 12.14, 13.23, 13.24 and 16.05 are aligned with their nearest geographic summary area

3.15.9
Reactionary delay minutes to passenger and freight operators by location were extracted with mean delay per train; the results of the top 15 locations of each were tabled and are presented in **Appendix C**.

3.15.10
Total delay was further categorised by JPIP category (these are broad categories of incident causation used in the Joint Performance Improvement Plans). Each JPIP category was assessed for the Great Western RUS area and by each summary area. The results of the Great Western RUS area are presented in Figure 3.40.

3.15.11
Analysis of the main delays showed the top three causes of total delay in the scope area to both passenger and freight services as being due to TOC Other (external causes, freight terminal/yard delays, low adhesion includes autumn impact and non-technical fleet delays), fleet issues and infrastructure faults.

3.15.12
Split by passenger and freight, Figure 3.41 presents the main delays for train operators in the RUS scope area. The top three causes of delay for passenger services are shown as fleet issues, non-track assets (points, train detection systems, signalling systems and power supply assets) and network management/other (delay categories to cover Network Rail operations delays, impact of possessions and train planning issues). For freight operators, the top three causes of delay are TOC Other, fleet issues and operations (which includes delays due to traincrew and other TOC operational issues) as presented in Figure 3.42.

Details of the delay per summary area are available on Network Rail's website under the baseline analysis.

Figure 3.40 – Total delay for the Great Western RUS area by JPIP category

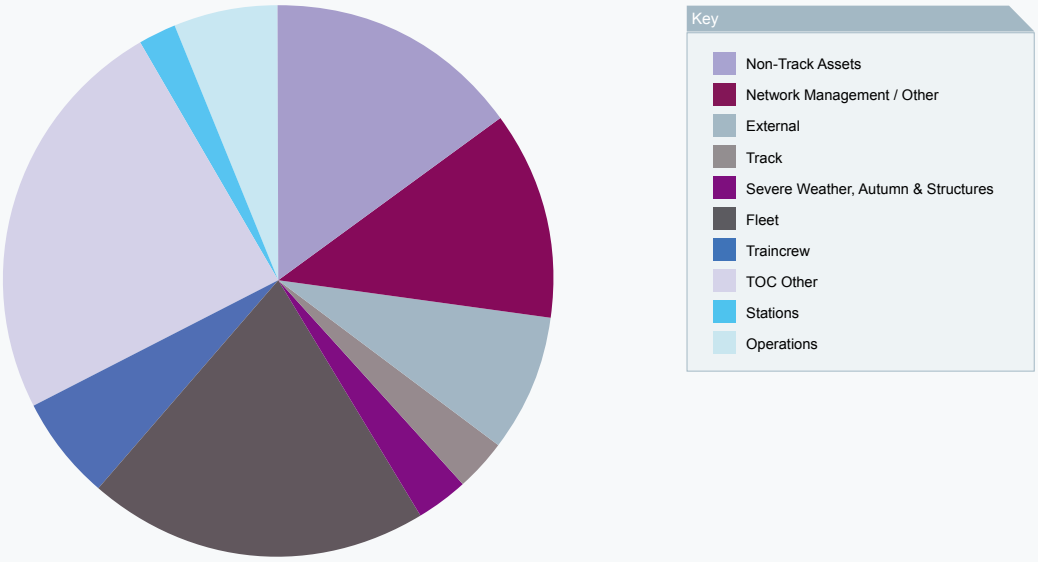


Figure 3.41 – Total delay in the Great Western RUS area for Train Operating Companies

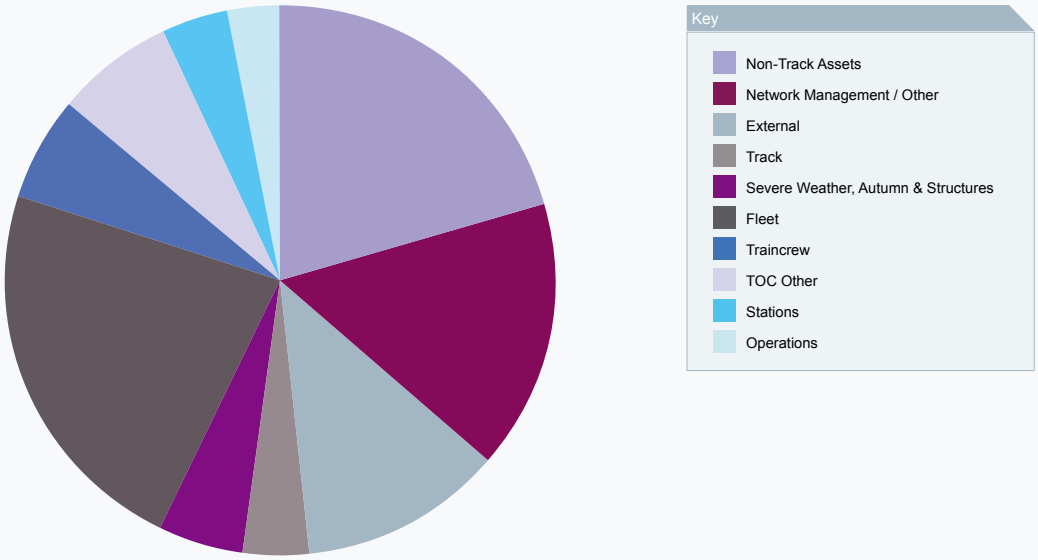
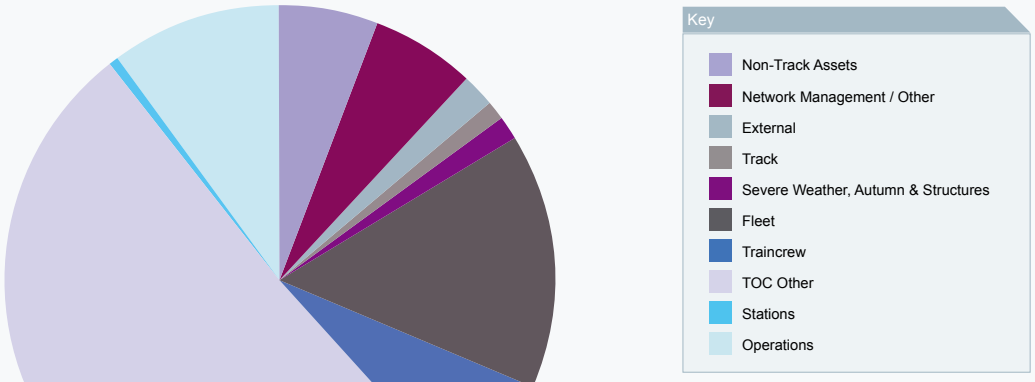


Figure 3.42 – Total delay in the Great Western RUS area for Freight Operating Companies



3.15.13
More detailed analysis on the main sources of delay per route section was undertaken. The total delay for 2006/07, 2007/08 and 2008/09 and the available data for 2009/10 was combined, split by primary and reactionary delay, and presented by line of route for the following key routes within the Great Western RUS area:

- Bristol Temple Meads to London (Figure 3.43)
- South Wales to London (Figure 3.44)
- Cotswolds to London (Figure 3.45)
- Penzance to London (via Berks and Hants) (Figure 3.46)
- Birmingham to Taunton (Figure 3.47)
- South Wales to South Coast. (Figure 3.48).

3.15.14
This analysis identified performance pinch-points at London Paddington, Reading, Didcot, Westbury and Bristol Temple Meads as evident in the following graphs.

3.15.15
The reasons for these performance pinch points are discussed further in **Chapter 6** 'Gaps and Options' where the gaps are quantified and the causes of the delays are investigated. Interventions are then proposed for development and appraisal to mitigate these delays.

Figure 3.43 – Bristol Temple Meads to London Paddington

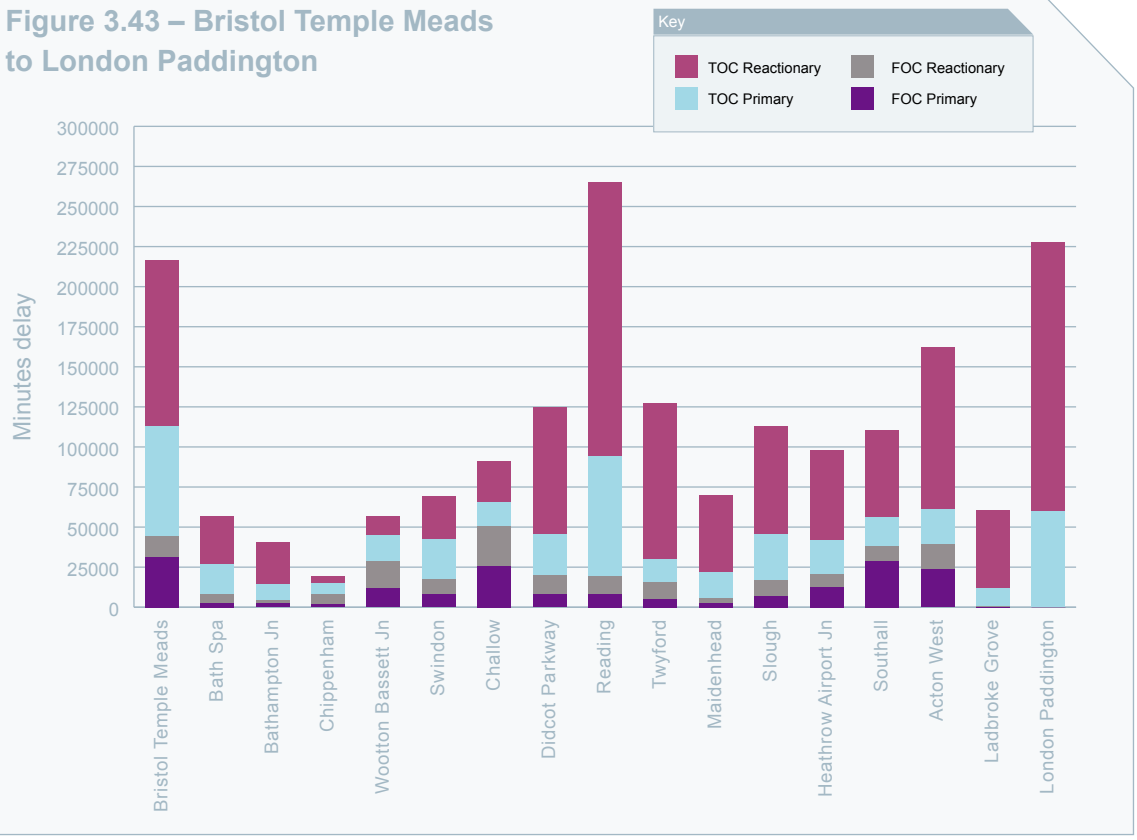


Figure 3.44 – South Wales to London Paddington

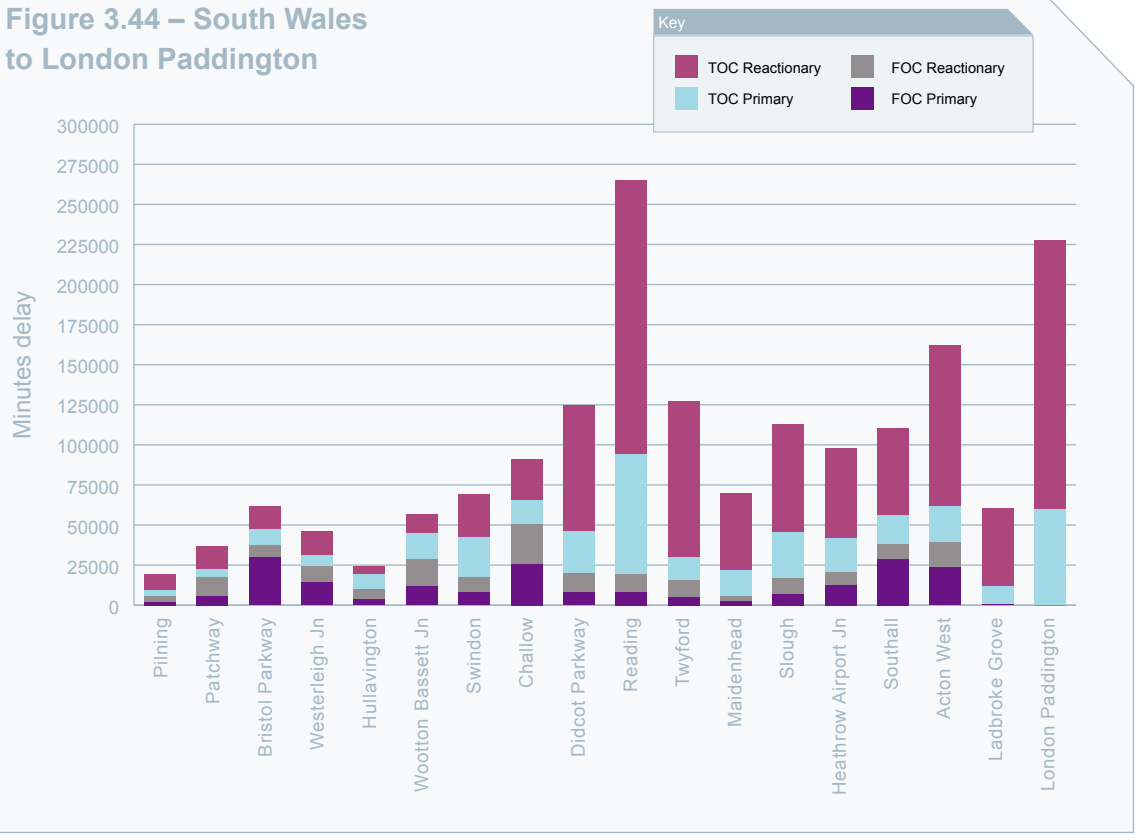


Figure 3.45 – Cotswolds to London Paddington

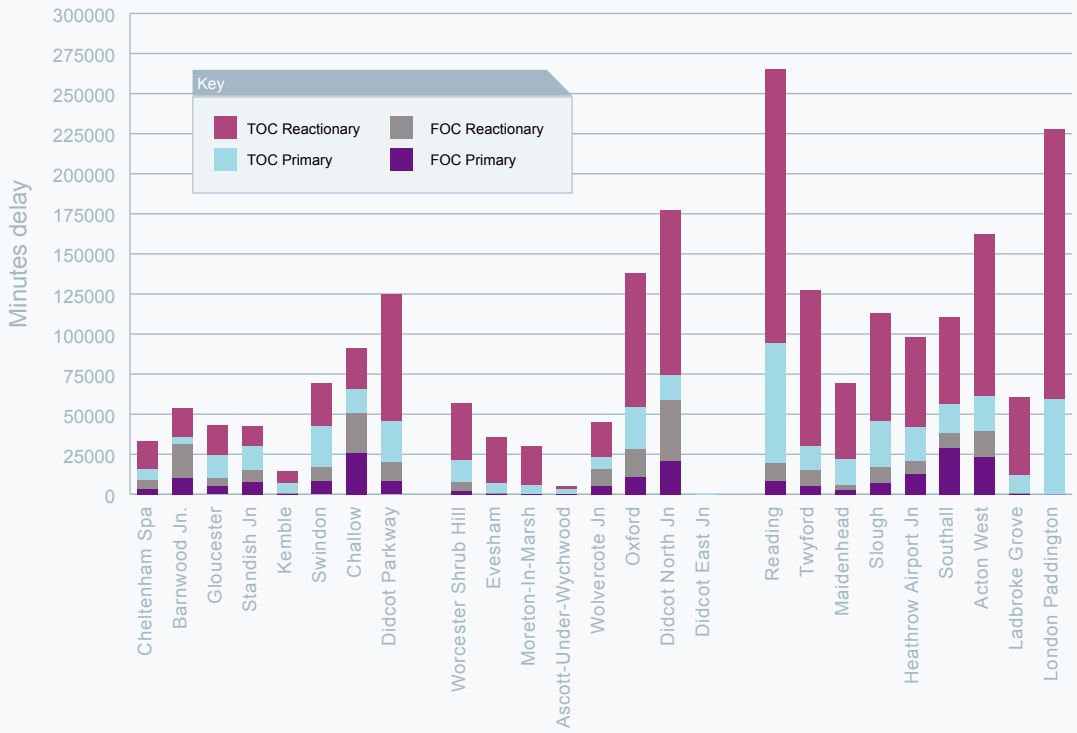


Figure 3.46 – Penzance to London Paddington (via Berks & Hants)

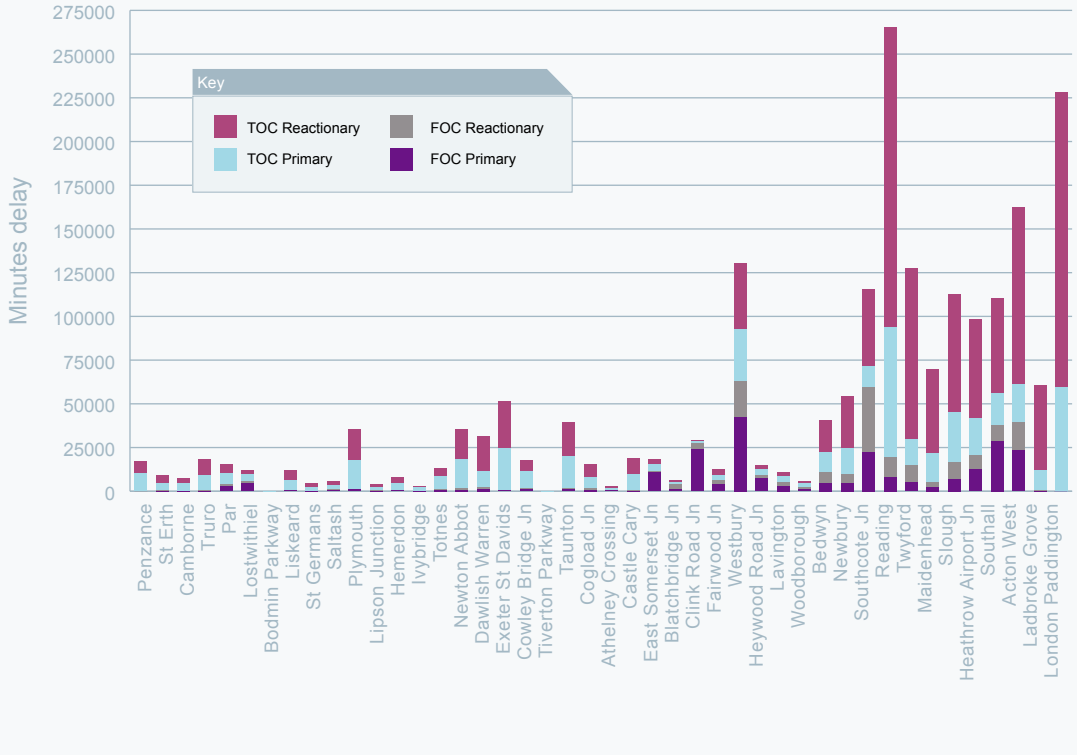


Figure 3.47 – Birmingham to Taunton

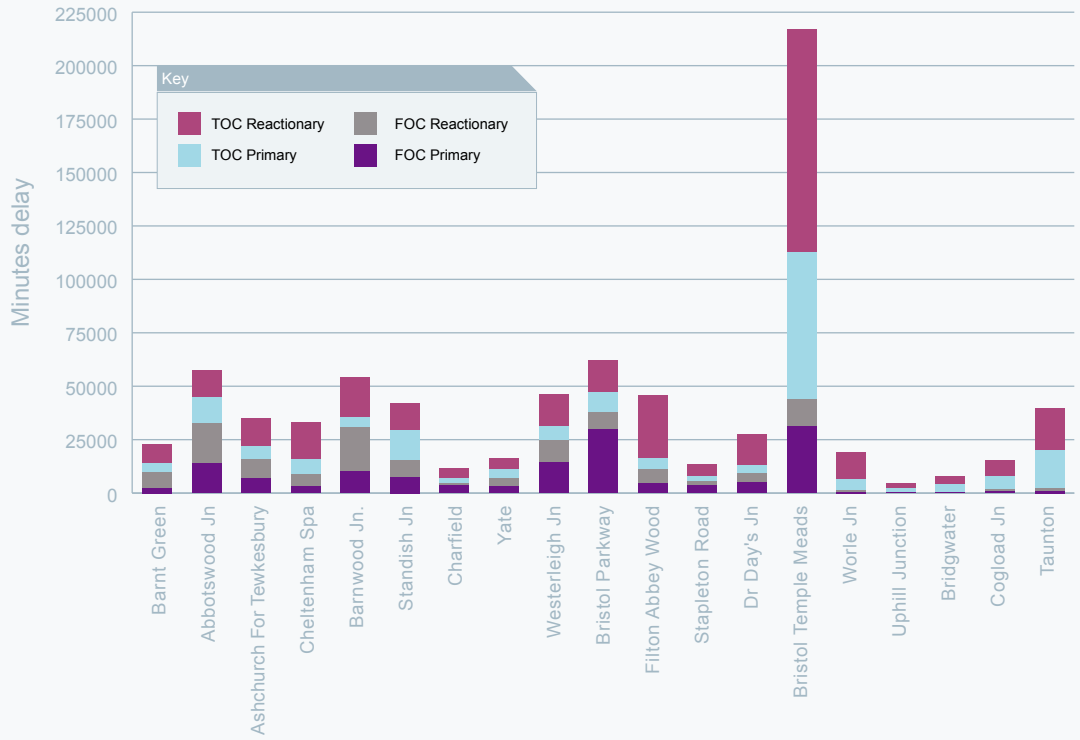
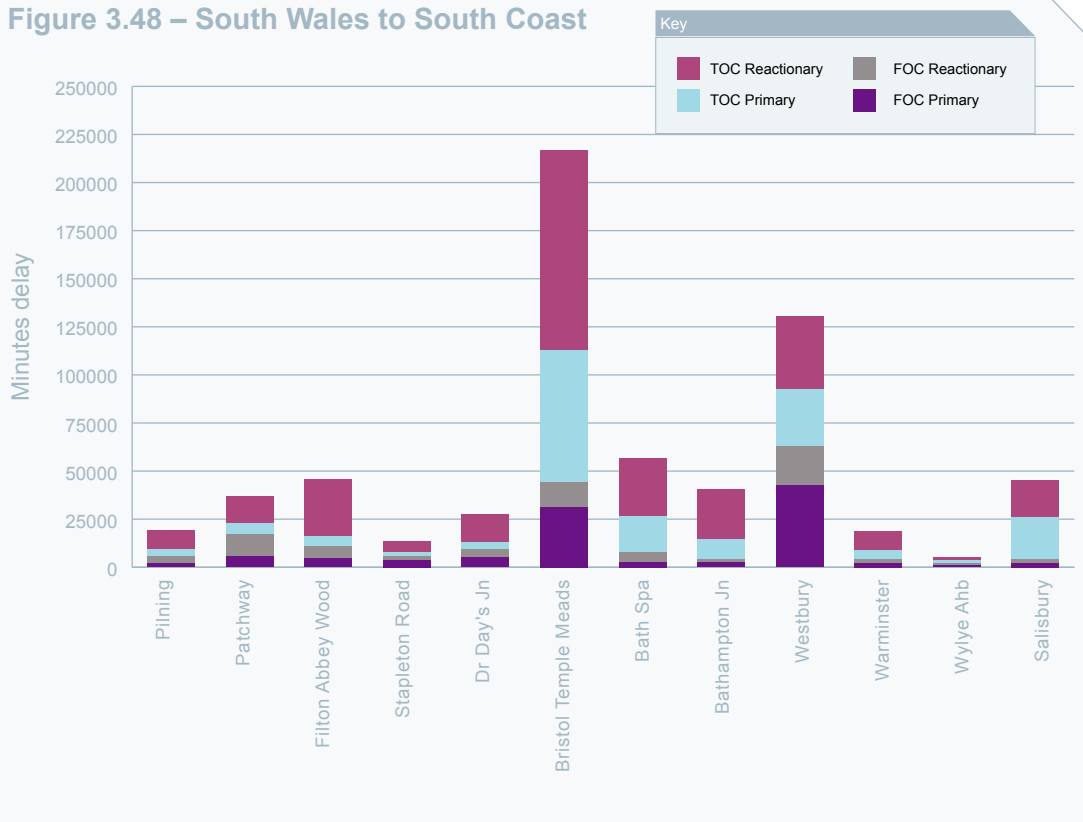


Figure 3.48 – South Wales to South Coast



3.15.16
Current causes for the cancellation of services have also been reviewed and identifies that for TOCs, the top three causes are network management, fleet and non-track assets. For freight, the main causes are network management, operations and TOC other. These are presented in Figures 3.49 and 3.50. The causes of cancellation are broadly consistent with the causes of delay. Cancellations, however, are more generally caused by primary incidents or by amendments to the train service following a primary incident than the performance pinch-points noted above.

3.16 Future performance targets to 2014

3.16.1
The Office of Rail Regulation Periodic Review determination stated that Crossrail should be deemed as performance neutral with the effects of the Reading Station Area Redevelopment included in the forward projections of performance to 2014. The RUS has included these assumptions within the baseline.

3.16.2
The HLOS performance metrics to be achieved by the end of CP4 are presented in **Chapter 8**, along with the initiatives that will help these targets be achieved.

3.17 Performance and timetables

3.17.1
The December 2008 timetable was confirmed by the Stakeholder Management Group (SMG) as the base timetable for RUS analysis. A joint working group between Network Rail and First Great Western was established to focus on the timetable developments for the Western route, reviewing problem areas and developing recommendations for timetable and performance improvements that can be undertaken up to 2014. The timetable working group and SMG agreed, that timetable changes would be managed through the Network Rail team and added to the RUS baseline with any further future timetable initiatives from 2014 onwards managed through the Great Western RUS process. Further details of the purpose, results and proposals for future timetable developments are provided in **Chapter 4** “Planned service changes”.

3.18 Summary

3.18.1
The assessment of the current baseline has illustrated a number of gaps. These are developed further in **Chapter 6** whereby the process of gap identification, quantification and option appraisal are presented.

Figure 3.49 – Main causes of cancellations for Train Operating Companies

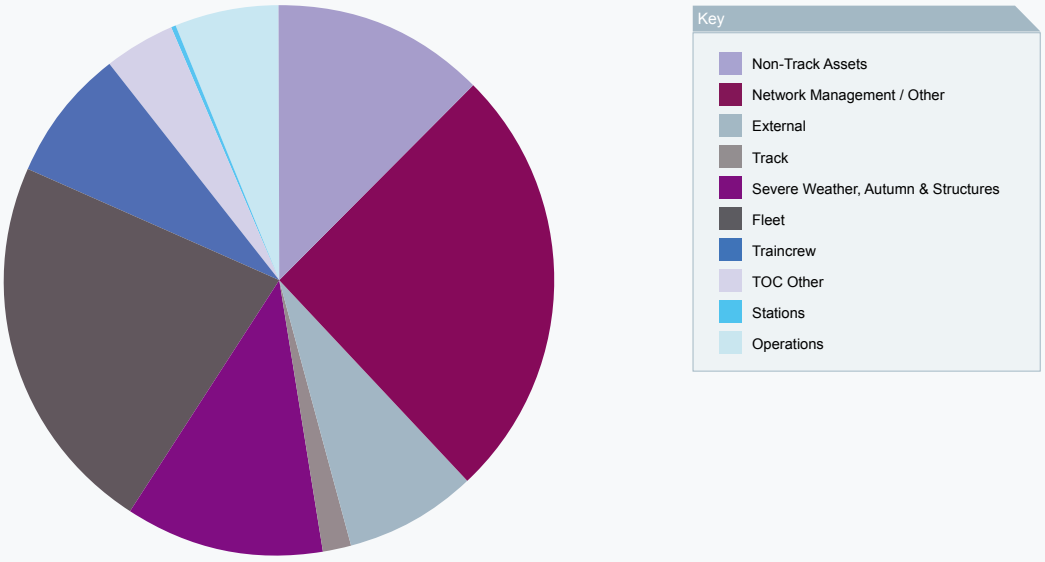
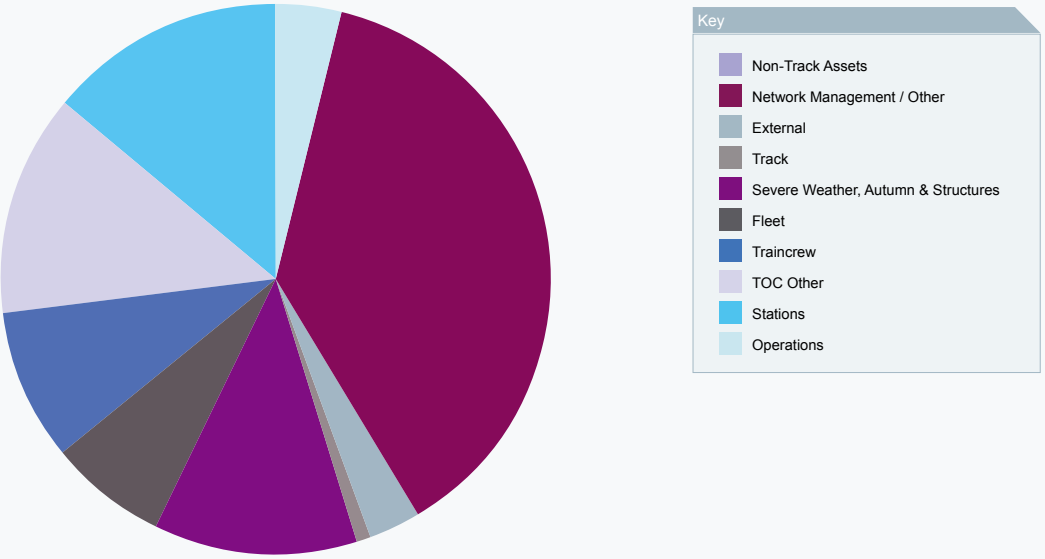


Figure 3.50 – Main causes of cancellations for Freight Operating Companies




Bristol Temple Meads

4. Planned changes to services and infrastructure

4.1 Introduction

4.1.1

This chapter outlines the major railway enhancement and renewal schemes which are either planned (committed schemes) or proposed (uncommitted schemes) within the forecasting horizon of the Great Western Route Utilisation Strategy (RUS) specifically over the next five to 10 years. It also reviews current and proposed changes to service provision.

4.1.2

Where schemes are committed, these are included within the RUS baseline. The baseline therefore equates to today's railway (as described in **Chapter 3**) plus committed schemes to 2014 and 2019; this is defined as the "do minimum". In this context, a committed scheme is that which is either included in the High Level Output Specification (HLOS), has confirmed funding or is at GRIP stage 3 (Option Selection) or above (GRIP being Network Rail's "Guide to Railway Investment Projects" and the process by which investment schemes are managed). Any interventions proposed by the RUS are assessed against this "do-minimum" scenario rather than the present situation.

4.1.3

If schemes are currently uncommitted, the RUS can not assume they will go ahead so will only consider the effect implementation of such projects may have on the strategic recommendations the RUS makes. However, once the RUS is established, it remains a live document and will be reviewed and if necessary updated whenever significant change in policy or circumstances arise.

4.2 Planned changes to infrastructure

4.2.1

This section presents committed enhancement schemes firstly by those specified in the HLOS, then by other committed schemes followed by uncommitted schemes that have also been taken into consideration.

4.2.2 Committed enhancement schemes – High Level Output Specification

The 2008 Periodic Review set Network Rail's outputs, revenue requirement and access charges for the period 1 April 2009 to 31 March 2014 (this is referred to as Control Period 4 (CP4)). This is the first review since the passing of the Railways Act 2005 and introduces the new process whereby the Secretary of State issues a High Level Output Specification (HLOS) and a Statement of Funds Available (SoFA).

4.2.2.1

The HLOS states what the Government wants to buy from the rail industry in terms of reliability, capacity and safety and the projects it will fund over the five years of the control period, the key elements of which are presented here before being discussed in more detail:

- Reliability and punctuality (performance improvement)
- Capacity (by strategic route)
- Safety
- Intercity Express Programme (IEP)
- European Rail Traffic Management System (ERTMS)
- Maidenhead and Twyford platform extensions (relief lines)
- Reading station area redevelopment

- Cotswold Line redoubling
- Westerleigh Jn to Barnt Green linespeed improvements
- National Stations Improvement Programme (NSIP)
- Network Rail Discretionary Fund (NRDF)
- Strategic Freight Network (SFN)
- Network availability - Seven Day Railway
- Rolling stock.

The HLOS specifies national targets for Reliability, Capacity and Safety to be achieved by the end of CP4:

Reliability

- 92 – 93 percent Public Performance Measure (PPM) for services split into the sectors of Long distance; London and South East and Regional
- a 25 percent reduction on services arriving at their final destination 30 minutes or more late, or cancelled; with
- £160 million allocated for a performance improvement fund to ensure the industry performance meets the PPM and cancellation and significant lateness outputs.

Capacity

- an increase of 22.5 percent capacity to relieve overcrowding
- a target in additional passenger kilometres to be accommodated on each of the strategic routes
- major stations and other urban areas have target numbers of arriving passengers to be accommodated. Figure 4.1 indicates the volume for the areas within the Great Western RUS
- the peak three hours are between 07:00–09:59 and 16:00–18:59 with the high-peak hours being 08:00–08:59 and 17:00–17:59
- load factors are defined as the ratio of passengers actually carried on a train compared to the design capacity of the train (including seats and standing allowances).

Figure 4.1 – High Level Output Specification total demand to be accommodated

	Peak three hours			High-peak hours		
	Forecast demand in 2008/09	Extra demand to be met by 2013/14	Maximum average load factor by 2014	Forecast demand in 2008/09	Extra demand to be met by 2013/14	Maximum average load factor by 2014
Paddington	24100	2900	67%	11500	1400	76%
Other urban areas	27700	3600	41%	12300	2000	46%

Safety

- a three percent reduction in the risk of death or injury from accidents on the railway for passengers and rail workers
- the network passenger safety index reduced to 0.240. (A forecast measure of the risk of fatalities and weighted injuries normalised per billion passenger kilometres).

4.2.2.2

The committed enhancement schemes to deliver these CP4 HLOS targets are further described below:

4.2.2.3 Intercity Express Programme (IEP)

The Intercity Express Programme (IEP) provides a new generation of trains catering for longer distance travel and services on interurban and outer suburban routes, replacing the existing High Speed Trains. The introduction of the modern designed units on an increased service level will provide a significant increase in capacity which will make a major contribution towards meeting the increasing demand for rail travel over the next 30 years.

The Great Western IEP fleet is expected to be delivered from 2016 onwards and comprises electric trains up to 260 metres in length and a significant number of bi-mode trains with five-, six- and eight-car formations proposed; capable of being self-powered through the generator car as well as being able to take advantage of overhead electrification. All trains will operate as electric trains where overhead line electrification is provided; they will then continue to operate in diesel mode on the non-electrified parts of the network, continuing to provide through connectivity between electrified and non-electrified routes by the bi-mode facility. The enhanced capabilities and qualities of the new rolling stock will therefore benefit passengers across the whole route through improved end-to-end journey times and service environment.

Although the procurement of these new trains is committed, development work is underway on the proposed timetable and calling patterns for these new services. The train type (electric or bi-mode) and configuration depend on the service. A draft service specification was devised as part of the IEP tender documentation to manufacturers and this has been used for the purpose of RUS analysis as a guide to the expected provision of services. The trains will be allocated to the Long Distance High Speed services from London Paddington to South Wales, Bristol and through to Penzance (with services mainly calling at Exeter, Paignton and Plymouth) and the Thames Valley outer suburban services to Oxford and Newbury as illustrated in Figure 4.2.

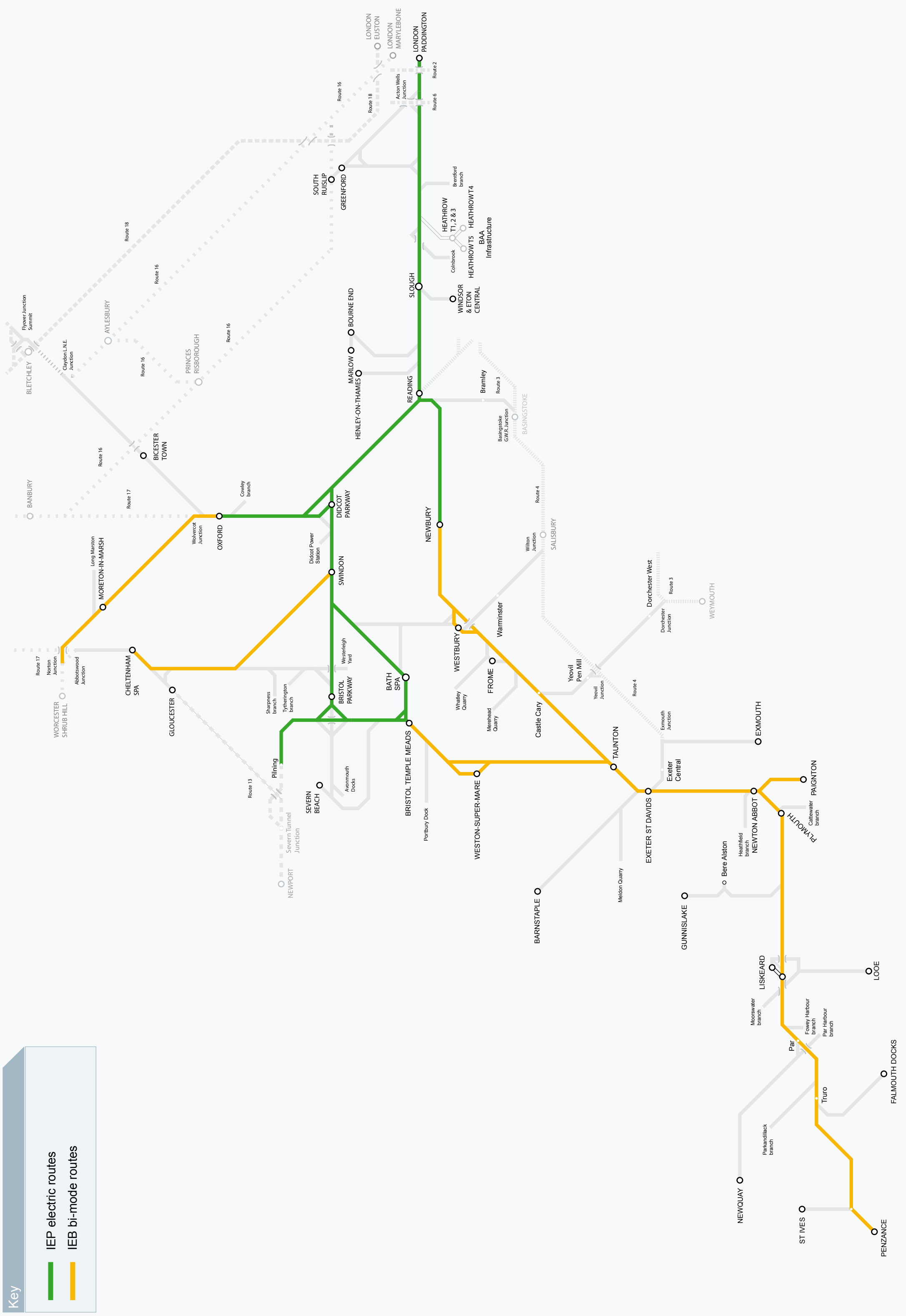
Following the commitment in July 2009 to electrify the Great Western Main Line (GWML), IEP fleet deployment will maximise the opportunities this presents. An outline of the current service specification (August 2009) is presented in 4.3.3 Future service provision.

4.2.2.4 European Rail Traffic Management System (ERTMS)

European Rail Traffic Management System (ERTMS) is a cab-based signalling and train control system which combines the European Train Control System (ETCS) and Global System for Mobile communications – Railways (GSM-R). ERTMS enables the signalling control centres to transmit movement authorities via the GSM-R directly to the train.

The on-board computer knows the braking characteristics of the individual train and is able to calculate and enforce the maximum safe speed at any time preventing the train from exceeding its movement authority. All required information, such as speed, and situation on a forthcoming section of track is communicated directly and continuously to the train driver via a monitor mounted in the driver's cab. With the data being computed on-board, the system can calculate different braking profiles for different train types. This enables movement authorities to be provided and the distance between trains to be reduced thus enabling a more efficient movement of trains on the network. Through this, improvements in network capacity can be achieved by the ability to path an increased number of services as ERTMS, in effect, reduces signalling headways.

Figure 4.2 – Initial IEP deployment



The introduction of radio-based cab signalling will be a key enabler in the development of the future railway. It will underpin enhancements to railway operations and support capacity improvements beginning in Control Period 5 (CP5) and Control Period 6 (CP6). ERTMS will be applied to all major resignalling schemes from approximately 2014 onwards with the Great Western Main Line expected in 2016.

4.2.2.5 Maidenhead and Twyford platform extensions

The enhancement of the Up and Down relief line platforms at Maidenhead and Twyford to cater for longer suburban trains in advance of Crossrail will contribute to the delivery of increased capacity into London Paddington to achieve the HLOS capacity metric and support the operational plans. The scheme will only be implemented should the HLOS vehicle programme fail to deliver the specified metric[1]. However, the current Crossrail proposal includes the redevelopment of Maidenhead station.

4.2.2.6 Reading station area redevelopment

The redevelopment of Reading station is a major scheme to relieve the bottleneck currently experienced on the GWML from the West to London and North to South. The programme of works delivers a major capacity, capability and performance enhancement of the station area and its approaches. Based around a core of new platforms; north entrance, transfer bridge and track work within the main station area, the scheme involves a major capacity enhancement through grade separation at Reading West Jn and reinstatement of the east end diveunder. A new train maintenance depot will be constructed to the west of the station replacing the existing depot, which will be demolished to accommodate the new track layout. Preliminary works commenced during 2009 with full implementation currently programmed for 2016.

4.2.2.7 Cotswold Line redoubling

The scheme redoubles around 20 miles of single track on the Cotswolds Line from west of Evesham through to Moreton-in-Marsh and from Ascott-under-Wychwood to Charlbury, with significant signalling modifications, three new station platforms and associated facilities. The current single line sections significantly constrain route performance and capacity and prevent the introduction of a regular, operationally robust hourly clock-face service. It also makes it difficult for the timetable to recover from operational problems elsewhere on the network, especially in the London area and this regularly leads to further late running. The scheme will enable the introduction of an hourly service increasing capacity whilst delivering improved performance on the route for the existing service pattern. The scheme further allows through running for freight and diversionary operations. Implementation is planned for 2011.

4.2.2.8 Westerleigh Jn to Barnt Green linespeed improvements

The scheme to raise the linespeeds up to 100mph, and where feasible to 110mph, will deliver a significant reduction in journey times along the Bristol to Birmingham and South Wales to Birmingham corridors which merge north of Gloucester, with associated benefits to the wider cross boundary services. This enhancement will also deliver significant performance improvements as well as providing an increase in both passenger and freight capacity. Implementation is currently programmed for 2013.

4.2.2.9 National Stations Improvement Programme (NSIP)

£150 million will be spent nationally on a National Stations Improvement Programme (NSIP) to develop an informed programme for the enhancement and improvement of

1 Should the HLOS capacity metric for London be met by the rolling stock plan, this project would not be required for HLOS purposes

stations during CP4. The primary driver for this is the improvement of the service environment including passenger facilities, security and overall visual quality. The current NSIP tranche 1 stations in the Great Western RUS scope area are presented in Figure 4.3, with a brief description of the scope, current status and estimated completion date, however these are subject to change:

Figure 4.3 – Tranche 1 National Stations Improvement Programme		
Newbury	access improvement works to the station entrance; enhancement works to footbridge; new fences and new totems creating additional drop-off car parking. Additional passenger seating.	2010
Didcot Parkway	upgrade of ticket hall; new waiting accommodation on platforms; additional cycle storage provision and possible increase in retail availability. Works include bus information points and interchange facilities	2010
Swindon	waiting accommodation on platforms, cycle storage and forecourt works	2010
Chippenham	waiting accommodation, cycle storage, canopies	2010
Exeter St Davids	waiting accommodation on platforms, cycle storage, forecourt works which includes new bus shelters and ticket hall upgrades	2010
Penzance	new toilets, seating, ticket area upgrades, waiting rooms	2010
Ealing Broadway	additional seats, CCTV and cycle storage	2010
Southall	additional seats, CCTV and cycle storage	2010
Hayes and Harlington	relocate ticket office and provide new drop-off point	2010
Langley	additional seats, CCTV and cycle storage	2010
Cheltenham Spa	forecourt and access works; customer signage, customer seating and cycle storage	2011
Slough	enhance ticket hall, new seating and customer waiting accommodation, toilets, customer information signage, fencing, cycle storage and redefined north side road access.	2011

Stations currently identified for Tranche 2 (from 2012 onwards) are Gloucester, Exeter Central, Newton Abbot and Plymouth with the decision made on their inclusion and scope expected in 2011. It is anticipated that in the longer-term the Crossrail project will deliver more extensive enhancements at Ealing Broadway (new ticket hall, concourse and platform access), Southall (new ticket hall and platform access), Hayes and Harlington (new station building and platform access) and Slough (new station building and platform access).

Figure 4.4 – Proposed Tranche 2 National Stations Improvement Programme		
Gloucester	forecourt works; customer signage, customer seating, cycle storage	2012
Truro	waiting accommodation on platforms, cycle storage, forecourt works, ticket hall upgrades and car park works	2012
Newton Abbot	new waiting accommodation, customer information signage and refurbishment of toilets	2012
Exeter Central	waiting accommodation with integrated helpdesk, fire alarm integration, DDA windows and customer information signage	2013
Plymouth	refurbish ticket hall, waiting room and toilets	2013

4.2.2.10 Network Rail Discretionary Fund (NRDF)

The Network Rail Discretionary Fund (NRDF) is a mechanism for funding minor schemes (nominally under £5 million) which are either linked to renewals or are stand alone schemes which have a positive whole-industry business case. A stand alone scheme is an enhancement undertaken as a separate scheme independent of any planned renewal works whilst an enhancement undertaken with a renewal is an enhancement implemented as part of a planned renewal. This specific funding stream reflects the importance to enhance the capacity and capability of the rail network where this will deliver value for money, and meet identified requirements.

Schemes that have been funded by the NRDF and completed to date include the Paddington to Reading relief line linespeed improvements, the Taunton relief line linespeed improvements, the enhancement to Airport Jn, the additional third platform at Bristol Parkway and the conversion to passenger use of the Up and Down goods loops at Oxford. Network Rail also part funded the Falmouth branch line upgrade discussed in paragraph 4.2.3.9. Schemes currently underway with committed funding from the NRDF include the south facing bay platform at Oxford station and the Bath Spa capacity upgrade which increases capacity through the station area reducing platform reoccupation times.

4.2.2.11 The Strategic Freight Network (SFN)

£200 million has been allocated nationally for the development of the Strategic Freight Network (SFN) during CP4. The SFN seeks to create a network of core and diversionary routes on the heaviest used lines, to complement and be integrated with, the existing rail network with capability of gauge and train length available. It will provide an enhanced core trunk network, capable of accommodating more and longer freight trains, with a selective ability to handle wagons with higher axle loads and greater loading gauge to allow for expected growth in traffic. An optimised pattern of freight trunk routeing will minimise conflicts between freight and passenger traffic, benefiting both forms of traffic.

For the Great Western RUS area the diversionary route between Southampton and Basingstoke via Laverstock and Andover has been identified and approved as a committed scheme to enable W12 gauge. It will be the first step in a strategy to provide both additional capacity and diversionary capability on the route from Southampton to the West Midlands and West Coast Main Line. The gauge enhancement to the main line route forms the initial Transport Innovation Fund (TIF) enhancement scheme (see 4.2.3.5 for further details). Train lengthening opportunities are also being assessed under the SFN, with the Southampton to West Midlands route a candidate scheme currently being progressed to GRIP stage 2 (Pre-feasibility), permitting growth without increasing capacity utilisation. However, in order to facilitate this infrastructure changes may be necessary.

The Channel Tunnel route to the south of London has funding of £10 million allocated for its delivery. There are two potential components of this; the first is an enhancement of the route between Tonbridge and the West London Line via Redhill to allow Class 92 locomotives to operate. The second is to look at creating a south of London orbital route between Tonbridge and Reading via Redhill and Guildford and is currently uncommitted.

Also included in the SFN is a specific fund for infill gauge schemes to progress towards the SFN vision of extensive W12 gauge clearance and funding provision of £5 million for studies to develop identified schemes for delivery in CP5 – these are currently being defined and agreed with stakeholders.

The SFN initiatives and schemes for the Great Western RUS area are further discussed in **Chapter 6**.

4.2.2.12 Network availability: Seven Day Railway

The Office of Rail Regulation (ORR) allocated £160 million nationally to assist in the development of the Seven Day Railway initiative. The Seven Day Railway programme of change will increase current levels of network availability by keeping passengers on trains rather than rail replacement buses during engineering works.

The Department for Transport's (DfT) White Paper "Delivering a Sustainable Railway" (2007) also emphasised the benefits of linking the development of the Strategic Freight Network to the development of a Seven Day Railway with an optimised and co-ordinated pattern of possessions/blockades with definitive diversionary routes for freight services. The intention is that this would maximise the network availability for freight.

The overall vision for the Seven Day Railway initiative on the Great Western is to build a railway that reduces disruption to passenger and freight customers that better meets their needs, whilst delivering efficient and effective maintenance, renewals and enhancements.

Within the Great Western RUS area, the routes identified for the Seven Day Railway are:

- London Paddington to Swansea
- London Paddington to Bristol
- London Paddington to Exeter
- Reading to Plymouth
- Reading to Birmingham
- Bristol to Birmingham
- Oxford to Worcester

The funding for the Seven Day Railway initiative will be spent on both infrastructure enhancements to facilitate the increase in rail operations such as crossovers and bi-directional signalling, plant and equipment to facilitate working under the new access patterns and protection systems for staff as well as changing Network Rail's work methods. A back to basics review of both the train timetable and maintenance methods and requirements will lead to further improvements initially proposed within Wales.

It is recognised that there is merit in moving towards a regime whereby fundamentally the same timetable operates on a daily basis, alongside cyclical maintenance, renewal and enhancement requirements. This will entail a need to provide more flexible operational layouts at the time engineering work is carried out, together with changes in working arrangements and greater efficiency. The latter are likely to include the introduction of quicker and simpler procedures for taking and giving up track occupancy, coupled with changed ways of working to allow greater adjacent line open or single line working train operations.

The introduction of new technology to Network Rail is currently undergoing scheme development and will enable smarter, and quicker, working practices. For example, the frequency and length of track access requirements to perform On-Track Machine treatment of switches and crossings can be reduced through the introduction of new technology using Curve Assisted Laser, Data Recording Processor and planning for the wide scale deployment of the Multi Purpose Stoneblower.

A proportion of the Seven Day Railway initiatives such as the provision of weekend services, delivery of weeknight renewals (using High Output Track Renewal techniques) through single line working and a diversionary route strategy are being reviewed by the Western route. During CP4, the key aim is to allow an increased proportion of the working timetable to operate throughout the week and weekends. This will involve a greater level of renewal and maintenance efficiency coupled with the introduction of targeted infrastructure enhancements.

Focus for the Great Western RUS area has been on key route sections where a number of initiatives have been used or are in development:

- Bristol–Birmingham: changes to the infrastructure to allow for more widespread and efficient use of single line working in association with the high output track renewals work planned on this route and ongoing weeknight maintenance needs are being considered with the benefit of the extra access on Sundays evaluated against the disruption proposed to weeknight services
- Didcot–Swindon–Bristol: improvement in the utilisation of the current bi-directional signalling capability to reduce the number of disruptive midweek and weekend possessions including the provision of additional signalling equipment in the Bath area linked to the Bath Spa capacity upgrade scheme
- Didcot–Oxford: a live trial to implement new methods of accessing the infrastructure for maintenance activity through the use of track occupancy permits (TOP) resulting in less weekend disruption to passenger services
- Further consideration of Exeter–Plymouth to understand engineering access and train service needs on this two track route section.

Further schemes are actively being considered where they mitigate disruption during major projects or where a cost effective enhancement is possible to an existing project, these relate to a number of HLOS, SFN and RUS schemes. Examples include:

- the consideration of minor temporary and permanent changes to stations in the Thames Valley area to assist passenger flows during the construction phase of the Reading and Crossrail projects
- linked to the HLOS capacity scheme to redouble part of the Cotswolds line between Oxford and Worcester an assessment of what additional features can be provided to reduce the disruption impact of future renewals and maintenance
- an evaluation of a W10 gauge cleared route around Reading to enable a diversionary route between Reading and Leamington Spa during the Reading station area redevelopment works. This is combined with the SFN diversionary scheme
- incremental signalling enhancement to the Swindon to Kemble redoubling scheme to provide capacity improvements during normal and diversionary working between Swindon and Gloucester.

The Seven Day Railway vision has been enhanced through the recent commitment and joint working of Network Rail, the Association of Train Operating Companies (ATOC) and Passenger Focus as new proposals and technology is introduced to minimise passenger disruption with the pledge to reduce ‘bustitution’. This has been further developed with the recent introduction of Route Categorisation. Route Categorisation identifies the top 29 routes nationally, which carry 60 percent of all weekend passengers – these have been classified as Category A routes. The principles for these category A routes are that passengers will not be transferred onto buses (unless they are travelling to a station which is not listed on each route as a primary intermediate station) and diversions away from a trains normal routeing, will not increase journey time by more than 30 percent. For the Great Western RUS area, a number of routes have been identified as Category A. These are presented in Figure 4.5, along with the primary intermediate station for each route.

Figure 4.5 – Route categorisation and primary intermediate station

Route	Primary intermediate station
London to Heathrow Airport	
London Paddington to Cardiff Central via Bristol Parkway	Reading, Swindon, Bristol Parkway and Newport
Swindon to Bristol Temple Meads via Bath Spa	Bath Spa
Bristol Parkway to Bristol Temple Meads	
Birmingham to Plymouth	Bristol Temple Meads
Birmingham to Southampton	Coventry, Oxford, Reading and Basingstoke

The principle for freight is that Network Rail when blocking a route will, unless there is no practical alternative, maintain the ability to deliver key freight traffic flows by means of a preferred or 'fit for purpose' alternative route. In this context, this means the route shall be of the correct gauge and route availability; be able to deliver acceptable journey times and with sufficient capacity to accommodate the diverted traffic.

These initiatives will take effect from the start of the December 2011 timetable. Plans covering intervening timetable years will be reviewed to determine whether improvements in access are possible.

4.2.2.13 Rolling stock

The Department for Transport's (DfT) White Paper "Delivering a Sustainable Railway" (2007), also stated that a rolling stock plan would be published, setting out in greater detail how rolling stock would be used to deliver increased capacity. While the primary focus of this rolling stock plan is on delivering the additional capacity in CP4 it also sets out the steps that the Government is taking to achieve the longer-term aspirations set out in the Rail Technical Strategy.

In terms of the HLOS, the additional capacity will be secured either through the procurement of new rolling stock; or through redeploying existing rolling stock which is displaced by new. The replacement, whether new or redeployed from elsewhere, will derive opportunities for journey time improvements and increase operational flexibility.

First Great Western submitted their Request for Proposal for the HLOS rolling stock to the DfT for 40 additional vehicles for the Thames Valley area and 12 additional vehicles for the West of England (including Devon and Cornwall). This has been assumed for the purposes of the Great Western RUS baseline as a committed scheme.

With the recent commitment to the electrification of the GWML, the requirements for rolling stock radically changes as there becomes less need for diesel trains and a greater requirement for electric trains. The previously planned procurement of new diesel trains has therefore been superseded with a new rolling stock plan to be published by the DfT in 2010. For the purpose of the RUS, the current assumptions for the number of additional vehicles remain.

4.2.2.14 Safety

Most safety improvements for passengers and the workforce will come from more effective and efficient development and management of the network, rather than specific safety initiatives. The largest contributor to the reduction in passenger risk is station related through improved design, signage and lighting, surveillance and CCTV initiatives, staff training and emergency planning. This is expected to account for just over 90 percent of the passenger related risk reduction and will be addressed through station schemes such as the National Stations Improvement Programme and through further Network Rail and station operator initiatives.

The second largest contributor to reduce passenger risk is the reduction in track faults including less broken rails, improved track geometry and fewer gauge faults. The third largest contributor is level crossings. These risks will be reduced through renewals including updates to modern standards, technology improvements and closure programmes as well as media campaigns such as 'Don't run the risk' which highlight the importance of level crossing safety to the public. The ORR has also outlined a series of initiatives aimed at reducing the risks of accidents at level crossings over the short, medium and long term which will include the inspection of all automatic open level crossings (AOCL). Network Rail will also examine the linespeed at AOCLs in line with industry guidelines.

The biggest contributors to improved workforce safety are system design including improved tools and equipment, risk planning and control, leadership actions, competence management, safety communications and assurance. These account for over 93 percent of the reduction in workforce safety risk.

4.2.3 Other committed enhancement schemes (2009 – 2019)

The following schemes are other committed enhancements within the Great Western RUS area. These schemes, in addition to the capacity and performance specified schemes above have formed part of the baseline and as such have been taken into consideration during appraisal work.

4.2.3.1 Electrification

In July 2009, the commitment to electrification of the GWML beyond the scope of Crossrail to Maidenhead, in accordance with the position set out in the Network RUS (May 2009) was announced. The following routes will be electrified as shown in Figure 4.6.

- London Paddington to Swansea (via Bristol Parkway)
- Reading to Newbury
- Didcot to Oxford
- Swindon to Bristol Temple Meads
- Bristol Temple Meads to Bristol Parkway and Patchway

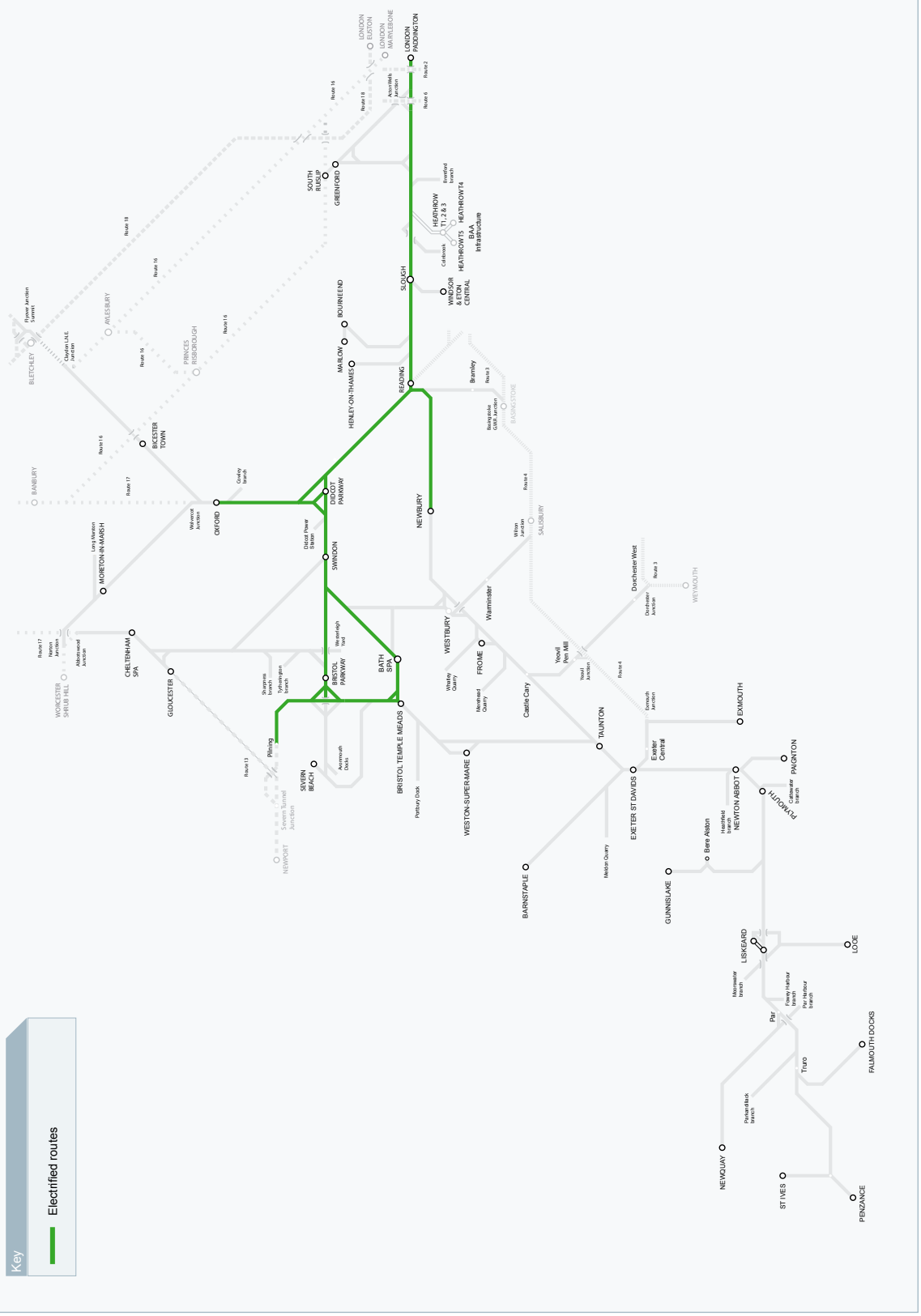
Development works have commenced, with the majority of construction work between 2014 and 2016. Subject to detailed planning work, electric services will be introduced progressively: London Paddington to Oxford, Newbury and Bristol by the end of 2016 and London Paddington to Swansea by the end of 2017.

Further areas of in-fill electrification are being reviewed, with longer-term aspirations following the completion of the main line scheme discussed in **Chapters 7** and **9**.

4.2.3.2 Crossrail

Crossrail is a new railway proposal for London and the South East. The route utilises the current network of lines and will run from Maidenhead and Heathrow in the west across London into Essex and Greater London in the east, travelling underground through new twin-bore tunnels between London Paddington and east London. It will initially operate with 10-car electric trains, capable of carrying more than 1500 passengers in each train delivering substantial economic benefits in London and the South East and across the UK. Crossrail will make travelling in the area easier and quicker whilst reducing crowding on London's existing transport network.

Figure 4.6 – Electrification



Royal Assent was given to the Crossrail Bill in July 2008 and the new Crossrail Act 2008 gave authority for the railway to be built. Main construction works are scheduled to commence in 2010 with the service operational from 2017. Further details on the scope and developments for Crossrail are presented in **Chapter 9**.

4.2.3.3 West Ealing bay platform

As featured in the Thames Valley Regional Planning Assessment (2007) this scheme will provide additional capacity into London Paddington for other services. Greenford services will terminate at a new west facing bay platform at West Ealing and could be increased in frequency. The scheme is included within the Crossrail proposals and as such implementation forms part of the Crossrail programme and is currently scheduled for 2013.

4.2.3.4 Reading Green Park

A third party funded new station between Reading and Basingstoke adjacent to the M4 motorway at Junction 11, is being developed to serve the business community at Green Park. The station is proposed to be completed by 2011.

4.2.3.5 Southampton to West Coast gauge enhancement

This scheme to construct a W10 gauge cleared route from Southampton to the West Coast Main line via Basingstoke, Reading, Didcot and Leamington is a Transport Innovation Fund (TIF) scheme which will enable the movement of 9ft 6in containers on standard height wagons on this core route. Works are underway with completion programmed for 2011.

4.2.3.6 Evergreen III – Chiltern Main line and Bicester Chord

Evergreen III forms part of Chiltern Railways franchise commitment to upgrade the Chiltern Main line to Birmingham (by May 2011) and provide a new half hourly London Marylebone to Oxford service through the construction of a new south–west chord line. This will connect the Chiltern main line and the former Oxford to Cambridge line where they cross south of Bicester. The scheme will rebuild the Bicester to Oxford section of the route for 100mph capability, with five minute planning headways and involves the construction of a new Park and Ride station at Water Eaton, to the north of Oxford subject to a Transport and Works Order. The scheme aims to be operational by 2013.

4.2.3.7 Swindon to Kemble redoubling

To improve capacity and performance on the Swindon to Kemble route this scheme proposes to redouble a 12 mile section of single line. This will enable an improvement in reliability and the use of this section of the railway as a key diversionary route for South Wales when the main line route via the Severn Tunnel is closed. In its current role, the single line section severely restricts service development, diversionary capacity and performance. The scheme is currently being developed to GRIP stage 4 (Single Option Development); however, there is currently no commitment to fund implementation. The South West Regional Development Agency (SWRDA) has committed £20 million to the scheme as part of their short-term commitments in the South West Regional Funding advice for 2009 to 2019.

4.2.3.8 Clifton turnback

As part of the Severnside Community Rail Partnership, Bristol City Council and Network Rail have jointly funded the provision of a turnback facility at Clifton Down station on the Severn Beach branch line. This enhancement permits the turning of trains back towards Bristol Temple Meads during times of perturbation and introduces the operational flexibility to allow the operation of a more frequent service between these stations. The scheme was completed in April 2009.

4.2.3.9 Falmouth branch line upgrade

This project was the aspiration of Cornwall Council to enhance the service frequency on the Falmouth branch line to two services an hour throughout the day. The provision of a new passing loop and platform improvement works at Penryn were undertaken as part of the scheme, which was completed in April 2009. The route has recently been designated a Community Rail Line and this enhancement is promoted by the DfT as a way forward for the Community Rail initiative.

4.2.3.10 Access for All

In 2005, the DfT agreed a funding pattern for the next ten years to provide an 'accessible route' at selected stations as part of an Access for All Programme. The Access for All Programme is part of the Railways for All Strategy, launched in 2006, to address the issues faced by mobility impaired passengers using railway stations in Great Britain. Central to the strategy is the commitment of £35 million nationally per year, until 2015, for provision of an obstacle free, accessible route to and between platforms at priority stations. This generally includes the provision of lifts or ramps, as well as associated works and refurbishment along the defined route.

The current stations, scope and programme for those stations in the Great Western RUS area is as follows:

Figure 4.7 – Access for All programme

Station	Scope	Completion
Exeter Central	Lifts	Completed
Taunton	Lifts	Completed
Westbury	Lifts	Completed
Twyford	New footbridge, lifts, tactiles	Completed
Chippenham	Lifts and footbridge	2011
Gloucester	Lifts and footbridge	2011
St Erth	Lifts and footbridge	2012
Burnham	scope to be confirmed	2014

4.2.4 Uncommitted enhancement schemes (2009 – 2019)

There are a number of schemes and initiatives for improving future capacity, capability and/or performance, which have been considered, even though they are currently unfunded. As there is no firm funding commitment, they are taken as uncommitted (so do not form part of the RUS baseline) but due to their significance and the effect that can be achieved through their implementation, we have, where necessary, considered their impact through our analysis.

4.2.4.1 New lines

Network Rail commissioned a New Lines Programme to investigate the case for building one or more new lines as additions to the national network. The focus of the New Lines Programme was to test the hypothesis that in the future, the existing rail lines from London to the North and West will be operating at full capacity and the conventional and next generation tools for increasing capacity will be exhausted. In August 2009, Network Rail published its report analysing the case for new lines. The report concluded that a positive business case exists for a new high speed rail line to the West Midlands, North West and Scotland with a spur to Heathrow Airport. This study will help inform the high speed rail debate.

HS2 is a new company established to review the development of potential high speed lines improving connectivity between London and the North West – HS2 is mainly focusing on the route from London to the West Midlands, with potential links to Heathrow Airport. HS2 submitted their report to Government, with a response expected in spring 2010.

4.2.4.2 Paddington station remodelling

With the introduction of IEP trains, the platform configuration at Paddington station will need remodelling with potential signal relocations, additional electrification and platform lengthening in order to accommodate the volume of growth – the current IEP service specification potentially requires up to 15 long platforms, all of which can be accommodated within the existing station footprint. In addition to these station works, due to the predicted increasing volumes of traffic in each direction (with the introduction of IEP and Crossrail), grade separation of the throat into Paddington is also a likely requirement.

4.2.4.3 London Heathrow – western access

There are longer-term aspirations for accessing Heathrow Airport by rail via a western access (ie. on to the Great Western Main Line, west of West Drayton) beyond the objectives of Crossrail. This would enable trains to run directly between Reading and Heathrow Terminal 5 (T5) (for which passive provision has been provided at T5). The proposal is in the early stages of development.

4.2.4.4 AirTrack

AirTrack is a BAA proposal to connect Heathrow Airport directly to the national rail network south of the airport through the provision of three new services to T5 via Staines: from London Waterloo via Richmond; from Guildford via Woking; and from Reading via Bracknell. The scheme will require four kilometres of new railway to connect the new station at T5 to the existing Windsor line near Staines with the rebuilding of 400 metres of railway in Staines.

The redevelopment work at Reading station (under the Reading Station Area Redevelopment scheme) provides for additional capacity to be introduced at the southern side of the station with a new third platform and platform extensions to enable longer 12-car trains to be accommodated. The new Reading station will enable the terminus of the AirTrack proposal to offer a new rail link into Heathrow Airport from the west. Implementation of AirTrack is currently programmed for 2014 (subject to funding) and would provide the opportunity for more rail service options in the future. The scheme is currently funded to complete the required Transport and Works Order.

4.2.4.5 East West Rail

The primary objective of this initiative is to improve east–west connectivity in the Oxford

to Cambridge arc. The East West Rail (EWR) Consortium wish to reintroduce passenger services from Oxford and Aylesbury to Bletchley and Milton Keynes. The primary purpose of the reopened railway is as a local transport link supporting growth and development, and as a means of easing traffic congestion problems in Oxford, Bletchley and Milton Keynes. Further development of the route would deliver significant capacity headspace on the Cherwell Valley and other existing routes and is seen as a long-term strategic route, supporting inter-regional passenger services and creating an alternative freight route between the South of England and the Midlands, the North and Scotland.

Part of the route between Bicester and Oxford is being developed under the committed scheme, Evergreen III detailed in paragraph 4.2.3.6.

4.2.4.6 Reopening of the Portishead line

A scheme to reopen six kilometres of disused railway between the current limit of the line adjacent to the Portbury Dock boundary (Portbury Jn) and Portishead town centre with the conversion of the current freight only line to passenger status is undergoing evaluation.

The reopened line would support both a passenger service to operate between Portishead and Bristol Temple Meads and freight services for Portbury Docks. Passenger service frequency is yet to be confirmed and is subject to a range of optioneering decisions. Promoted by North Somerset Council (NSC), the scheme is part of a wider West of England Partnership promoted Bristol area bid under the Transport Innovation Fund (TIF) and is currently being developed to GRIP stage 3 (Option Selection). The South West Regional Development Agency (SWRDA) has also submitted a bid for £25 million as a contribution to the scheme as part of their medium term commitments (2014 – 2019) in the South West Regional Funding advice for 2009 to 2019.

4.2.5 Mitigation Plans for Crossrail and Reading

4.2.5.1

The development and delivery of construction plans for major schemes are the responsibility of the project team. This includes a strategy for maintaining services during implementation works. There are a number of major schemes in the RUS area which are still in development and as such, construction plans are yet to be detailed. However, Network Rail continues to refine the mitigation strategy with passenger and freight customers, which depending on the delivery methodology and train service offering, may mean the delivery of a number of operational or infrastructure enhancement measures in order to minimise disruption to operators and rail users during the Reading and Crossrail construction period from 2010 to 2017. This will also be reviewed in line with the implementation of electrification on the Great Western Main Line in 2016.

4.2.5.2

Many of the schemes are still being developed, prioritised by the delivery timeline and access footprint required, with their funding source to be confirmed. However, for 2010, the following schemes are committed:

- **Banbury turnback**

  Provision of a northern diversionary route into London Paddington via Banbury, Aynho Jn and the Chiltern Lines for use when any lines are blocked at points between Reading and Old Oak Common West Jn. It is proposed that Platform 1 at Banbury is used to turn back passenger trains and the necessary infrastructure works to complete this are being reviewed.

- **Infrastructure Reliance Programme**

  Various key assets in the Reading area will be renewed and strengthened to improve performance and reliability.

4.2.5.3

Other schemes currently being assessed include provision of additional infrastructure to increase operational flexibility or improve customer journey experience, by enabling turn back facilities, platform lengthening and extension, improvement of station facilities to include improved interchange for rail/road replacement or the rerouteing of current services. The project is looking where possible to mitigate Network Rail's access requirements by employing innovative operational solutions rather than infrastructure enhancements, which will be subject to a positive business case and funding. Network Rail continues to work closely with industry colleagues to find the best value for money solutions and develop a coherent and effective mitigation strategy.

4.2.6 Planned major renewal schemes

4.2.6.1

Figure 4.8 lists the major planned renewal schemes within the RUS area for CP4. The precise timing and scope of renewals will remain subject to review to enable Network Rail to meet its overall obligations as efficiently as possible, consistent with the reasonable requirements of operations and other stakeholders.

4.2.6.2

The major planned renewal schemes currently programmed for CP5 include the resignalling of Reading, Oxford, Swindon, Bristol, Exeter and Plymouth. However, with the proposed introduction of ERTMS on the Great Western Main Line between London Paddington and Bristol due to commence towards the latter stages of CP4, with estimated completion during CP5, it is anticipated that this will supersede the existing signalling system and in effect replace the need for conventional signalling. This will enable enhanced capabilities and capacity to be realised and achieved through, for example, the reduction of signalling headways.

4.2.6.3

The resignalling of Exeter and Plymouth will continue based on current asset condition and is currently programmed for implementation during 2016 -– 2018, with Cornwall resignalling programmed within CP6.

Figure 4.8 – Major planned renewal schemes for CP4

Implementation	Scheme
2009/10	Switch and Crossing (S&C) track renewals – Ableton Lane, Bathampton Jn, Oxford North Jn and Thingley Jn, Heywood Road Jn, Long Rock and St Budeaux Jn
2009/10	Earthworks renewals – Chipping Sodbury, Cleeve, Kemble and Tredington, Heywood Road Jn and Dawlish
2009/10	Building renewals at Exeter St Davids station
2010/11	S&C renewals – Southall West Jn, Barnwood Jn, Berkeley Road Jn, Lawrence Hill, Stoke Gifford Jn, Thingley Jn and Whitehill, Keyham, Saltash and Tiverton
2010/11	Earthworks renewals – Bourton, Rodbourne and Uffington
2010/11	Didcot Parkway, Taunton, Exeter St Davids and Plymouth – CCTV, Customer Information Systems and Public Announcement
2011/12	S&C renewals – Acton East Jn, Greenford, Didcot North Jn, Dr Days Jn, Grange Court, Yatton, Taunton and Topsham
2011/12	Telecoms renewals - Swindon and Bristol Temple Meads - CCTV, Customer Information Systems and Public Announcement
2012/13	S&C renewals – Didcot East, Newbury West, Woodborough, Swindon East, Aish, Hermerdon and Saltash

4.3 Planned service changes

4.3.1 December 2009 timetable changes

During the production of the Great Western RUS, there have been three timetable changes (December 2008, May 2009 and December 2009). Some of the earlier analysis resulted in identifying proposals which have since been implemented as part of these timetable changes. The specific elements of this are addressed further in **Chapter 6**; however, a summary of amendments undertaken in December 2009 followed by high level proposals for May 2010 are presented below.

4.3.1.1 First Great Western

Improvements to high speed services included the removal of calls at Didcot Parkway and Reading on a key morning business train from South Wales to London Paddington and the removal of Didcot Parkway in a return evening peak service during the week to provide faster journey times. An enhanced service at Radley has been provided through selected off-peak Monday to Friday departures from London Paddington calling additionally at the station and an additional Monday to Friday evening service provided from Filton Abbey Wood to Westbury via Bristol Temple Meads.

4.3.1.2 CrossCountry

CrossCountry proposed no changes and the timetable remained as per May 2009.

4.3.1.3 Removal of South West Trains services west of Exeter

From December 2009, South West Trains (SWT) terminated its London Waterloo to South Devon services at Exeter St Davids, ceasing operations west of Exeter to Paignton and Plymouth. The London Waterloo to Exeter St Davids service has been increased to one train per hour facilitated by the provision of a new passing loop at Axminster implemented during 2009. This fulfils the company's franchise commitment to provide an hourly service between Exeter St Davids and London Waterloo via Honiton, Axminster and Crewkerne.

Whilst the new infrastructure enabled this increased service level with the additional resources required for the increased hourly service, the termination point for these services became Exeter St Davids. First Great Western (FGW) is providing replacement services from Exeter St Davids westwards at similar times. This is being facilitated in the short term by locomotive and coaches operation in the Bristol area cascading rolling stock to the Exeter area. Discussions on the longer-term rolling stock solution are ongoing between the DfT, FGW and the rolling stock companies.

4.3.2 May 2010 timetable changes

Proposed changes for the 2010 timetables are summarised as many assist in addressing a number of issues in the RUS area. These changes are subject to the normal timetabling process and franchise Service Level Commitment consultation where applicable.

4.3.2.1 First Great Western

To improve connectivity and journey times, service amendments will include acceleration of a number of services through a change to calling patterns. Changes to high speed services on summer Saturdays include additional calls at Saltash and a minor recast of London Paddington to Plymouth/ Penzance services to fill service gaps and meet high levels of demand. Summer Sunday amendments include an additional Exeter St Davids to Exmouth service to operate, providing a year round early morning start on the branch. An additional round trip from Exeter St Davids to Barnstaple facilitating an arrival into Exeter before midday on Sundays is also proposed. This service is planned subject to consultation and third party funding.

Services in the west will benefit from greater peak frequencies from Gloucester to Bristol, with services from Bristol Parkway starting back at Cheltenham and selected services to Westbury extended to Frome. An enhancement of Sunday services on the Severn Beach branch is also proposed in addition to key morning and evening services to become joined with the Bristol Temple Meads to Taunton services to provide direct links to/from Weston-super-Mare, serving seaside traffic in the summer.

4.3.2.2 CrossCountry

Minor changes proposed with the first northbound Bristol Temple Meads to Birmingham starting back from Bath Spa, amendments to calls at Gloucester and changes to the service provision on summer Saturdays. All options are being evaluated and are subject to agreement.

4.3.3 Future service provision with IEP and Crossrail

4.3.3.1

With the introduction of IEP (2016) and Crossrail (2017) there will be significant changes to the service provision across the route. With the absence of confirmed timetables for both IEP and Crossrail, the current service specifications have been used to assess capacity and service provision. Detailed below are the anticipated changes presented by the current service structure as per the current draft service specifications. It is recognised that when final specifications for these schemes are available, further, more detailed analysis will be required to ensure that IEP, Crossrail and freight services can all be accommodated.

4.3.3.2 Main line services (Great Western Main Line)

IEP trains will begin to replace the current eight-car High Speed Trains across much of the GWML network including the Oxford/ Cotswold corridor. Projected growth in demand is expected to be catered for by a substantial increase in capacity of the new train formations which will be capable of working in electric or bi-mode formations.

In addition to the higher capacity of the new trains themselves, an increase in frequency from two trains per hour to three trains per hour is currently proposed for the Oxford corridor, with through working to the Cotswold Line (from Oxford to Worcester, Great Malvern and Hereford) at standard hourly intervals.

4.3.3.3 Main line services (interurban)

On the core London Paddington/Bristol/South Wales corridor IEP trains will continue to provide half hourly services, with some South Wales services accelerated to run non-stop between Reading and Bristol Parkway. A fifth train per hour is currently proposed between London Paddington and Bristol Temple Meads via Bristol Parkway to cater for projected growth more generally. Swindon and Didcot will be served by alternative high speed services which will include some services starting from these stations. The existing two-hourly through service from London Paddington to Cheltenham will potentially increase to an hourly frequency.

IEP services are proposed to operate through to Taunton, Exeter, Paignton, Plymouth and Penzance with bi-mode trains to continue the through journey on the non-electrified parts of the network. An increase in the frequency of these services is currently proposed, specifically to Exeter St Davids to assist with the predicted growth in demand.

4.3.3.4 Outer suburban (beyond Slough to Oxford and Newbury)

In order to cater for Twyford an outer suburban service will be operated on the relief lines, integrated with Crossrail Maidenhead services, which will run between London Paddington and Oxford, calling at the local Thames Valley stations between Reading, Didcot and Oxford. With electrification of the GWML, it is envisaged that these services will be four-car electric trains (redeployed from the Thameslink programme) replacing the existing two and three-car diesel trains.

All Henley branch trains will operate to Twyford only to connect with these services and all Marlow/Bourne End services will operate to Maidenhead only, both will remain as existing diesel trains. Under Crossrail proposals, these services operate only as branch line shuttles with the retention of one morning peak service direct to London Paddington.

On the Kennet Valley section between Reading and Newbury, services will be provided by an hourly semi-fast service between London Paddington and Exeter St Davids, with extra peak hour services between London Paddington and Newbury. In conjunction with this arrangement longer distance services (to Plymouth and Cornwall) will run faster to Exeter St Davids than at present.

4.3.3.5 Inner suburban (services east of Slough)

Crossrail services will operate at a similar frequency as the existing local service today with up to four trains per hour Maidenhead to West Drayton (inclusive) and on to London Paddington and the Crossrail core. Projected growth in demand will be catered for by a substantial increase in the capacity of the new, standard 10-car electric train formations. The new trains will feature a greater proportion of standee capacity to reflect the higher level of demand for short commuter journeys to inner and central London.

Between Hayes and Acton (inclusive), the Heathrow Terminal 4 service will provide a minimum level of four trains per hour. In the peak hours, eight trains per hour, all day Crossrail services will be supplemented by a further two additional trains per hour east of West Drayton. The normal linkage of these services across London will be between Maidenhead and Shenfield and between Heathrow Terminal 4 and Abbey Wood.

Further details of the introduction of IEP and Crossrail and the impact on the Great Western RUS area are provided in **Chapter 9**.

4.3.4 Timetable review

It is evident that that with the magnitude of change predicted on the Great Western Main Line through the delivery of these enhancement schemes, a review of the timetable will be required. This will provide the opportunity for revisions to the main and relief line service patterns across the route. This will initially be completed through IEP and Crossrail in 2016 and 2017 respectively. Furthermore, through the implementation of electrification and ERTMS/resignalling, opportunities exist to develop the timetable to enable maximum use of the enhanced capacity and capability that these initiatives will provide.

4.3.5 Increased service provision

Any increases to the number of services or linespeed on a route are assessed for required amendments to risk assessments, engineering access requirements and/or renewal and maintenance plans. Where there are significant changes through major schemes, the project teams manage the review of the service levels with the necessary track and maintenance engineers and timetable planners. A briefing guide is also issued with each timetable change highlighting the areas of service changes. Operational co-ordinators review the impact of the change in services on any level crossings on the route and these are risk assessed to understand any change to the level of risk at level crossings.

4.3.6 Rules of the Plan

Rules of the Plan are frequently updated with the details of the committed enhancement schemes at least 12 months before the changes to the infrastructure are implemented. This enables the Train Operating Companies (TOC) to successfully bid for new timetable requests for new train paths in advance of scheme completion. This results in the optimum use of the new infrastructure, for capacity and performance benefits, with immediate effect.

4.3.7 Rules of the Route

Engineering access requirements are also reviewed with changes to infrastructure and services along with maintenance and renewals plans. The possession plans for each route are updated to reflect the requirements for maintenance in line with growth and increases in services.

4.4 Definition of "do-minimum" case

4.4.1 Generic assumptions (for non-London services)

Options developed later in this document (**Chapter 6**) are compared against a do-minimum case that assumes the interventions in 4.2 as committed schemes will happen as planned. Any interventions that are proposed in the RUS are therefore assessed against this "do-minimum" rather than the present day situation.

4.4.2 Four scenarios for London services

4.4.2.1

As there were a large number of known developments (committed and uncommitted) programmed for the Thames Valley area over the time period of the RUS, four different scenarios were developed for the "do-minimum" case for London services. This is due not only to the mix of interventions but also due to the high level of uncertainty in the actual timeframes, scope and service specifications of these proposals at this time.

4.4.2.2

The introduction of IEP on the Long Distance High Speed services is a generic assumption for this RUS as a commitment under the HLOS. However, in developing the RUS, it was uncertain whether diesel or electric IEP trains would be procured which gave rise to two alternative do minimum cases – diesel and electric.

4.4.2.3

Furthermore, until July 2008 when the parliamentary order gave Crossrail Royal Assent, it was uncertain whether Crossrail would be delivered as scheduled for 2017. This also gave rise to two different do minimum cases – with and without Crossrail.

4.4.2.4

The other variable within this scenario matrix was electrification. When work on the Great Western RUS commenced in March 2008, electrification was still an uncommitted desirable. This has since progressed with the commitment to electrification of the Great Western Main Line. However, due to the uncertainty of this during the process of RUS analysis two different do minimum cases were considered – with and without electrification.

4.4.2.5

Since Crossrail, IEP and electrification interventions interact, it was necessary to develop four different scenarios to manage the different possibilities that could exist. This enabled the RUS to progress with analysis and proposals for potential interventions to assist with the issues of capacity and performance that were identified through the gaps process (detailed in **Chapter 6**).

4.4.2.6

The table below describes the four scenarios used for the London services:

Figure 4.9 – Scenario matrix for London services

Scenario	IEP	Electrification	Crossrail (to Maidenhead)
A	Y	N (IEP-Diesel)	N
B	Y	Y (IEP-Electric)	N
C	Y	N (IEP-Diesel)	Y
D	Y	Y (IEP-Electric)	Y

Electrification refers to London Paddington to Bristol/Swansea and Oxford/Newbury

IEP refers to London Paddington to South Wales, Bristol and West of England services

Scenario A ■ Electrification as now (Heathrow) ■ No Crossrail ■ Current suburban services ■ IEP diesel	**Scenario B** ■ Electrification ■ No Crossrail ■ Current suburban services ■ IEP electric
Scenario C ■ Crossrail plus electrification to Maidenhead ■ Residual suburban service to Paddington High level ■ IEP diesel	**Scenario D** ■ Crossrail to Maidenhead ■ Electrification ■ Residual suburban service to Paddington High level ■ IEP electric

4.4.2.7
The interventions that have been assessed against these scenarios, as part of this RUS, are detailed in **Chapter 6** 'Gaps and Options'.

4.5 Rolling stock

4.5.1
The proposed rolling stock replacement programme creates an opportunity which potentially will not reoccur for another 30 years. This involves the choice of new rolling stock which could provide a significant opportunity to address a number of gaps that exist in this RUS. These benefits are magnified with the incremental extension of electrification. The replacement, whether new or redeployed from elsewhere can unlock additional journey opportunities; increase operational flexibility and potentially improve capacity.

4.5.2
The electrification programme for the GWML radically affects the requirements for rolling stock over the next decade. There will be less need for diesel trains and a greater requirement for electric trains. The current proposals under the HLOS rolling stock plan have been used to date as part of the RUS baseline. However, it is recognised that with the commitment to electrification, the previous plan for new diesel trains has been superseded. As such a new rolling stock plan is to be published in 2010. For the purpose of the RUS, the assumptions have remained on the number of HLOS vehicles proposed.

4.5.3
Introducing additional capacity during the peak, whether as longer trains or more frequent short trains, will generally require additional rolling stock to be sourced. The standard approach when assessing these options in a RUS is to include the full lease cost of the extra rolling stock unit(s), giving due consideration to the types that might be available from leasing companies or manufacturers if new build is required.

4.5.4
The RUS therefore seeks to identify principles for future rolling stock provision, as a contribution to a wider rolling stock strategy to be developed by or on behalf of the Government. The aims should be to enable:

- additional rolling stock to be introduced incrementally on routes in the Great Western RUS area
- appropriate rolling stock to be deployed on each service group.

4.6 Depots and stabling

4.6.1

Nationally a strategy is being developed in order to accommodate the additional vehicles procured as part of the HLOS. This will affect depots across the RUS area which may need to be enhanced or have additional facilities provided as it is recognised that the current capacity and facilities available at the depots may not be able to accommodate the new vehicles procured as part of the fleet replacement due around 2014.

4.6.2

It is also recognised that there is limited capacity at the existing depots for stabling additional vehicles. Therefore, depending on the specification of the new units, facilities at current depots may need to be reviewed as an integral part of the fleet replacement programme. The Network RUS is examining the rolling stock and maintenance depot strategies.

4.6.3

Chapter 3 presented the current situation with regards to depots and stabling capabilities within the RUS area and it is expected that this will be sufficient for the expected number of vehicles under the HLOS within the Thames Valley region. A review of the requirements in the West of England is underway with a number of locations being considered.

4.6.4

In addition to the HLOS vehicles, IEP will also bring about its own requirements for depots, stabling and maintenance facilities with the current proposal to use the North Pole Depot in London and new facilities to be built in Reading, at Stoke Gifford, Bristol and at Maliphant, Swansea (although this is outside the scope of the RUS area). **Chapter 9** expands on these requirements with the development work being undertaken.

5. Planning context and future demand

5.1 Introduction

5.1.1

This chapter considers the planning context for the Great Western Route Utilisation Strategy (RUS). The Great Western RUS is related to a number of other strategies and policies covering rail and other transport modes and a synopsis of the key documents that have influenced the analysis is presented. This is followed by the predicted changes in demand for both the passenger and freight markets within the area of the Great Western RUS, outlining the process undertaken and the resultant predictions.

5.1.2

The following key documents represent the planning context and have been influential in the RUS process:

- Regional Spatial Strategies (RSS) for the South West (draft) and the South East of England (known as the South East Plan)
- Regional Economic Strategies (RES) for the South West and the South East
- Regional Planning Assessments (RPA) for the South West and Thames Valley
- The South West Rail Prospectus
- The Future of Air Transport
- The Strategic Rail Authority Great Western Main Line RUS
- Network RUS: Scenarios and Long Distance Forecasts and Electrification
- Freight Route Utilisation Strategy (FRUS)
- Delivering a Sustainable Transport System (DaSTS).

5.2 Regional planning documents

5.2.1 Regional Planning Assessments

5.2.1.1

The Department for Transport's (DfT) Thames Valley and South West Regional Planning Assessments for the railway published in May 2007 and June 2007 respectively considered the impact of future levels of growth across the rail network and the capacity issues that may emerge from this over the short, medium and long term to 2026.

5.2.1.2

The RPAs identify the role of rail as supporting London's role as a world city and the local economies of other key urban centres, by enabling rail commuting linking employers to sources of skilled labour; supporting the growth and integration of London and South East, and the South West economies. The South West Rail Prospectus also notes that rail has a key role to play in facilitating longer distance movements connecting the South West to London, the South East and West Midlands as well as supporting tourism and providing access to ports and airports.

5.2.1.3

The DfT's Thames Valley RPA forecasts growth for morning peak arrivals into Reading to increase by 15 percent between 2006 and 2016 and by 31 percent to 2026. The South West RPA forecasts that demand for rail passenger journeys towards London in the morning peak will be met throughout the route by increased service provision up to 2016. However, by 2026 seating demand is forecast to be in excess of capacity from as far as Castle Cary by up to 14 percent. The RPAs also indicate that interurban growth on the

Bristol to London Paddington route is forecast to be in excess of seating capacity by as much as 18 percent, from as far west as Chippenham by 2026[1]. Demand for holiday traffic to Devon and Cornwall is set to grow, with significant growth forecast for local services to Exeter, mainly on the Exmouth branch and from the south Devon area.

5.2.1.4

Demand for travel from the South West to London and to the Midlands and the North is also on the increase and is expected to continue. Between Bristol and Birmingham 36 percent growth in rail demand is forecast between 2006 and 2016 with 63 percent growth to 2026. There is a key business need for connectivity to London and the South East, including Heathrow Airport with journey times from key centres such as Taunton in under two hours, Exeter under two and a half hours and Plymouth in under three hours. Demand has been particularly strong in the evening peak, on Fridays and throughout the weekend, with Sundays being CrossCountry's second busiest day of the week.

5.2.1.5

The Government's "Delivering a Sustainable Railway" White Paper (2007) also proposes a continuation of the Community Rail Development Strategy. This aims to improve long-term sustainability on local and rural lines by encouraging demand growth and managing costs down. With the exception of the Exmouth and Paignton branches, all branch lines in Devon and Cornwall have either a Community Rail line or service designation, therefore demand on these lines will be strongly influenced by their respective local rail partnerships.

5.2.2 Regional Spatial Strategies for the South West and South East 2006 – 2026

5.2.2.1

Regional Spatial Strategies (RSS) set the spatial framework for the future development of each region from 2006 to 2026. They seek to tackle the major challenges that the region faces over this period, including accommodating a substantial increase in population and a growing economy, tackling climate change and reducing the region's ecological footprint as defined by the consumption of natural resources and energy. They provide a spatial context within which Local Development Frameworks and Local Transport Plans need to be prepared, as well as other regional and sub-regional strategies and programmes that have a bearing on land use activities. These include the regional economic and housing strategies as well as strategies and programmes that address air quality, biodiversity, climate change, education, energy, community safety, environment, health and sustainable development.

5.2.2.2

Transport links, business, social requirements and environmental concerns, as well as the way different areas and places function, all have a significant influence. An important spatial context for the South West is provided by the relations it has with adjacent regions namely the South East, West Midlands and Wales. Evidence demonstrates that the most significant linkages between the South West and the wider United Kingdom are those with London and the South East, particularly for the business community.

1 As quoted in the South West RPA, 6.2.1 the "seating capacity is based on the December 2006 timetable allowing for further resource changes to First Great Western High Speed Train formations."

5.2.2.3
By 2026, the draft South West RSS estimates that the region could have a population of around six million with the South East region expecting to exceed 9.5 million. South West regional housing requirements plan for economic growth at 2.8 percent per annum with an increase in the total number of jobs by 2026 of between 365,000 and 465,000. The South East Plan forecasts the delivery of 654,000 new dwellings up to 2026 with up to 480,000 new jobs.

5.2.2.4
In addition to other areas, the draft South West RSS identifies 21 Strategically Significant Cities and Towns (SSCTs) across the region which form the basis for the extensive growth in dwellings and jobs anticipated over the period to 2026. Figure 5.1 summarises the projected increases in jobs, dwellings and population in the SSCTs by 2026.

Figure 5.1 – Projected increases in the 21 SSCTs by 2026

SSCT	Jobs	Dwellings	Population
Barnstaple	6300	4800	9600
Bath	16000 – 20000	7500	15000
Bournemouth	18100 – 23000	15600	31200
Bridgwater	18500	6200	12400
Bristol	73000 – 93000	64000	128000
Cheltenham	8000 – 10800	12500	25000
Chippenham	6300	4500	9000
Cornwall Towns*	16500	13800	27600
Dorchester	7300 – 9500	4000	8000
Exeter	22300 – 28500	18500	37000
Gloucester	9300 – 12700	17500	35000
Plymouth	42000	31500	63000
Poole	14700 – 18,900	10000	20000
Salisbury	10800 – 13600	5000	10000
Swindon	26000 – 32000	35000	70000
Taunton	18500	14000	28000
Torbay*	11700	10000	20000
Trowbridge	11700	5000	10000
Weston-super-Mare	8500 – 10000	12000	24000
Weymouth	7300 – 9500	5000	10000
Yeovil	9100	6400	12800
Total	**336100 – 394100**	**302800**	**605600**

*Cornwall Towns includes Camborne, Pool, Redruth, Falmouth, Penryn and Truro. Torbay includes Torquay, Paignton and Brixham.

5.2.2.5
The South East Plan identifies a network of 21 regional hubs which represent a network of centres of economic activity. Of these Oxford, Reading and Slough are within the Great Western RUS area. The scope of the South East Plan is further divided into nine sub-regions which are major concentrations of growth potential - referred to in the Regional Economic Strategy as Diamonds for investment and growth - which can act as a catalyst to stimulate prosperity across wider areas and with the potential for further sustainable growth through targeted investment in infrastructure. Within the nine sub-regions, the Western Corridor (Thames Valley) and Central Oxfordshire are within the RUS area.

5.2.2.6
The RSS includes the Regional Transport Strategy and a set of transport policies to deliver this strategy. For the South West, this states that the most important transport factor affecting the performance of the regional economy is reliable connections to London and the South East (and international markets beyond). Much of the region lies within the two-hour rail journey time to London which is characteristic of locations having the best economic prospects. Further development of the heavy rail network in Greater Bristol, Exeter and Plymouth to provide for local and commuter journeys is also proposed to deliver spatial growth and meet congestion targets.

5.2.2.7
The growth shown in Figure 5.1 emphasises the large increases in jobs, and hence both commuting and business travel, which is anticipated in Swindon, Bristol, Exeter and Plymouth and hence the potential for rail to have a major role in both these markets in each of the areas. As a result, there is an emphasis on these key locations in the development of commuter rail operations in the region.

5.2.2.8
The South East Regional Transport Strategy seeks to maintain high quality radial connectivity to London, and develop orbital routes around London. Emphasis is placed on the railway system being developed to carry an increasing share of freight movements. Priority should be given to providing enhanced capacity for the movement of freight by rail particularly on the Southampton to West Midlands; Dover/Channel Tunnel to and through/around London, the Great Western Main Line and Portsmouth to Southampton/West Midlands corridors. The strategy supports rail improvements including East West Rail, Reading Station Area Redevelopment, the North Downs rail line and bottlenecks on the Great Western Main Line.

5.2.2.9
Regional Spatial Strategies are aligned with the Regional Economic Strategies which seek to sustain regional economic performance, improve the quality of skills across the region, encourage regeneration of deprived areas and address inequalities within the region.

5.2.3 Regional Economic Strategies for the South West (2006 – 2015) and the South East (2006 – 2016)

5.2.3.1

The aim of the Regional Economic Strategy (RES) is to address the particular economic needs of the region. It achieves this whilst also supporting, enhancing and delivering European, national and regional strategies and policies. The South West RES states that Bristol has a lead role as a city-region of international, national and regional significance and can use its status as a national science city to strengthen the West of England's regional economic base. Plymouth has the potential for a more significant role in the region as have Exeter, Swindon, Gloucester and Cheltenham. The vision for the South East RES is that by 2016, the South East will be a world class region achieving sustainable prosperity. The South East is divided into three broad economic contours of the Inner South East; the Rural South East and the Coastal South East, each with their own characteristics and challenges. The RES supports the regional hubs identified in the South East Plan in developing and implementing their plans for sustainable growth through the frameworks and strategies for the Inner, Rural and Coastal South East.

5.2.3.2

Regionally, it is important that the RES reinforces the aims set out in the Integrated Regional Strategy, and complements the Regional Spatial Strategy to ensure that the region is working in an integrated way to agreed goals. The Integrated Regional Strategy for the South West is an important mechanism for better integrated working in the region as it provides a set of broad objectives and priorities relevant across sectors. Just Connect is an Integrated Regional Strategy for the South West for the period 2004 to 2026.

5.2.4 Delivering a Sustainable Transport System (DaSTS)

5.2.4.1

Delivering a Sustainable Transport System (DaSTS) is the DfT's new approach to long-term transport planning and will be used in determining funding decisions for the five-year period from 2014 to 2019 and beyond and reflects the conclusions from the Eddington Study and the Stern review. DaSTS sets out the process for determining priorities with the establishment of goals and the identification of challenges. Options are then generated, sifted and prioritised before decisions are made on the future transport programme.

5.2.4.2

DaSTS outlines five goals for transport, focusing on the challenge of delivering strong economic growth while at the same time reducing greenhouse gas emissions. It outlines the key components of the national infrastructure and discusses the difficulties of planning over the long-term in the context of uncertain future demand. The five goals are:

- to support national economic competitiveness and growth by delivering reliable and efficient transport networks
- to reduce transports emissions of carbon dioxide (CO2) and other greenhouse gasses, with the desired outcome of tackling climate change
- to contribute to better safety and health and longer life expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health
- to promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society, and
- to improve quality of life for transport users and non-transport users, and to promote a healthy natural environment.

5.2.4.3
Rail has the potential to help meet these objectives and Network Rail will continue to engage with the regions and local authorities at all levels of the process. There are four stages in the process. In stage one each region was invited to propose a number of strategically relevant studies to take forward which they believe will meet the DaSTS objectives. The DfT then selected the studies that would progress into stage two to generate options for appropriate interventions. All studies are currently in stage two and need to produce a long list of options by the end of March 2010 for further review. Stage three will involve the sifting and packaging of options, while stage four will see the completion of an overall programme, with all studies complete by 2012.

5.2.4.4
As part of the DaSTS programme there are both national and regional studies, the national studies are led by the DfT and the local studies are led by the regions. There are a number of joint studies with the involvement of both the DfT and the regions.

5.2.4.5
There is a national Freight Modal Choice study looking to confirm the economic, social and environmental benefits of current freight movements by non-road modes on national network corridors and to identify where changes in future modal choice, from road to rail or water, could address issues on the network and deliver against the five DaSTS goals. This includes consideration of the capacity and capability of the national infrastructure to accommodate these changes in modal choice.

5.2.4.6
DaSTS draws together the recommendations in both the Regional Spatial Strategies and the Regional Economic Strategies for the South West and the South East presenting nine main growth areas identified by the regions as per the RSS's and the priorities for delivering sustainable economic growth in the RES's. These areas require the largest quantum of sustainable growth (84 percent of growth in dwellings and 86 percent of growth in employment). The nine growth areas are:

- Cheltenham and Gloucester
- Swindon
- West of England (Bath, Bristol and Weston-super-Mare)
- Taunton
- Exeter
- Torbay (Torquay, Paignton and Brixham)
- Plymouth
- Key Cornish towns (Camborne, Redruth, Truro, Falmouth and Penryn)
- South East Dorset (Bournemouth and Poole (outside the RUS area).

5.2.4.7
With the RSS and the RES the challenges across economic development, housing and transport and the issues faced in different parts of the region are well known. The South West Regional Development Agency and the South West Councils have formed a four-stage programme to develop the evidence base necessary to support the principal objectives of their Regional Funding Allocation (RFA) 2 bid whilst adopting the DaSTS process. The South East England Regional Transport Board submitted a work programme for their programme of studies which cover seven corridors; two fall within the Great Western RUS area – The Western corridor and Blackwater valley and Central Oxfordshire.

5.2.4.8

Through the submission of a Stage 1 DaSTS report, approval has been sought on the studies to be taken forward within the South East and South West. All of the areas are identified in the South East and West RSS's as Strategically Significant Cities and Towns. The studies will all review ways to accommodate the predicted growth to 2026 and recommend the most suitable transport systems. The following studies are now being developed through the process of options and appraisal, strategy testing and final reports. A summary of the studies are detailed below:

5.2.4.8.1 Western corridor and Blackwater valley

The study area includes the South East Diamonds for Growth at Basingstoke and Reading, the regional hub of Slough and sub-regional hubs of Newbury, Bracknell and Maidenhead within the Great Western RUS area. The objective of the study is to understand the deficiencies across all the modes of the current transport network in delivering the sustainable economic and housing growth and developments of the Blackwater Valley. This will include improvements to sustainable transport links and journey time reliability between the Thames Valley and Heathrow Airport and the efficient movement of freight.

5.2.4.8.2 Central Oxfordshire

The study area is defined as the South East Plan's Central Oxfordshire sub-region with emphasis on the areas to the north and south of the city, with a focus on the Didcot New Growth Point and the Bicester environs – both of which are likely to be foci for the planned growth in the sub-region. The focus of the study area is on the strategic transport links necessary to support and deliver the predicted growth in the RSS.

5.2.4.8.3 Swindon Transport Delivery Framework

The study will present the requirements necessary to deliver a sustainable transport network for Swindon and its environs, this will follow on from the recommendations made in the Swindon Transport Strategy. Swindon is a New Growth Point with substantial housing and employment growth predicted in the RSS. The study will demonstrate the role that transport can play with economic growth and define the most appropriate transport options on key corridors to improve access to the town centre and to accommodate town wide movements.

5.2.4.8.4 Gloucester and Cheltenham Transport Links

This study will review the cumulative impacts of the predicted growth in housing and economic developments on the key transport corridors in and around the Cheltenham and Gloucester areas, including strategic corridors linking these SSCT's with other growth areas within the Gloucestershire sub-region and within the South West region. The study will define the necessary transport network which best supports the economic regeneration, access to jobs and services and planned housing growth within the study area.

5.2.4.8.5 South Bristol Accessibility and Regeneration Study

This is one of the three studies in the West of England sub-region; to inform the impact of transport investment on economic growth and deprivation in South Bristol. The study will clarify the contribution transport investment, along with known schemes, can make to tackling accessibility and facilitating regeneration and improve social indicators specifically in South Bristol.

5.2.4.8.6 West of England Transport Carbon Emissions Study

The second of the studies for the West of England will assess the impact of transport investment on climate change. The study will consider the impacts of the sub-regions major scheme programme and particularly investment in public transport, on greenhouse gas emissions and the possible contribution of modal shift towards related national targets. The major scheme programme for the West of England includes the Bath transportation package, the Greater Bristol bus network,

Ashton Vale to Bristol City Centre rapid transit, South Bristol link, North Fringe to Hengrove package, the Weston Package and Portishead rail corridor and the Greater Bristol Metro rail network.

5.2.4.8.7 West of England Motorway and local network Interaction Study

The final study for the West of England sub-region will review the inter-relationship between local and strategic transport investment proposals with the Highway proposals, the major scheme transport programme and the Joint Local Transport Plan integrated transport and maintenance strategy. The review will identify opportunities to build on these measures and compliment their benefits for all modes of transport.

5.2.4.8.8 Taunton Gateway Study

The aim of this is to develop a long-term transport strategy for interurban movement on strategic growth corridors in the Taunton housing market area (known as the Taunton Gateway) which includes Taunton, Bridgwater and Wellington. The study area is at the convergence of national and regional routes and will assess the impacts of growth on the national and regional corridors and connections to the gateway in the sub-region.

5.2.4.8.9 Exeter and Far South West Gateway

The study will assess the cumulative impact of growth and regeneration within the South West Peninsula on the reliability and resilience of the corridors that connect the Strategically Significant Cities and Towns to Exeter and onwards to wider national markets. The study will consider how peripherality and deprivation in the South West Peninsula can be tackled by maintaining and improving connectivity to these markets, whilst ensuring that the impacts on carbon reduction are minimised. The key issues in the peninsula are being able to manage transport growth while delivering the levels of housing and employment growth identified in the RSS for the main growth areas of Exeter, Newton Abbot, Torbay, Plymouth and the key Cornish towns.

5.2.5 The Future of Air Transport

5.2.5.1

The Government's White Paper "The Future of Air Transport" published in 2003 sets out a national strategic framework for the development of airport capacity until 2033. Developments at Heathrow Airport, such as the new Terminal 5, which opened in March 2008 and the modernising of other terminals has and will continue to have a major impact on the RUS area. Forecast growth in passengers using Heathrow Airport has identified the need for further airport expansion leading to the proposal for a third runway and sixth terminal. The challenge for rail will be how it can contribute to providing national links to key centres as an alternative to domestic flights.

5.2.5.2

The national policy framework established in the White Paper supports the development of Bristol as the main regional airport in the South West but also supports improved access and development to the other airports within the area namely Exeter, Plymouth and Newquay. These airports are forecast to grow from 4.5 million passengers per annum in 2000 to almost 20 million passengers per annum by 2030. Developing the role of the South West airports to support the growth of tourist visits to the region will be key.

5.2.5.3

In the context of national policy, the aim of the South West's air strategy as presented in the draft Regional Spatial Strategy is to meet more of the South West's demand for air services within the region with reduced journeys to airports outside the region, particularly in the form of road traffic to London Heathrow and Gatwick. This will be achieved through the development of existing airports through improved access and investment at Bristol, Exeter, Plymouth and Newquay airports. To improve access to Bristol Airport there is a proposal to develop Worle station as a Parkway station and interchange for the city and the airport to enable through links. This is discussed further in **Chapter 9**.

5.2.5.4
Despite wishing to contain travel and demand to airports within the South West, the development of a western rail link to London Heathrow is favoured by the region as there continues to be strong demand particularly from the business community for improved rail access to Heathrow Airport. The recent commitment to electrification between London, Bristol and South Wales will have an impact on the case for western rail access.

5.3 Eco-towns

5.3.1
Eco-towns are a proposed programme of exemplar sustainable new towns to be built in England. They will be new towns of at least 5,000 – 20,000 homes intended to create new settlements to achieve zero carbon emissions and more sustainable living, using the best new design and architecture. The developments are intended to encourage a modal shift from road to rail and promote a car free community, with reduced emissions and traffic congestion being the key measures.

5.3.2
In November 2008, a shortlist of 12 sites was announced for public consultation of which, three impacted on the Great Western RUS area: Weston Otmoor, Middle Quinton and St Austell. In July 2009, the DfT announced four confirmed sites to be progressed to the next phases of planning, public consultation and local planning approval. The four sites are St Austell (China Clay) in Cornwall, North West Bicester in Oxfordshire, Whitehill-Bordon in Hampshire and Rackheath in Norfolk.
Of these, the site at St Austell is within the scope of this RUS with the site at Bicester bordering the area with the West Midlands and Chilterns RUS. A decision is outstanding on Middle Quinton and will not be made until Communities and Local Government has received the report on the West Midlands Regional Spatial Strategy.

5.3.3
It is currently expected that this first wave of eco-towns will be established by 2016. Local authorities in the 'first-wave' of locations are in the process of submitting bids for the £60 million start-up funding. All eco-town schemes brought forward at these locations will go through the usual local planning process.
The progression of these sites will increase levels of rail demand in the surrounding areas; however the options for rail have yet to be fully evaluated. Cornwall Council are working with Network Rail to complete a pre-feasibility study of the options available for rail at St Austell. The review will consider the aspiration for new stations at Blackpool or Nanpean, near St Austell, for the eco-town community. This is discussed further in **Chapter 6**.

5.3.4
The identification of the locations for the second wave of eco-towns were announced in December 2009, with 15 areas wishing to examine the feasibility of development to eco-town standards. Of these, four are within the Great Western RUS area, Taunton (Monkton Heathfield and Corneytrowe), Yeovil and the Dearne Valley in Cornwall. £10 million will be available to support the councils in developing their plans, funding early stage demonstrator projects at the sites and reviewing the feasibility of the locations.

5.4 Connecting Communities

5.4.1
In June 2009, the Association of Train Operating Companies (ATOC) published their 'Connecting Communities: Expanding access to the rail network' report which reviews options for capacity enhancements through other means such as links to (or new stations on) existing lines, by utilising freight lines (current or closed) as well as through railway land left by line closures and capacity reductions of the 1960s and 70s.

5.4.2
Within the RUS area, the ATOC report presents a positive case for a new station at Wantage/Grove between Didcot and Swindon. It also supports the reopening of the Portishead line for passenger services and recommends further review of a rail link on

the Brixham railway line for connections into Exmouth via Exeter. These are presented as opportunities for improving accessibility to the network for communities that are not currently rail connected but which require further work and funding to develop.

5.5 New developments and stations

5.5.1

In order to accommodate the predicted levels of growth in the RSS's, new developments are proposed to be constructed for both housing and business purposes which may determine the need for new stations. For example, there is a new station proposal for Long Ashton to serve a new housing development proposed to accommodate a proportion of the growth forecast for Bristol and at Exeter, new stations are proposed at Monkerton and Newcourt to serve industrial estates and new housing areas. **Appendix G** lists the aspirations for new stations.

5.6 Safeguarded land

5.6.1

It is appreciated that there are a number of closed or new routes which have the potential for future use as and when the demand requirements and funding possibilities are known or committed. The RUS supports the safeguarding of routes by local authorities which can facilitate future developments and opportunities. Network Rail will discuss and review the implications of protecting this land with the relevant planning authorities through the standard process of land applications.

5.6.2

The Strategic Freight Network (SFN) will also reflect emerging issues in the freight market and emphasise the importance of safeguarding freight routes for future opportunities wherever there is a positive business case.

5.7 Growth in rail demand: Strategic context

5.7.1

Beyond the early years of the strategy, forecasts become increasingly less certain. In considering demand beyond 2019, the RUS notes the Government's aspiration in the "Delivering a Sustainable Railway" White Paper, to provide a reliable network capable of handling double the number of passengers over the next 30 years. This aspiration sets an overall context for the future development of the railway but is not intended to be a forecast for any specific route or area.

5.7.2

The Great Western RUS Draft for Consultation reported passenger demand forecasts produced in summer 2008, using the then current view of key demand drivers which include employment and Gross Domestic Product (GDP). This is used to reflect economic performance. Since then, the severity of the recession has worsened. Recent forecasts from Oxford Economics, suggest that the long-term effect of the recession will be a permanent loss of approximately seven percent of GDP compared to a continuation of pre-recession growth. On this basis, and using industry standard forecasting models, it might have been expected that passenger rail demand would have reduced significantly over the last two to three years and that the forecasts for 2019 in the RUS Draft for Consultation might not be achieved until at least 2022.

5.7.3

However, analysis demonstrates that rail demand in the Great Western RUS area as a whole has not been affected by the recession in the way implied above. Between 2006/07 and the year to September 2009, the number of rail passenger journeys to London Paddington grew by approximately 14 percent, while total demand between the remaining stations within the RUS area has also increased at a similar rate. These rates of growth are comparable to the draft RUS forecasts and are in line with other industry findings, which show that over this period regional rail journeys continued to grow despite the recession. The number of rail journeys has not been affected substantially by the recession partly because some passengers opt to 'trade down' from first class to standard class or from full fare to a cheaper ticket.

5.7.4

Although the recession has slowed down the rate of growth in rail demand, its impact is significantly less than what the industry standard forecasting models would have predicted. Looking forward, the timescales for recovery from the recession are inevitably uncertain. However, the RUS forecasts provide a medium to long-term view of growth and so should not be affected by the shorter term uncertainty. It is therefore reasonable to conclude that there is no strong reason to change the passenger forecasts from the RUS Draft for Consultation. As the Freight RUS was published in March 2007, it provides a pre-recession view of freight demand and growth and it is apparent that the recession has had a greater impact on the freight market. The SFN has produced further forecasts of freight growth, which have been confirmed for growth up to 2030 but which are still being refined for growth up to 2019. These forecasts consider the impact of the recession.

5.7.5

The following sections present the forecasts of passenger demand to 2019 for the Great Western RUS area within the markets of Long Distance High Speed (LDHS) services; suburban services and key interurban centres. A review of the long-term, long distance forecasts as presented by the Network RUS specifically for the Great Western RUS area is included followed by a review of the future freight forecasts and market scenarios. These passenger forecasts are also referred to as 'unconstrained' growth and assume demand would not be suppressed by the level of on-train loadings.

5.7.6

The passenger demand forecasts for the LDHS services have been revised to include a high level view of the incremental effect from electrification. It is recognised that there are quantitative and qualitative benefits evident from electrifying the railway which will impact and increase passenger demand.

5.8 Forecast passenger demand

5.8.1 Forecasting approach

5.8.1.1

The Passenger Demand Forecasting Handbook (PDFH) is the industry standard framework for modelling growth, using demand drivers, such as UK demographics, economic growth and the characteristics of competing modes to predict the change in passenger demand. A number of data sources regarding these external drivers were used in compiling the forecasts:

- gross domestic product (GDP) and central London employment forecasts were obtained from Oxford Economic Forecasting
- forecasts of local population and employment were obtained from version 5.4 of the Department for Transport's TEMPRO model
- elasticity assumptions were drawn from PDFH version 4.1, except for elasticity to fare increases, for which PDFH 4.0 guidance was used
- assumptions about the real cost of fuel and levels of car ownership were derived from TEMPRO version 5.4.

5.8.1.2

The PDFH has been used to predict future growth in rail journeys, except where this has been shown to be an under or over prediction of historic growth in the RUS area. In these cases, an alternative methodology (or overlay) based on historic evidence has been used. Evidence suggests that the PDFH framework can underestimate the recent acceleration in passenger growth experienced in some urban and interurban rail markets outside of London. An extensive validation exercise was therefore undertaken to assess how well the PDFH methodology would have explained historic growth on key flows in the Great Western RUS area.

5.8.1.3

For London flows, the RUS found that the PDFH was able to reasonably predict the historic growth that occurred between 1998 and 2006 once various changes that had occurred over this time period had been included eg. timetable changes, the impact of performance improvement and the effect of installing ticket barriers at London Paddington. Similarly demand into Reading could be explained by PDFH methodology. These forecasts were therefore agreed by the Stakeholder Management Group (SMG) and used for the RUS analysis.

5.8.1.4

However, it was evident that the PDFH under predicted historic growth on the urban and interurban flows in the RUS area. This under prediction was particularly significant for flows into Bristol and flows between the RUS area and other regions, particularly the West Midlands and South Wales. An alternative approach to forecasting was therefore developed using a combination of historic growth and PDFH estimates, in line with the methodology used in other RUSs. This approach assumes that the current short-term rate of high growth continues in the first two years; this is then followed by four years of standard PDFH growth with an additional "overlay" to capture the unexplained historic growth; the growth rate then returns to the rate predicted using the standard PDFH methodology. These forecasts were agreed by the SMG and used for the RUS analysis.

5.8.1.5

In developing the demand forecasts for the Great Western RUS, Reading and the surrounding area to the west have been grouped together to form the forecasts for LDHS services while the shorter commuter market comprising of the stations located to the east of Reading are grouped as suburban services. Each of these markets and their forecasts are discussed in turn below.

5.8.2 Passenger forecasts – Long Distance High Speed

5.8.2.1

The number of rail journeys made from within the Great Western RUS area to London Paddington on the LDHS services is predicted to increase between 2008 and 2019 by 31 percent in the peak and 42 percent for all day services. This is equivalent to a 2.5 percent increase in the peak and a 3.2 percent increase all day per annum. These growth forecasts are 'background' growth based on underlying factors such as economic and employment projections as well as the cost of travel with rail fares and fuel prices. They do not include the impact of any committed or potential schemes. These forecasts are 'unconstrained' and therefore do not include the impact of demand suppression.

5.8.2.2

These forecasts have been revised to include a high level view of the incremental impact of the Intercity Express Programme (IEP) and electrification of the Great Western Main Line (GWML) on demand. This estimates the demand induced by electrification with the effect of moving from the current high speed train timetable to a revised timetable with the operation of IEP trains. However, as the service specification for IEP services is still being developed, the impact that these schemes may have on demand is uncertain. These forecasts therefore present a high level indication of growth using the latest specification available.

5.8.2.3
Electrification brings a number of drivers of change in generating additional benefits for passengers and is therefore seen as an attractor to rail. Electrification, along with IEP, will bring changes in timetables with improved journey time and increased service frequency, increases in seating capacity which can provide crowding relief and offers improved service quality (specifically with the introduction of the new 'super express' train) and other rolling stock as well as improving service reliability and performance. These changes also increase the attractiveness of rail to passengers who travel to or from an area that is outside the scope of electrification. These further benefits are often referred to as the "sparks effect".

5.8.2.4
Using the assumptions from the current IEP service specification, it has been estimated that the introduction of electrification with electric IEP services will bring an additional nine percent growth for passenger flows from within the Great Western RUS area to London Paddington on the LDHS services during the peak and inter-peak. This therefore revises the demand forecast to 2019 to 40 percent for peak services and 51 percent for all day services into London Paddington when combined with the previous unconstrained background growth forecast.

5.8.2.5
With the current IEP service specification the proposed quantum of services has been used as a basis to undertake initial capacity analysis to ascertain how the increase in service provision (as presented in **Chapter 4**) can assist with accommodating predicted growth. With the draft design for the new bi-mode and electric trains, an indication of the number of seats and standing allowance has enabled high level load factor analysis to be undertaken.

5.8.2.6
This analysis has demonstrated that the extra capacity provided by IEP (in either bi-mode or electric form) is sufficient to accommodate predicted demand into London Paddington to 2019 during the three-hour peak period (07:00 and 09:59). This additional capacity is provided through the increased capability of the rolling stock and through the proposed increase in service frequency on a number of routes.

5.8.3 Passenger forecasts – suburban services

5.8.3.1
Demand from the short to medium commuter market in the Great Western RUS area to London Paddington (measured in passenger journeys) is predicted to increase by 21 percent in the peak and by 25 percent all day between 2008 and 2019. This is equivalent to an annual growth of 1.8 percent for peak services and 2.1 percent for all day services. These forecasts predominantly represent demand from stations to the east of Reading to central London such as Maidenhead, Slough and West Drayton. These forecasts represent demand driven by external factors such as economic growth and are unconstrained by on-train loadings. It is recognised that following the introduction of electrification on these services by the end of 2016, additional capacity will be provided through the introduction of four-car electric trains (proposed to be redeployed from the current Thameslink fleet) replacing the existing two and three-car diesel trains. This change may also positively impact on the attractiveness of rail and therefore the level of passenger demand for these services, however the potential impact of this has not been included in the forecasts.

5.8.3.2
The potential impact of the Crossrail scheme on passenger demand is not included in the forecasts as the Crossrail timetable is still under development (now at Iteration 2), therefore the RUS has not explicitly analysed the impact on demand of Crossrail. However,

capacity analysis has been undertaken at a high level using the capacity assumptions for the proposed 10-car Crossrail service with the Crossrail Iteration 1 timetable which demonstrates that sufficient capacity will be available on the suburban services. It is anticipated, that following the implementation of Crossrail in 2017, passenger demand and travel patterns in the Thames Valley area will begin to be affected towards the end of the 10-year RUS forecast period following an introductory period of the new services. Looking ahead, it is predicted that on-train capacity on Crossrail services into London Paddington will be sufficient until at least 2026.

5.8.3.3

The recent introduction of Oyster Pay As You Go (PAYG) ticketing on National Rail services within Greater London (zones 1 - 6) is likely to stimulate demand for rail, although this is only of relevance to this RUS for stations located to the east of West Drayton (inclusive).[2] This new ticket type makes rail travel easier and simpler. It also reduces the cost of rail travel on some routes within Greater London although the size of fare reduction varies by time of day, station zone and whether a journey involves the use of London underground services. The effect of Oyster PAYG on demand for rail in the RUS area has not been quantified and it is anticipated to have a marginal impact on the total number of rail journeys to London Paddington. Furthermore its impact in the peak is predicted to be minimal because demand for commuter journeys is predominately driven by employment in London.

5.8.4 Passenger forecasts – key urban centres

5.8.4.1 Reading

Peak arrivals into Reading are predicted to increase by 28 percent between 2008 and 2019, this equates to a rate of 2.3 percent per annum. All day demand is predicted to increase at a higher rate of 31 percent in the same forecast period, equating to an annual increase of 2.5 percent.

5.8.4.2 Bristol

Peak demand to Bristol is predicted to grow by 41 percent between 2008 and 2019 which is equivalent to an annual growth rate of 3.2 percent. Off-peak demand is predicted to grow by 37 percent over the same time period, which is principally assumed to be for leisure purposes. These forecasts represent unconstrained growth driven by underlying factors such as economic projection and road fuel prices. They do not include any growth that might be stimulated by improvements to rail services over the RUS period. The RUS forecast is aligned with the recent high growth experienced in the Bristol conurbation area as a result of a number of demand drivers; these include an increase in road congestion during peak hours and changes in commuting patterns favouring rail travel. This growth forecast is also consistent with the forecast in the South West Regional Planning Assessment, which predicts an average growth rate of 3.5 percent per annum (all day) between 2006 and 2026 under the “High Growth Scenario”.

5.8.4.3 Exeter and Plymouth

It has been shown that the PDFH tends to under predict rail passenger growth experienced in urban and interurban rail markets outside of London. As shown in **Chapter 3**, urban centres in the South West region such as Exeter and Plymouth have experienced strong growth in rail demand over the last decade. Therefore, for the purpose of option appraisal as detailed in **Chapter 6**, the passenger growth forecast, established for Bristol has been adopted and used for Exeter and Plymouth. A bespoke forecast has not been explicitly developed. It is anticipated that in the short to medium-term, rail demand at these urban centres will continue to grow at a rate higher than PDFH forecasts and the magnitude of growth is likely to be similar to Bristol.

2 Oyster Pay As You Go is currently not valid on the Heathrow Connect services between Hayes and Harlington and Heathrow Terminals

5.8.5 Predicted loadings – key urban centres

5.8.5.1 Reading

Figure 5.2 shows the estimated load factors (relative to seats) on arrival at Reading in 2019. This is a ratio of passengers to seats expressed as a percentage. This is presented by corridor in the three-hour morning peak period followed by the high-peak hour in Figure 5.3.

5.8.5.2

All corridors, except Wokingham and Basingstoke, will have sufficient seats available to meet expected demand across the high-peak hour and three-hour peak period.

These estimated load factors take into account the additional capacity expected to be provided through the High Level Output Specification (HLOS) with the rolling stock proposals and IEP. These interventions have been included within the analysis as they form committed schemes as discussed in **Chapter 4**. With the commitment to electrification, a revised Rolling Stock plan is expected in 2010, which will supersede the earlier commitment to additional diesel vehicles. This will, in effect, replace the previous HLOS proposals submitted by the Train Operating Companies (TOCs) for additional vehicles with alternative ways of increasing capacity being investigated between the TOCs and DfT in order to achieve the HLOS capacity metrics up to 2014. As a decision on this is still awaited, the RUS has continued with the earlier assumptions in the RUS base with the HLOS proposals and the additional number of vehicles required. Should the revised rolling stock strategy differ from the vehicle proposals, the base figures can theoretically be adjusted to include any additional numbers that would be required to accommodate growth to 2019.

5.8.5.3

The HLOS response submitted by First Great Western (FGW) to a Request for Proposal by the DfT includes provision for train lengthening on the Wokingham and Basingstoke corridors. For the Basingstoke corridor, these additional vehicles resolve the expected crowding in 2019 on the suburban services – the resultant crowding as shown in Figure 5.3 remains on the long distance CrossCountry services into Reading. On the Wokingham corridor, after the introduction of the HLOS additional vehicles, it is still expected that the Gatwick Airport to Reading services will continue to have more passengers than seats available on arrival in the morning peak period at Reading in 2019, with the stations at Guildford and Gatwick Airport also experiencing on-train crowding. However, both of these corridors will have sufficient total capacity (includes seats and standing allowance) to meet predicted growth in the morning peak.

5.8.5.4 Bristol

The level of crowding on services into Bristol during the morning three-hour peak period is forecast to increase by 2019. Figure 5.4 shows estimated load factors by corridor in the morning three-hour peak period followed by the high-peak hour in Figure 5.5.

As part of their HLOS Request for Proposal response, FGW propose 12 additional vehicles to enable train lengthening on a number of routes in the West of England and the predicted load factors presented in Figure 5.4 and Figure 5.5 have taken this into account.

The Cardiff to Bristol corridor is still predicted to experience a high level of crowding in 2019 with some passengers standing across the high-peak hour above the total capacity provision (this includes both seating and standing allowances). It is recognised that additional capacity will need to be sought and this is discussed further in **Chapter 6**. Although Gloucester and Weston-super-Mare corridors are predicted to experience a passenger to seat ratio of 100 percent or above in the high-peak hour, there remains sufficient total capacity to accommodate predicted demand in the peak to 2019.

Figure 5.2 – Average weekday load factors on arrival at Reading in 2019, three-hour peak (07:00-09:59)

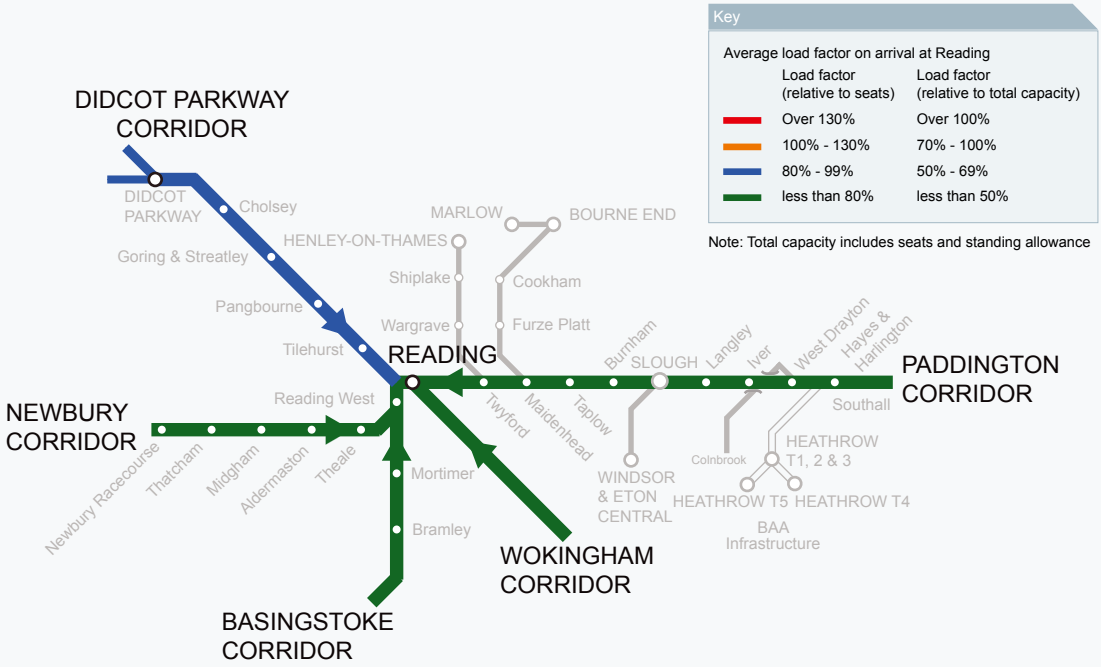


Figure 5.3 – Average weekday load factors on arrival at Reading in 2019, high-peak hour (08:00-08:59)

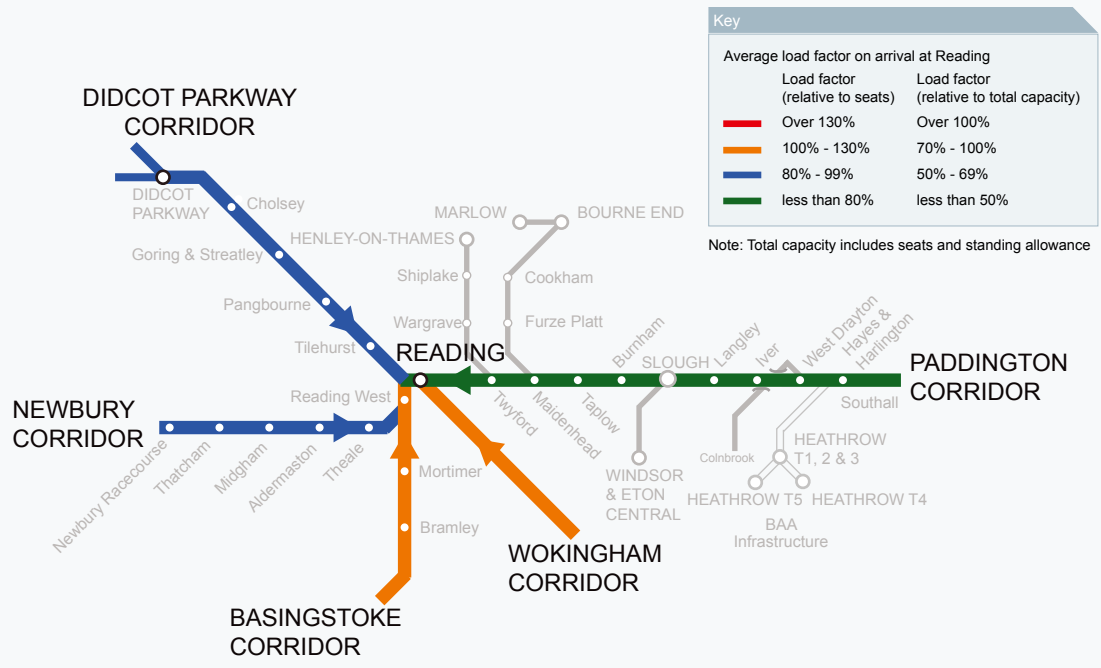
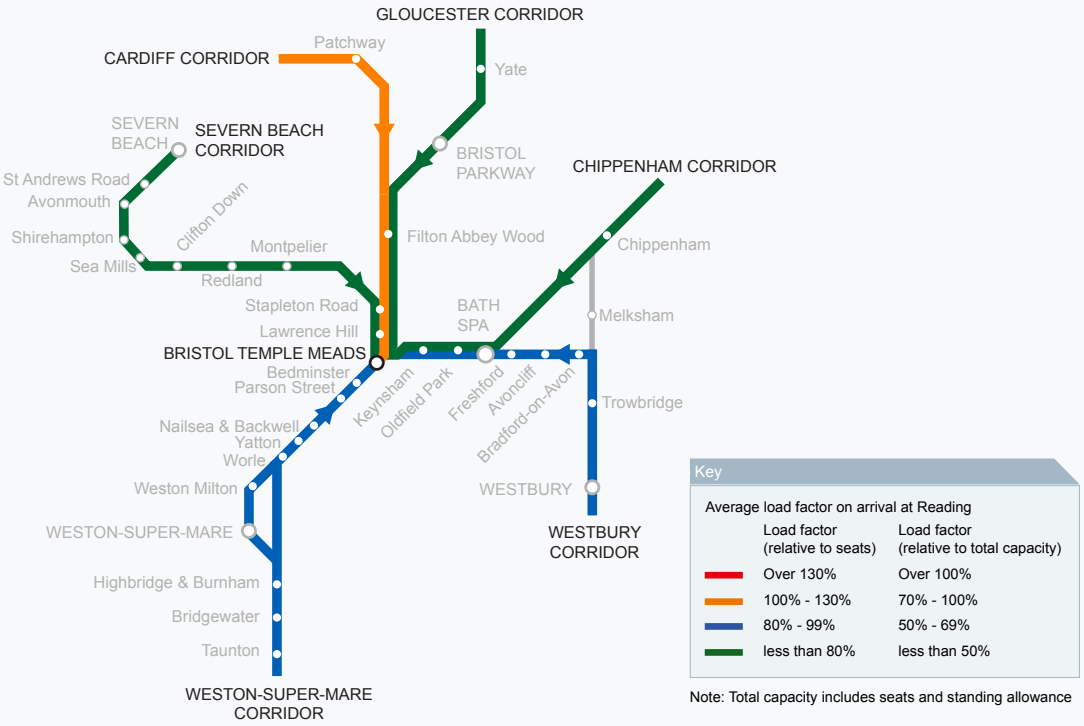
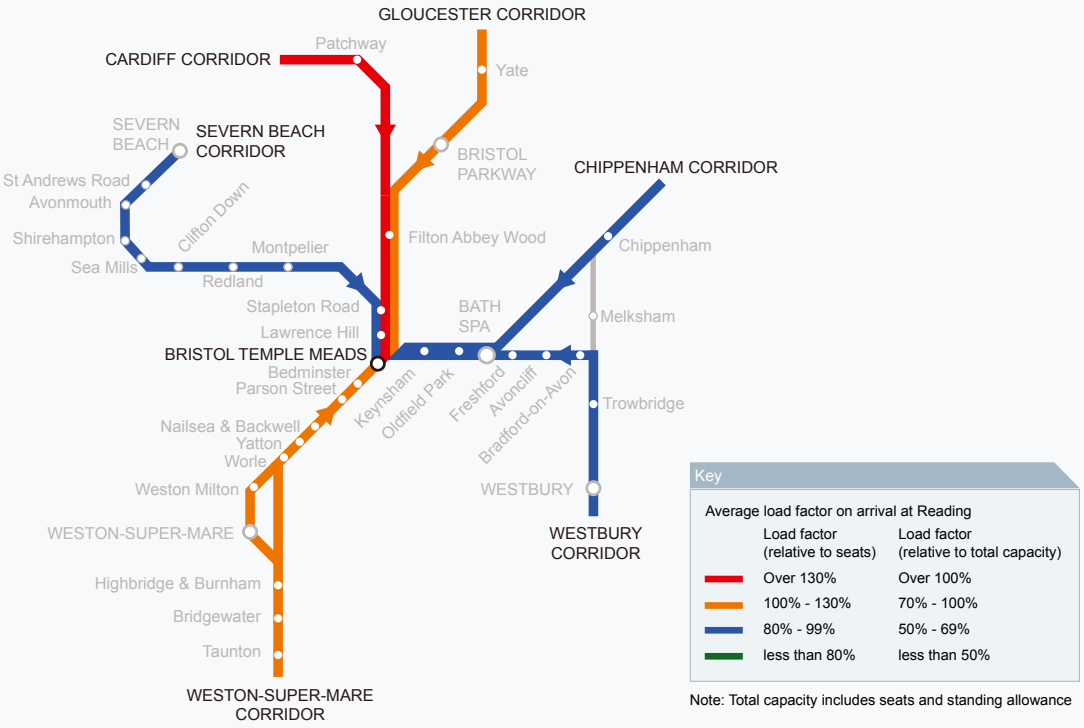


Figure 5.4 – Average weekday load factors on arrival at Bristol Temple Meads in 2019, three-hour peak (07:00-09:59)



Note: Total capacity includes seats and standing allowance

Figure 5.5 – Average weekday load factors on arrival at Bristol Temple Meads in 2019, high-peak hour (08:00-08:59)



Note: Total capacity includes seats and standing allowance

5.8.6 Passenger forecasts – cross-RUS flows

5.8.6.1

The Network RUS "Scenarios and long distance forecasts" published in June 2009 predicts significant growth to 2019 on flows between the Great Western RUS area and South Wales and between the Great Western RUS area and the West Midlands. All day passenger demand in this market is predicted to grow by over 30 percent between 2008 and 2019. The greatest growth is expected between Bristol and South Wales at 35 percent, followed by Reading and the West Midlands at 34 percent with a 32 percent growth predicted between Bristol and the West Midlands.

5.8.7 Network RUS: Long distance passenger demand forecasts

5.8.7.1

The Network RUS presented the growth in rail demand over a 30-year horizon for conurbation flows on the western route by four scenarios, these are shown in Figure 5.6.

5.8.7.2

The Network RUS demand forecast is developed using an alternative approach to PDFH as it recognises that PDFH is not always appropriate for longer-term forecasts. The forecasts are based on a detailed consideration of factors affecting long distance market size and market share and represent a longer-term view to 2036. However, these forecasts do not include the impact of any known or committed rail schemes. The strategic national corridor for the western route includes the key conurbations on the London to Bristol and Plymouth; London to South Wales and from South Wales to the South West routes. Figure 5.7 illustrates the forecast growth in long distance rail trips to cities on this corridor. The long distance passenger corridor in the Network RUS also includes the cross-country route from Leeds to Bristol, although not shown in Figure 5.7; it will impact on the Great Western RUS area.

Figure 5.6 – Network RUS scenarios

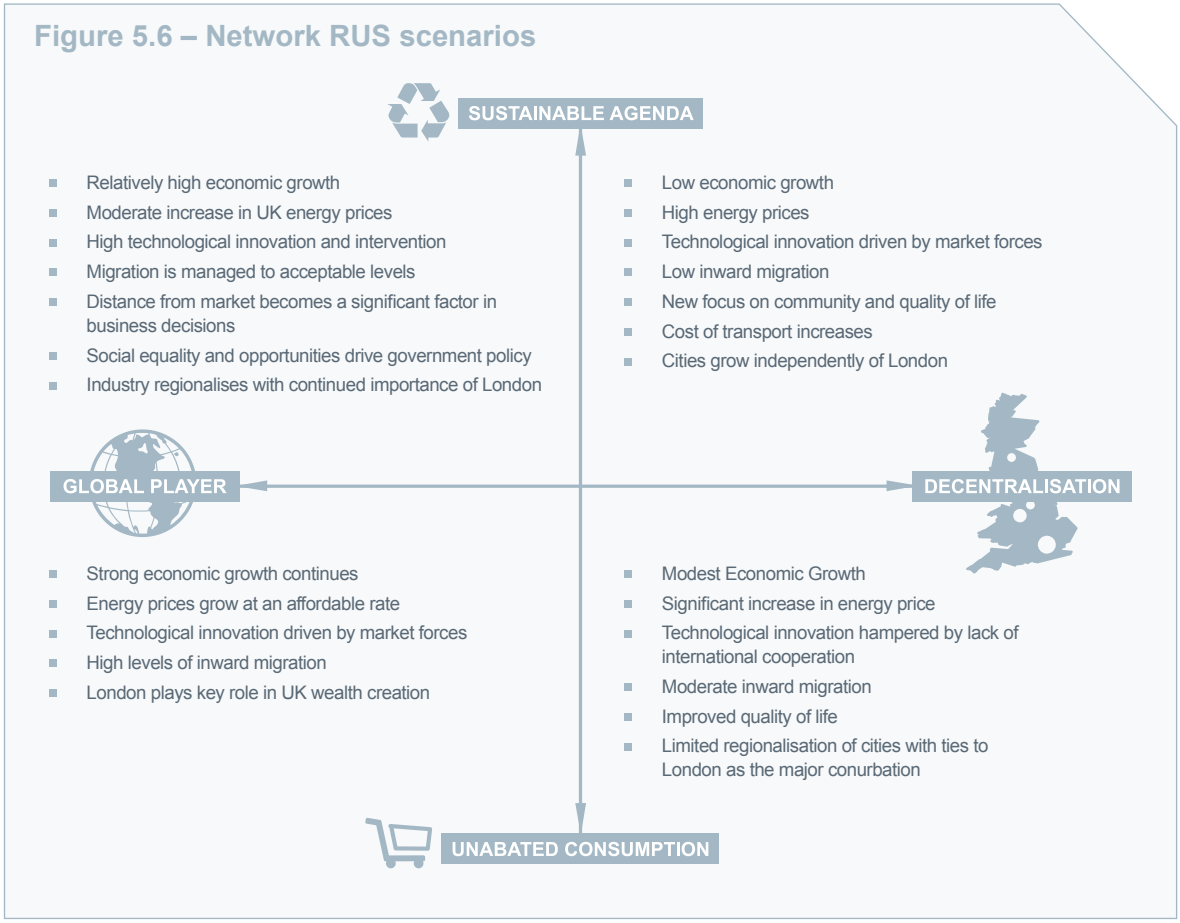
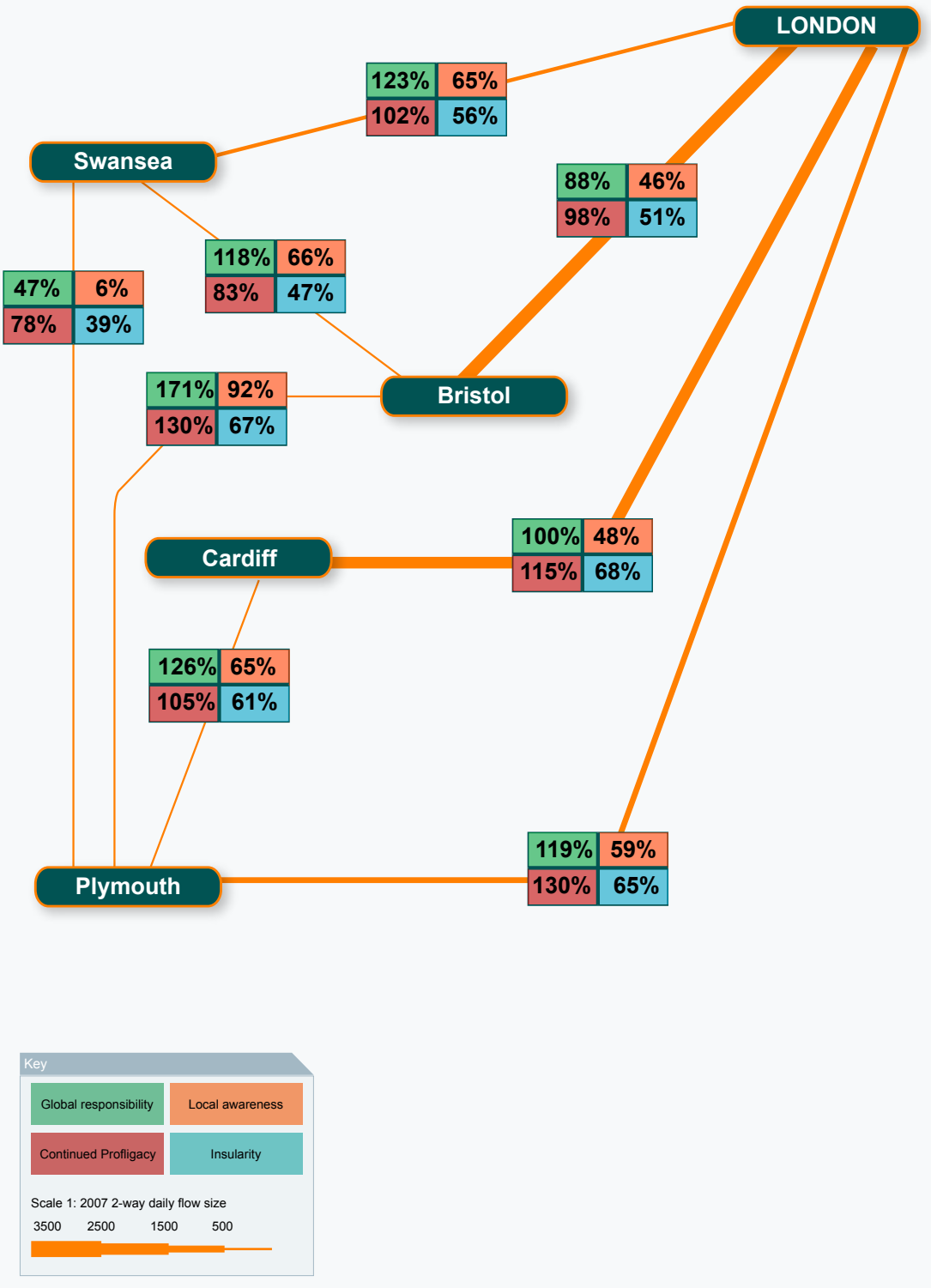


Figure 5.7 – Network RUS: Western corridor demand forecasts to 2036



5.8.7.3
The effect of increasing the attractiveness of rail compared to road is strongest for flows such as Bristol to Swansea and Plymouth where rail has a relatively low market share but where small changes in rail's competitive position can lead to large changes in market share. It is recognised that future changes to rail patterns positively impacts on the role of rail, strengthening its position and increasing demand. However, the potential changes in the economy, as reflected in the various scenarios, will impact to differing extents on the level of growth forecast.

5.9 Forecast freight demand

5.9.1
Freight demand forecasts were developed nationally in the Freight Route Utilisation Strategy (FRUS) published in March 2007; this presented a strategy for accommodating the forecast freight traffic across the national network over the 10-year period from 2004/05 to 2014/15 and estimated approximately 25 percent growth in the number of freight trains per day.

5.9.2
In compiling these forecasts, two methods were used. Firstly, a "bottom up" approach using current flows and known changes projected forward to 2014. This was undertaken by the Freight Operating Companies and predicted a 26 percent growth. The other method referred to as the "top down" approach used a more scientific approach using the "Great Britain Freight Model" (GBFM), a calibrated model based on evidence of actual rail market shares. This estimated a 28 percent growth to 2014.

5.9.3
Since the publication of the FRUS, these forecasts have been supplemented by aspirations by the DfT and other stakeholders to increase the proportion of freight carried by rail throughout the United Kingdom. The DfT's "Delivering a Sustainable Transport System" White Paper provides support for transferring freight from road to rail in order to reduce road congestion and carbon emissions, with the Ports Policy Review interim report (2007) forecasting that by 2030 half of all rail freight will be port related.

5.9.4
In August 2008, the Rail Freight Group (RFG) and Freight Transport Association (FTA) published forecasts for demand for rail up to 2015 and 2030. These forecasts present a 30 percent increase in tonne km from 2006 to 2015 and more than doubling by 2030. However, the growth in intermodal traffic is forecast to be much higher, more than doubling by 2015 and a five-fold increase by 2030 reflecting a continuing expansion of trade from continental Europe and further afield, plus a significant use of rail to and from rail-connected warehouses.

5.9.5
Figure 5.8 presents the national rail freight forecasts to 2030:

Figure 5.8 – National rail freight forecasts

	2006	2015	2030
Tonnes (millions)	123.7	130.3	197.8
Tonne km (billions)	23.5	31.0	50.4
Trains ('000s)	409	434	634
Percent tonne KM by rail	12.6	15.0	20.7

Source: Rail Freight Forecasts by MDS Transmodal on behalf of the Rail Freight Group and the Freight Transportation Association

5.9.6
The Strategic Freight Network (SFN) has produced a current indication of the order of growth to 2019 and 2030 for specific corridors. These forecasts are an approximation and are currently being refined and agreed with key stakeholders for growth up to 2019. The forecasts for growth to 2030 have been agreed. These forecasts will be presented on a route by route basis across the national rail network with capacity assessments undertaken to review if this growth can be accommodated on the current network – where it can't, the SFN will propose and appraise interventions.

5.9.7
Initial assessments for the indicative level of freight growth on the Reading to London Paddington corridor, Didcot to Leamington and flows which travel across Bristol from Avonmouth and Portbury to Wales and the West Midlands have been included in the Great Western RUS option appraisal work (see **Chapter 6**). These forecasts are subject to confirmation of the actual growth that is expected to occur over the next ten to twenty years. They have been agreed for growth up to 2030 but are still to be confirmed for growth to 2019. The forecasts represent the total number of train paths per day in each direction at 2019 and 2030. The breakdown used for each route is presented in Figure 5.9.

5.9.8 Current market scenarios
The potential for freight growth exists in all market sectors but the current economic fluctuations make accurate forecasting difficult. However, it is not unreasonable to assume that following a period of static or negative growth freight will return to, or exceed, previously attained levels of traffic. The following scenarios describe the main opportunities in each sector:

5.9.8.1 Intermodal
Strong deep sea container growth is forecast to continue with the W10 gauge clearance scheme underway between the port of Southampton and the West Coast Main Line. Once the enhancement scheme is delivered in 2011, the forecasts identify growth of six to eight trains per day in each direction to and from the port by 2014/15. Growth in container traffic is also expected with the proposed aspirations of the Bristol Port Company as discussed in paragraph 5.9.9.

5.9.8.2 Aggregates
Growth in aggregates freight traffic is also expected to occur to meet the house building programme demands in the South East of England, the construction of the Olympic Games sites and Crossrail. The construction of Crossrail will generate significant volumes of freight movements both for aggregates and cement traffic to site, and extracted materials from the tunnelling works from site. The FRUS indicates up to three additional trains per day will be required to meet the predicted growth in construction traffic, with a substantial increase under the SFN forecasts to 2019.

Figure 5.9 – Strategic Freight Network: forecast train paths required

Location	2019	2030
Paddington to Reading	34	56
Didcot to Oxford	25	39
Bristol	9	9

These figures represent the total number of freight paths required per day in each direction in 2019 and 2030

5.9.8.3 Coal

The most significant driver of change in demand patterns is the Energy Supply Industry (ESI) coal market. This is due to ongoing shifts towards importing coal supplies and volume shifts between competing import facilities. The future of the UK energy policy and carbon emission levels will affect the demand for coal. It is currently unclear how this will affect the demand for rail transport. Biofuel alternatives being considered require substantial volumes, and any growth in this type of fuel at the expense of coal (for conventional coal-fired power generation) is likely to increase the demand for train paths rather than lead to a reduction.

The future of Didcot Power station is currently unclear. At present, the plant is non-EU compliant as it is not fitted with Flue Gas Desulphurisation (FGD) equipment and unless a dispensation is granted it is likely that the station will cease operations from 2015. This would release additional capacity on the route between Avonmouth and Didcot should the power station cease coal burning operations. However, if it remains operational, future freight capacity on this section would need to be reviewed to assess whether the current infrastructure can accommodate such growth along with the other enhancements proposed for the area specifically with the introduction of the Intercity Express Programme.

5.9.8.4 Other materials

The FRUS estimates two additional metal product trains per day and one additional petroleum train per day will be needed across the RUS area.

5.9.9 Terminal developments

The Regional Spatial Strategy for the South West supports opportunities for developing freight markets in the region particularly for Bristol which is the largest port in the South West. Opportunities to develop the markets of these ports are supported, especially where measures include improved rail access to enable more sustainable distribution. The Bristol Port Company has high level proposals for increased rail volumes from a proposed container terminal development at Avonmouth. Further growth driven by the development of this new terminal could drive new capacity gaps.

The South East Plan identifies that between three and four intermodal interchange terminals will be required to serve London and South East England. Although the locations have yet to be determined it is recognised that these need to be located close to London and the proposed markets.

5.10 Summary

5.10.1

The above analysis has enabled a number of “gaps” to be identified between the current levels of supply and demand and that which will be required over the next 10-year period to 2019 in order to accommodate predicted growth. The gaps identified and the interventions assessed are discussed further in the following chapter ‘Gaps and options’.

6. Gaps and options

6.1 Introduction

6.1.1

Previous chapters have presented baseline data (the current capability and requirements of the network), committed schemes, forecasts of future demand and other drivers of change. This chapter builds on this by detailing the process of gap identification, the options to address these gaps and the process of their appraisal.

6.2 Gaps

6.2.1

A Route Utilisation Strategy (RUS) gap is defined as the difference between what the system can currently supply, in terms of infrastructure and train services, and what is likely to be demanded of the system, in terms of what it needs to do both now and in the future for passenger and freight at suitable levels of performance.

6.2.2

RUS gaps can be broadly classified into four types:

- capacity and capability – where the size, number and mix of services (passenger and/or freight) does not meet current or future needs
- performance – where the performance outputs of the railway system fall short of requirements
- journey times – where location to location journey times (passenger or freight) do not meet current or future needs
- connectivity – where journeys between locations (passenger or freight) do not meet current or future needs.

6.3 Process

6.3.1

The process adopted during the Great Western RUS was to identify and catalogue where issues exist on the current railway and where they are expected to exist going forward. This was undertaken through the baseline study (with stakeholder input) and through an analysis and comparison of current (**Chapter 3**) and predicted changes in demand (**Chapter 5**) as well as a review of strategic documentation for the geographical area. This provided identification of potential “gaps” between what the railway system delivers now and what it is required to deliver going forward over the timeframe of the RUS.

6.3.2

A list of 128 issues were assembled from this process, which were then subjected to detailed analysis by the Great Western RUS Stakeholder Management Group (SMG). Each issue was meticulously reviewed and categorised as a gap, an option, a constraint or a stakeholder aspiration. This finalised the gaps which were considered to need further, more detailed analysis.

6.4 Identification of gaps

6.4.1

From the list of 128, the SMG determined there were 21 gaps to be pursued under the Great Western RUS. A summary table of the identified gaps is as follows:

Figure 6.1 – Table of gaps

No.	Nature of gap	Key issues
1.	Paddington peak capacity	existing and predicted crowding and ability to meet forecast growth to 2014, 2019 and beyond on services at London Paddington during the peak
2.	Inner suburban service pattern	existing and predicted crowding and ability to meet forecasted growth and service provision following proposed interventions with Crossrail and Intercity Express Programme
3.	Paddington to Reading all day capacity	existing and predicted crowding and ability to meet forecast growth to 2014, 2019 and beyond on all day services between London Paddington and Reading
4.	Paddington to Reading performance	existing performance issues and requirement to meet the High Level Output Specification targets to 2014 and beyond
5.	Slough to Windsor all day capacity	existing crowding and ability to meet forecast growth to 2019
6.	Freight capacity and capability in/ around London and freight capacity North–South	freight paths, loading gauge and train lengthening with current schemes under the Freight RUS, Strategic Freight Network, Crossrail and East West Rail
7.	Reading peak capacity	existing and predicted crowding and ability to meet forecast growth to 2019 and beyond on services during the peak at Reading
8.	Didcot to Wolvercot Jn performance	existing performance issues at Didcot East Jn, Didcot North Jn and Oxford
9.	West Midlands to South Coast: a) connectivity b) all day capacity	a) lack of direct services from the North East, Yorkshire and Derbyshire to the South Coast b) existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on all day services between the North and the South Coast
10.	Swindon to Gloucester performance	existing performance problems and service levels for normal service provision and under diversionary working
11.	South Wales to South Coast all day capacity	existing and predicted crowding and ability to meet forecast growth to 2019 and beyond on all day services between South Wales and the South Coast
12.	West Midlands to South West a) connectivity b) all day capacity	a) lack of direct services from Greater Manchester and the South West beyond Bristol b) existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on all day services between the North and the South West
13.	Bristol peak capacity	existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on services during the peak at Bristol Temple Meads
14.	Bristol performance	existing performance issues on the approaches to Bristol Temple Meads, specifically due to conflicting moves at Bristol East Jn

15.	Westbury area performance	existing performance issues in the Westbury station area
16.	Exeter and Plymouth area service pattern	existing connectivity issues between and across Exeter and Plymouth
17.	Interurban journey times	opportunities for improving journey times on services through either linespeed improvements and/or changing calling patterns
18.	Early morning arrivals to key regional centres	limited early morning journey opportunities from London Paddington to Plymouth and from Birmingham to Cardiff
19.	Station crowding	existing and predicted capacity problems identified at London Paddington; Ealing Broadway; Windsor and Eton Central; Reading, Oxford and Bristol Temple Meads stations
20.	Seasonal fluctuations	existing and predicted fluctuations in supply and demand to, from and within Devon and Cornwall
21.	Impact of Heathrow Airport including western access	impact of Crossrail and Heathrow Express on London demand to Heathrow Airport; local demand and services to Heathrow Airport from Reading including current and expected demand to Heathrow Airport from the South West

Figure 6.2 visually demonstrates these gaps across the Great Western RUS area.

6.5 Generic gaps

6.5.1

A number of generic strategic gaps, relevant to the overall rail network, were identified by the SMG as part of the gaps process. The majority of which have been discussed in **Chapter 4** as committed schemes with the Intercity Express Programme (IEP), electrification and Seven Day Railway initiative. The Strategic Freight Network (SFN) and the Freight RUS captures the generic gap of freight train length and network capability whilst depot capacity for new rolling stock, predominantly as a result of the additional vehicles expected to be provided through the High Level Output Specification (HLOS), but also with reference to IEP, is being addressed nationally through the Network RUS and IEP project.

6.5.2

These strategic gaps are therefore being managed through various means and as such are not intended to be duplicated by this RUS. The performance and capacity metrics from the HLOS have been incorporated in the RUS gap list and are addressed accordingly through the option analysis below.

6.6 Quantification of gaps

6.6.1

Once the gaps have been identified, the next stage is to quantify the gap. During the process of assessing and quantifying the RUS gaps, a number of gaps were resolved and were therefore not progressed any further, these are discussed below:

6.6.2 Gap 5: Slough to Windsor and Eton Central all day capacity

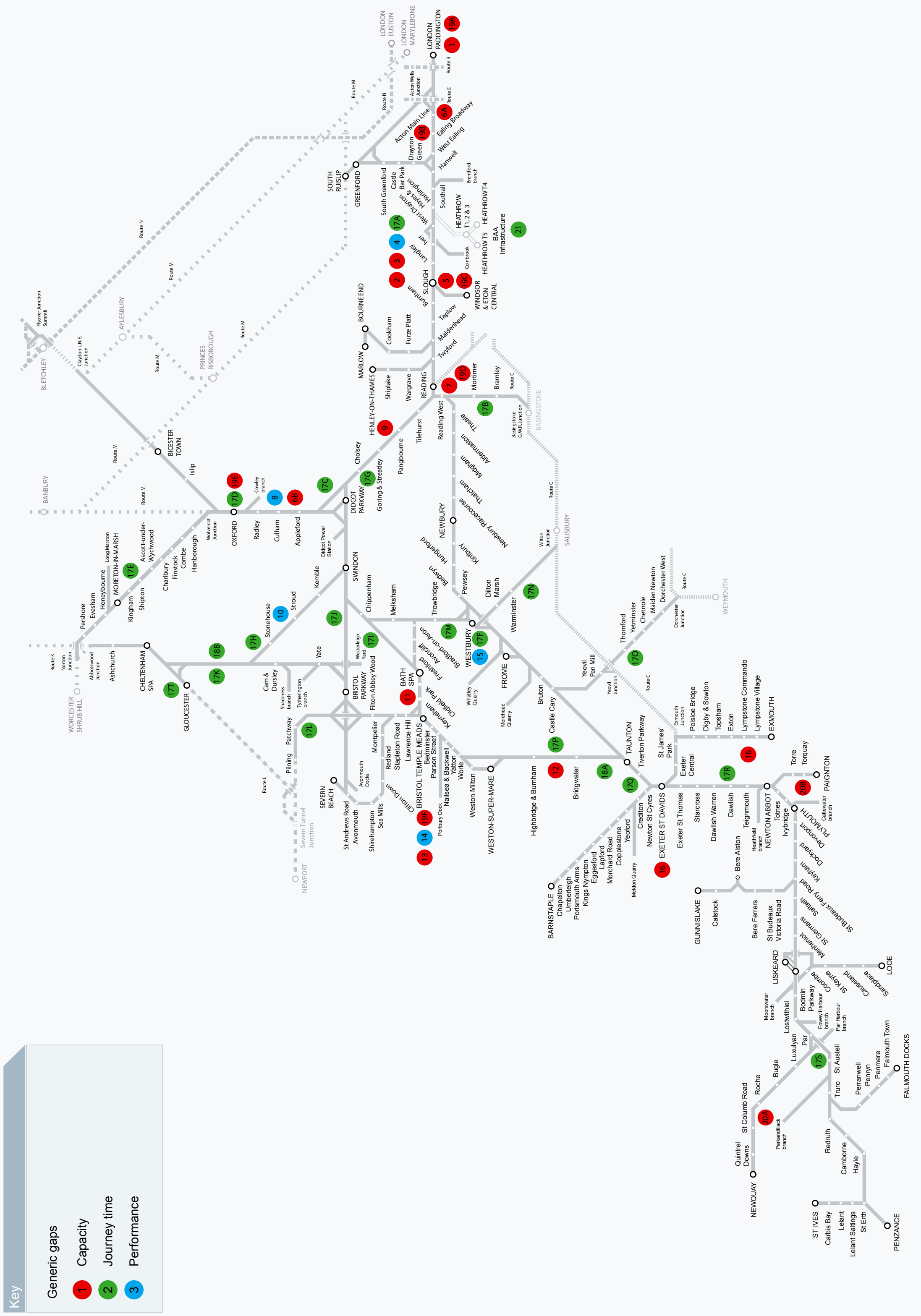
6.6.2.1

The issue of on-train crowding on services throughout the day between Slough and Windsor was raised during the gaps process. The timetable at the time of analysis (May 2008) provided three trains per hour Monday to Friday during the morning and evening peaks with two trains per hour during the inter-peak period.

6.6.2.2

However, from December 2008 the service provision increased to three trains per hour all day Monday to Friday. The current level of demand was assessed with forecast growth to 2019 to understand whether the two-car service of three trains per hour was sufficient to cater for the expected levels of demand. The results showed that the three trains per hour provided a passenger to total capacity

Figure 6.2 – Great Western RUS scope area with identified gaps



(includes seats and standing allowance) ratio of 70 percent during the morning three-hour peak hour, reducing to less than 20 percent in the off-peak. This level of service provision is therefore sufficient to accommodate predicted growth until at least 2019.

6.6.2.3
A review of the existing service provision and forecast growth to 2019 on weekend services was also undertaken. From July 2009, the Saturday service increased from two cars to three cars for the summer months. First Great Western (FGW) has reviewed the continuation of this extension as well as evaluating the operation of three trains per hour on Saturdays as an alternative but the business case is not sufficient for either scheme to be implemented. FGW will however continue to review the provision of an additional car on weekend services as necessary although this is dependent on rolling stock availability during the summer months.

6.6.2.4
In the longer-term, additional capacity could be provided on the line by either increasing the service to a four-car train and/or increasing the linespeed of the route in order to increase the frequency of the train service. Based on the current prediction of growth, it is expected that this will be required from 2020 onwards. With the introduction of the Crossrail scheme, the bay platform at Slough will remain capable of accommodating at least a four-car train.

6.6.3 Gap 6: Freight capacity and capability (in and around London and north-south)

6.6.3.1
Freight capacity and capability was raised as a gap by stakeholders across the RUS area, specifically in and around London and for flows north to south. Concerns were raised with regard to future freight growth particularly in the London area after the completion of the Crossrail scheme with freight capability noted specifically as an issue in and around the London area.

6.6.3.2
The Freight RUS identified freight capacity requirements nationally to 2014. The Strategic Freight Network is analysing freight growth nationally beyond 2014 to both 2019 and 2030 and will consider any interventions that may be required to meet this growth. Freight capacity and capability needed to be considered in line with these existing strategies and as such no specific options to address these gaps were analysed in the Great Western RUS. However, the SFN forecasts for freight growth to 2019 and 2030 have been included, where applicable, in the analysis of other options to address other gaps. The SFN forecasts have been agreed for growth up to 2030 and these confirmed figures have been applied in the RUS analysis. The forecasts for freight growth up to 2019 are still subject to agreement and as such, the RUS has continued to use the latest estimates as assumptions for growth to 2019.

6.6.3.3
The proposed and committed schemes for development and implementation under the SFN are listed below along with an update on the infrastructure enhancements provided by the Crossrail scheme which provide improvements for freight.

6.6.3.4
The Freight RUS divided gaps into capacity and capability. For the Great Western RUS area, the capacity gap identified related to the predicted growth to 2014 (of up to six additional trains per day) in intermodal traffic on the Southampton to West Midlands route. This is driven by the gauge clearance enhancement scheme addressing the capability gap for traffic from the port of Southampton to the West Coast Main Line (WCML) via Winchester, Reading West, Coventry and Nuneaton. The increase in capacity, and the potential gap arising, is assessed later in the chapter in Option C under 6.9.3.

6.6.3.5
As stated in **Chapter 4** under committed schemes, the gauge enhancement of this route to W10 is currently underway. As a result of this enhancement, it was evident that diversionary

routes would also be required to accommodate W10 traffic. Two diversionary routes were identified and assessed, via Laverstock and Andover or via Melksham, with the route via Laverstock and Andover approved under the SFN as a committed scheme. This again, forms part of the RUS base. The route via Melksham is currently uncommitted but remains an aspiration under the SFN. A GRIP (Guide to Railway Investment Projects) stage 2 study (Pre-feasibility) is currently underway to review the diversionary route via Melksham and for an alternative diversionary route via Kew. Both options will enable a diversionary route for W10 traffic to ensure minimal disruption during maintenance, renewals and enhancement works particularly during the construction phase of the Reading Station Area Redevelopment scheme. These options are being developed as part of the Seven Day Railway initiative but also form part of the mitigation plan for the Reading scheme.

6.6.3.6
Although the base case in the Freight RUS did not identify the Southampton to WCML route as a capacity constraint, it was noted that with the predicted demand generated by the gauge enhancement, a future capacity gap could arise. The Freight RUS presented a number of options to address this for the short and long term, many of which are being addressed through other schemes:

- train lengthening opportunities are being assessed through the SFN with a GRIP stage 2 study (Pre-feasibility) currently being developed reviewing the route between Southampton and the WCML for 775 metre capability
- the Reading Station Area Redevelopment scheme provides grade separation at Reading West Jn
- Oxford Resignalling will review signalling headways between Didcot and Aynho Jn when undertaken in Control Period 5
- the Cherwell Valley resignalling scheme addressed issues between Aynho Jn and Leamington Spa
- signalling headways will be improved as part of the Banbury signalling renewals during Control Period 4. The resignalling scheme also includes modernisation of the station layout at Banbury.

6.6.3.7
A timetable assessment completed for the Freight RUS indicated that four paths per day, in each direction, were available without any subsequent enhancement work between Southampton and the WCML. The Great Western RUS has completed a revised capacity study for the Didcot to Leamington area under Gap 8 (Didcot to Wolvercot Jn performance), incorporating the latest freight forecasts from the SFN for expected growth to 2019 and 2030 along with predictions in the increase of passenger services through the introduction of IEP. The characteristics of the additional freight trains were 75mph intermodal trains at 1,400 tonnes. The results of the study proved that the predicted growth is compatible with the existing infrastructure subject to the provision of a third bi-directional line from Didcot North Jn towards Appleford (see 6.9.3 for further details).

6.6.3.8
In the longer-term, the potential reopening of the Oxford to Bletchley line could offer a routeing option for this freight flow. This is being reviewed further under the West Midlands and Chilterns RUS with a common strategy being developed with the West Coast Main Line RUS. Building on the East West Rail scheme, the East West Rail consortium is reviewing a new north-south routeing strategy between the WCML and the South Coast via Reading which could be developed, for both passenger and freight services. If freight services are further extended to Bedford, this could provide a north-south freight route from the Midland Main Line to the South Coast (subject to gauge capability for W10 traffic).

6.6.3.9
The SFN is reviewing gauge enhancements from the West Midlands to Doncaster which could potentially further enhance and enable extension of the route from Southampton to

West Midlands further north. The increase in network capability that this could provide would assist in addressing the north-south capacity gap as identified under the Great Western RUS.

6.6.3.10
For the London area, as part of the SFN there is a GRIP stage 3 study (Option Selection) reviewing the options for a London orbital route from the Channel Tunnel to the north and west of London via Redhill and Reading which can also link into north–south movements as well as those around London.

6.6.3.11
Crossrail provides W12 gauge from Acton to Maidenhead for all new and reconstructed structures or W10 as a minimum in case of difficulty. The proposed infrastructure works listed below will assist with freight flows and improve access to terminals:

- grade separation at Acton with a passenger 'diveunder' improving access/egress to/from Acton Yard
- improved grade separation at Airport Jn
- a repositioned loop at Hanwell Bridge to ease access to/from the Brentford Branch
- a repositioned fifth line between West Drayton and Iver.

6.6.3.12
The latest Crossrail service specification (Iteration 2) incorporates the specified provision of freight paths per day, in and around London, which accommodates the SFN growth forecasts of 34 paths per day to 2019 and 56 paths per day to 2030.

6.6.3.13
From the work streams currently in progress, there is evidence that the freight capacity and capability gaps into and around London and north to south are being reviewed and addressed and as such, no further interventions were proposed.

6.6.3.14
The SFN has confirmed growth forecasts for 2030 which have been agreed since the publication of the Draft for Consultation and these have been updated in the RUS. The 2019 forecasts are still being agreed, therefore the Great Western RUS has continued with the draft forecasts.

6.6.3.15
Freight capability issues across the national rail network will continue to be addressed through the SFN, with priorities being drawn together for Control Period 5 (CP5) and beyond. With the announcement of the electrification of the Great Western Main Line (GWML), it is proposed to complete where practicable, the gauge clearing works to enable W12 gauge at the same time as the electrification works. This then provides a wider scope for W12 gauge across the RUS area from London Paddington to Swansea and Reading to Newbury to complement the Southampton to WCML works already underway, along with the diversionary routes via Laverstock. The route between Swindon and Gloucester has also been proposed under the SFN as a diversionary route to be cleared to W12 gauge during CP5 however, this is subject to funding.

6.6.4 Gap 18: Earlier arrivals at key regional centres

6.6.4.1
Earlier morning arrivals for services at Plymouth (from London Paddington) and Cardiff (from Birmingham) was raised as a gap. A high level economic appraisal on the option of a new service from London Paddington to Plymouth indicated that the scheme offered a poor value for money business case.

6.6.4.2
With the Birmingham to Cardiff journey opportunity it was further clarified that the gap related to direct journeys from Birmingham New Street to Cardiff Central between 05:30 and 07:30. If the 05:42 service could be retimed to depart Birmingham New Street later and achieve a faster running time through the retimed path, the identified gap could be filled. It was therefore agreed that this was a timetabling issue to be reviewed and that the Great Western RUS should not consider it further.

6.6.4.3

With the London to Plymouth journey opportunities, a review of the travelling pattern of users was completed on the first morning services between London Paddington and Plymouth to understand who was travelling, where they were heading and what the purpose of their travel was. The results of this highlighted the focus of demand was more on local journeys specifically between Swindon and Bristol Temple Meads and between Exeter St Davids and Plymouth rather than end-to-end long distance London to Plymouth journeys. This confirmed the high levels of demand for the inter-regional connections which are further assessed under options H and L. Due to the results of the passenger survey and the limitations of the business case, the Great Western RUS did not consider this gap any further.

6.6.4.4

FGW are however developing a scheme, which is subject to Service Level Commitment consultation, and confirmation from the Department for Transport (DfT), to provide a direct early morning London Paddington to Paignton service via the Berks and Hants line. This will deliver an earlier morning arrival into Exeter, Paignton and, through a connection, Plymouth helping to address this gap.

6.7 Option definition

6.7.1

After each gap has been quantified and the issues assessed, they are then considered using a standard "toolkit" of possible solutions. The option toolkit includes a range of interventions, from the operation of longer trains within current infrastructure, re-timetabling to improve capacity, to platform extensions and the construction of additional tracks. Using the toolkit, interventions are defined and developed into proposed options to identify the next steps in the analysis.

6.7.2

A number of gaps with a degree of commonality were grouped together to form an option thus allowing the 21 gaps to be addressed by 15 defined options. The proposed options were reviewed and agreed by the SMG before further assessment commenced.

6.7.3

Figure 6.3 presents the Gap and Options matrix which provides a brief description of each of the options and includes which gaps are addressed through each option:

Figure 6.3 – Gaps and option matrix

Option	Gap addressed:
Option A: Increase capacity and improve performance on the Paddington to Reading corridor including connectivity to Heathrow Airport and also including a potential western access This option tested the requirements for lengthening services during the peak into Paddington; all day capacity and performance with and without Crossrail and Intercity Express Programme in addition to proposals for improved access from the west to Heathrow Airport	1, 2, 3, 4, 6a and 21
Option B: Lengthen services on the Reading to Gatwick Airport corridor This option tested the requirements for lengthening services during the peak into Reading specifically on the Wokingham corridor	7
Option C: Improve capacity and performance through infrastructure enhancements; Didcot – Wolvercot Jn This option tested various infrastructure enhancements to increase capacity and alleviate performance delays between Didcot and Wolvercot Jn	8

Option D: Improve connectivity and increase capacity on the West Midlands to South Coast corridor This option tests the requirements for lengthening services on the Newcastle to Reading and Manchester to Bournemouth services with alternative service provisions modelled to improve connectivity from the North to the South Coast	9
Option E: Improve capacity and performance through infrastructure enhancements; Swindon and Gloucester This option assumes double tracking between Swindon to Kemble and reviews reducing headways from Kemble to Standish Jn to improve performance and increase capacity, particularly when the route is used for diversionary purposes	10
Option F: Review service provision on the Cardiff to Portsmouth corridor This option tested the requirements for lengthening services during the peak on the Cardiff to Portsmouth route and reviewed an alternative service proposition for additional capacity and an improvement in journey times	11
Option G: Improve connectivity and increase capacity on the West Midlands to South West corridor This option tests the requirements for lengthening services on the Manchester to Bristol Temple Meads/Paignton and Edinburgh to Plymouth services with alternative service propositions modelled to improve connectivity from the North to the South West	12
Option H: Lengthen services into Bristol Temple Meads and review service proposition This option tested lengthening a number of services that operate to/from Bristol Temple Meads to alleviate on-train crowding and contribute towards the management of predicted demand	11 and 13
Option I: Improve capacity and performance through infrastructure enhancements at Bristol This option tested various infrastructure enhancements for the north, south and east approaches to Bristol Temple Meads in order to improve the performance of the station layout particularly at Bristol East Jn and increase capacity across Bristol	14
Option J: Review service proposition across Bristol to provide additional capacity and improve performance This option reviewed an alternative service proposition for cross Bristol services as a longer-term improvement to capacity, performance and connectivity	11, 13 and 14
Option K: Improve capacity and performance through infrastructure enhancements at Westbury This option tested the provision of an additional platform face at Westbury to increase capacity and improve performance around the station area	15
Option L: Increase connectivity between Exeter and Plymouth This option tested various timetable alterations for local services across Exeter and through extensions of long distance services from Bristol Temple Meads to Exeter and Plymouth	16
Option M: Improve linespeeds and change calling patterns on interurban journeys This option tested increasing linespeeds and/or changing calling patterns on a number of interurban routes in order to improve journey times	17
Option N: Improve passenger throughput at known constrained stations This option reviewed stations where passenger capacity was near to, or exceeding, the capability of the station	19
Option O: Seasonal fluctuations This option assessed supply and demand for the long distance services and for those branch lines where services are affected during the summer timetable. Capacity and operational interventions were also reviewed	20

6.8 Assessment of options

6.8.1

Each of the options has been assessed for operational and/or economic impact where applicable. Timetable and performance analysis is used to determine whether or not an option is practicable, i.e. the proposed service can actually be timetabled reliably on the network. Economic appraisals compare the revenue implications and socio-economic benefits of changes to infrastructure and/or service specifications (frequency, journey time, stopping pattern) against operating cost (Opex) changes and any capital costs (Capex) necessary to enhance infrastructure to permit such service alterations.

6.8.2

Options that have been developed to address gaps to 2019 have been subject to an appraisal which is compliant with the DfT's Transport Analysis Guidance (webTAG). Where appropriate, Benefit Cost Ratios (BCRs) are reported, which indicate the value for money of any particular scheme. A 30-year appraisal period is used for a scheme that does not require infrastructure investment. If the scheme requires infrastructure investment then a 60-year appraisal period is assumed unless specific information on the duration of the asset life is available.

6.8.3

The DfT funding criteria permits recommendation of funding through the RUS process if the BCR is at least 1.5, which is indicative of medium value for money. However, schemes involving infrastructure investment are required to offer high value for money indicated by a BCR of at least 2. However, all schemes are subject to funding being available.

6.8.4

The figures presented in this chapter result from high level feasibility work (equivalent to GRIP 0), and represent the most likely value for money based on a range of key sensitivities. Each option is presented below, detailing the scope, the process undertaken and the recommendations of the analysis. Where an option is recommended, the relevant Transport Economic Efficiency (TEE) table is provided. For options that are not recommended, the TEE tables are presented in **Appendix D**.

6.9 Option appraisal

6.9.1 Option A: Increase capacity and improve performance on the Paddington to Reading corridor including connectivity to Heathrow Airport and western access

The gaps identified relate to capacity, performance and connectivity on the Paddington to Reading corridor including service provision and western access to London Heathrow. Using the four scenarios, as presented in Figure 6.4, for the Intercity Express Programme, electrification and Crossrail, various options for capacity and service provision were reviewed.

Figure 6.4 – Scenario matrix for London services

Scenario	IEP	Electrification	Crossrail (to Maidenhead)
A	Y	N (IEP-Diesel)	N
B	Y	Y (IEP-Electric)	N
C	Y	N (IEP-Diesel)	Y
D	Y	Y (IEP-Electric)	Y

Electrification from London Paddington to Bristol/Swansea and Oxford/Newbury

IEP from London Paddington to South Wales, Bristol and West of England services

No specific options were devised to address performance as this work is being undertaken as part of the Reading Station Area Redevelopment scheme which addresses current issues on the main line substantially improving performance (predicted output is a 37 percent improvement in train delay minutes) and capacity (125 percent improvement on through line platform capacity). Any recommendations made to capacity and service provision should also, in effect, improve the performance of the services.

As part of the analysis a number of assumptions were made on schemes with which the Great Western RUS interfaces. The RUS assumes that the Paddington station remodelling scheme will deliver the necessary infrastructure changes to accommodate IEP and that London Underground Limited's (LUL) proposals will address station capacity issues with their proposed service revision.

With regards to timetables, the RUS analysis used the IEP service specification (January 2008) as per the DfT's Invitation to Tender (ITT) documentation with the Crossrail Iteration 1 timetable. The following assumptions were made:

- prior to Crossrail: all non-IEP services continue as now
- post Crossrail: two outer suburban trains per hour to London Paddington
- Heathrow Express continues as now (four fast trains per hour).

Although, the service specification of IEP is uncommitted, the proposal has been used for the purpose of analysis under the RUS. It is recognised that this is subject to change, and further detailed assessments will be completed in line with the predicted freight forecasts to ensure all services can be accommodated.

The RUS analysis focused on what the capacity provision of these proposed services would be and how this fitted with predicted demand and, where possible, reviewed the timetable structure to understand how this affected both capacity and connectivity. Scenario A and B focused upon the pre-Crossrail world, with the main difference being electrification under scenario B as this will affect whether bi-mode or electric IEP trains would be used (electric trains provide significant additional seating capacity). Scenario C and D included Crossrail but was with and without electrification beyond Maidenhead. The results and analysis for each scenario are summarised below.

6.9.1.1 Scenario A and B

Analysis shows there is sufficient on-train capacity to meet passenger demand and forecast growth to 2019 on Long Distance High Speed services (LDHS) with IEP (either diesel or electric). However, on-train crowding on the inner suburban services (Oxford to London Paddington (stopping), Greenford to London Paddington and Heathrow to London Paddington) is predicted to get worse by 2019. To maintain the current load factor in 2019 on these services, approximately 1200 extra seats would be required across the morning peak period.

A sensitivity test to change the service provision on the inner suburban services was undertaken to see whether this addressed on-train crowding. This considered replacing the current Greenford to London Paddington services with two-car Greenford to West Ealing shuttles plus an additional two trains per hour from West Drayton to London Paddington (five cars) with current Heathrow Connect (two trains per hour) continuing as now. The results showed an average ratio of passengers to seats of less than 90 percent across the three-hour peak which would address identified capacity problems.

Following the commitment to both Crossrail (July 2008) and electrification (July 2009), scenarios A and B become obsolete and therefore the options were closed. The RUS therefore focused on scenarios C and D.

6.9.1.2 Scenario C and D

Analysis shows there is sufficient on-train capacity to meet passenger demand and forecasted growth to 2019 on both Long Distance High Speed services, outer and inner suburban services with the implementation of IEP (electric) and Crossrail. The IEP and Crossrail service propositions were reviewed with a number of revisions modelled. Under the IEP specification (January 2008), there was a reduction in calls at Twyford and Maidenhead. The RUS reviewed the option of operating Didcot Parkway to London Paddington shuttles to improve connectivity and provide a relief line stopping service as far as Maidenhead; which then ran fast lines to London Paddington.

A further sensitivity was undertaken on the level of demand at Twyford and Maidenhead to assess whether this change in supply under the IEP specification would meet future requirements. The results showed sufficient on-train capacity at Maidenhead to meet demand in the morning peak provided by the current level of service. In the future, demand will be catered for by the proposed four trains per hour Crossrail service. Connectivity from Twyford proved sufficient for demand to at least 2019 under the current IEP specification.

The RUS completed a high level review of the Crossrail proposition which included extending Crossrail from Maidenhead to Reading and operating additional through peak hour trains from Bourne End and Henley to London Paddington. The commitment to the electrification of the Great Western Main Line, west of Maidenhead, provides the opportunity for the extension of Crossrail services to Reading which will bring significant benefits, by giving the wider Thames Valley direct rail access to central London and the city while also creating extra capacity at London Paddington for longer distance services. This is achieved through the removal of the residual diesel services which provided the service between Reading and intermediate stations. The extension of Crossrail would also reduce the infrastructure requirements for the scheme at Maidenhead and Slough. The DfT and Transport for London, as scheme sponsors, are reviewing the costs and benefits of this option. The possible electrification of the branch lines in the Thames Valley will also be reviewed in addition to some short sections of the route in West London to provide connectivity between freight lines.

Electrification will enable the current Thames Valley suburban services into London Paddington to be operated by electric trains instead of the existing diesel trains. It is proposed that existing Thameslink four-car electric trains be transferred onto the GWML, replacing the current two and three-car diesel trains, when the new Thameslink fleet is introduced. These vehicles can operate up to 100mph and provide additional capacity. It is planned that suburban services between Oxford, Reading and London Paddington will be operated with these vehicles by the end of 2016.

Heathrow Airport already benefits from an electrified rail link to London but passengers from the west are required to change trains or use coach links to the airport. A recent study commissioned by local authorities in the Thames Valley identified a potential case for direct rail access to the airport from the west, particularly from Slough, Maidenhead and Reading. One of the constraints identified was the lack of electrification on the GWML to support services from Heathrow Airport. The commitment to electrification will have a positive impact on the case for western rail access to Heathrow Airport and will continue to be assessed.

A comparison of the SFN forecasts with the provision of freight paths in the Crossrail timetable proved sufficient to accommodate predicted growth to at least 2030. The SFN forecasts 34 paths per day to 2019 and 56 paths per day to 2030. The Crossrail Access Option requires that there should be 69 westbound and 73 eastbound freight paths per day; with the current Crossrail timetable (Iteration 2) meeting this requirement.

Further to the RUS analysis of capacity and service provision with IEP and Crossrail, the capacity at Paddington station emerged as an issue with regards to track and platform capacity in the station area. This occurs from the potential mix of services which will operate post 2016 with Heathrow Express, IEP, Crossrail and residual diesel services. Early evaluation to determine the number, and length, of platforms that will be required has been completed and concludes that up to 15 long platforms will be required in the station area suitable to accommodate IEP, Heathrow Express, Crossrail and residual diesel services. This will be aligned with any necessary infrastructure enhancements of the approaches into the station area to accommodate the increase in services and depot connections with the proposed IEP depot at North Pole.

During the course of analysis under this RUS, further timetable specifications were produced revising both the IEP and Crossrail timetables. These were being developed simultaneously by the established project teams for each of these schemes. As such, many of the recommendations that would have been proposed in the RUS have been accommodated in the revised service propositions.

With the uncertainty, fluidity and changing base of the RUS (particularly for the Thames Valley area) the SMG agreed that no further work should be undertaken by the Great Western RUS for this option and that it should be remitted to the individual project teams established to manage and coordinate these schemes. Further details on the developments of IEP, Crossrail and connections to airports are provided in **Chapter 9** a longer-term view.

6.9.2 Option B: Lengthen services on the Reading to Gatwick Airport corridor

On-train crowding for services into Reading station was identified as a gap through the baseline analysis. Load factor forecasts to 2019 (as presented in **Chapter 5**) identified that the Wokingham and Basingstoke corridors would still experience passenger to seat ratios of over 100 percent on arrival at Reading during the high-peak hour (08:00-08:59). As part of the HLOS response to the Request for Proposal by the DfT, FGW has proposed additional vehicles on the Basingstoke corridor which will address issues of on-train crowding on the suburban service. Crowding will remain on the long distance services and is addressed through option D (see 6.9.4).

On the Wokingham corridor, under FGW's HLOS proposal, the two-car service currently operating between Redhill and Reading will be lengthened to three cars. A sensitivity test which included the proposed AirTrack service was completed to see whether the implementation of AirTrack would resolve the predicted crowding in 2019 on this corridor. This analysis confirmed that there would still be a capacity issue in particular with regard to three morning peak hour services from Guildford.

The option for providing additional capacity into Reading through train lengthening was considered. Economic appraisal work was undertaken on the proposal to lengthen the three morning peak hour services from the Guildford line into Reading, by one extra vehicle, with two services providing a sufficient BCR of greater than 1.5. However, this proposal relied upon the attaching and detaching of an additional vehicle to form a four-car unit for the peak period only. This was deemed an unrealistic assumption and would in practice be inoperable. A sensitivity test of operating the additional unit throughout the day was appraised, however due to the increase in operational cost, it produced poor value for money and the option was discounted.

Taken with the knowledge that other stations on the North Downs line experience overcrowding, a review of the entire route from Reading to Gatwick Airport was undertaken. From this, it was evident that four Reading to Gatwick Airport services could benefit from train lengthening, two in each direction.

The option reviewed lengthening these three-car services by two cars each. This was considered operationally viable due to the ability to be able to detach and reattach a two-car unit. The additional units would then only operate during the peak periods, addressing the capacity gap, and could be stabled or deployed elsewhere during the off-peak. Other potential uses for the rolling stock are also available during the inter-peak but these have not been included in the analysis. The revised appraisal for this option provides a medium value for money scheme and can therefore be recommended as a way to relieve crowding on the service. Figure 6.5 presents the transport economic efficiency table for this option. This option has no impact on freight services.

A number of the platforms on the route are only capable of accommodating three or four-car trains and therefore Selective Door Opening (SDO) would need to be deployed to make the service operationally practical. It is recognised that the operation of the four additional vehicles, should they be fitted with SDO, would not be compliant with the rest of the fleet and therefore an operational solution would need to be found.

Figure 6.5 – Transport economic efficiency table for lengthening the Reading to Gatwick Airport service

30-year appraisal	**£million (2002 PV)**
Costs (present value)	
Investment cost	0.0
Operating cost	8.7
Revenue	-2.8
Other government impacts	0.6
Total costs	**6.5**
Benefits (present value)	
Rail users' benefits	9.6
Non-users' benefits	1.1
Total quantified benefits	**10.7**
NPV	**4.2**
Quantified BCR	**1.7**

The Sussex RUS analysed peak arrivals into Gatwick Airport and recommend the lengthening of one peak service by one-car, however it was acknowledged that this recommendation was subject to further analysis undertaken by the Great Western RUS. The Great Western analysis has since reviewed every service on the North Downs route and concludes that there is a business case to lengthen four Reading to Gatwick Airport services (two in each direction) by two cars and it is not operationally viable to lengthen them by one car only. This therefore supersedes the train lengthening recommendation in the Sussex RUS.

During the Sussex RUS Draft for Consultation further analysis was undertaken to review the extension of services from Redhill to Gatwick Airport which is a requirement of the Greater Western Franchise. The potential remodelling at Redhill in CP5 would enable through services to operate to Gatwick Airport on a more ordered pattern of service, facilitating the existing franchise commitment of providing two trains per hour to Gatwick Airport. A positive business case to extend these services would facilitate an improvement to service frequency on the route between Reading and Gatwick Airport. However, at present, no case can be found to extend the remaining 14 North Downs services which terminate at Redhill through to Gatwick Airport. Timetabling work demonstrated that with the additional platform at Gatwick Airport (allowing some Gatwick Express services to be diverted away from Platforms 1 and 2); up to nine of the 14 trains could be extended through to Gatwick Airport (all in the off-peak). However the case for the extension of these services is undermined by long dwell times at Redhill as reversing services await a path to the Brighton Main Line. The recommended additional platform at Redhill in the Sussex RUS was also tested as part of the infrastructure required for this specific service extension but this only delivered two further through paths over and above the nine identified. A number of further timetable options were tested which included re-timing services from Reading to reduce dwell time at Redhill and removing stops between Guildford and Redhill again to provide optimal presentation time at Redhill. However, none of these options provided a viable service proposition. The Sussex RUS does however recommend that the second hourly service to Gatwick Airport from the North Downs line should be included as an option in the post-Thameslink timetabling work on the Redhill corridor as many of the timetable issues could be resolved through a recast on the Brighton Main Line and Redhill corridors.

6.9.3 Option C: Improve capacity and performance through infrastructure enhancements; Didcot to Wolvercot Jn.
The process started with a review of the baseline analysis whereby performance between Didcot and Wolvercot Jn was identified as a pinch-point for reactionary delays (**Chapter 3**) and classified as a gap. Through quantification of this gap, the main cause of delay was identified as being due to lost paths following late running trains. Specifically at Oxford, the analysis showed delays occur due to lost paths when regulated for other late running trains and awaiting platform allocation and station congestion.

As options to improve the performance gap between Didcot and Wolvercot Jn, the following five infrastructure enhancements were proposed:

1. Four tracking between Radley and Oxford
2. Four tracking between Oxford and Wolvercot Jn, redoubling Wolvercot Jn, and the route to Charlbury
3. Grade separation at Didcot East and construction of an Up Avoider platform
4. Extend and convert to passenger status the up goods loop at Didcot Parkway
5. Extend Didcot North Jn towards Appleford creating a four track section.

These schemes were modelled in Railsys (a simulation model comparing proposed infrastructure against a given timetable) to understand and quantify the reliability benefits that could be achieved by the enhancements. Option 1 provides additional tracks between Oxford and Radley. This is achieved through extending the down relief line to connect with the down goods loop and through to reception no.1, and through the extension of the up loop from Hinksey North Jn to Hinksey South Jn and onto Radley. Option 2 constructs a four track section north of Oxford station by extending the down goods loop to Wolvercot Jn, redoubling the junction and double tracking between Wolvercot Jn and Charlbury.

Through the Railsys model, both options 1 and 2 highlighted constraints at Oxford station due to the capacity constraint and routeing limitations available with the current layout and number of platforms. Both schemes improved performance into, and out of, Oxford but any benefit derived was eradicated by the capacity constraints at the station. As such, a theoretical future layout revising Oxford station was produced (see **Appendix E**). The revised layout was designed to accommodate IEP and future growth as well as taking cognisance of other known initiatives for the area with the south facing bay platform, Chiltern Railways half hourly Oxford to London Marylebone service and the aspiration for East West Rail. The proposal for the IEP services currently involves the splitting of a 10-car train into two five-car sets at Oxford to create shorter trains to serve specific routes, e.g. one five-car set would go forward to the Cotswolds line whilst the other five-car set may return to London.

It is noted that there are continued capacity constraints to the north of Oxford, as the route continues onto Birmingham. The implications of this are being addressed by the West Midlands and Chiltern RUS.

Options 1 and 2 were re-modelled in Railsys against the theoretical Oxford station layout to assess any potential benefits. The economic appraisal demonstrated that the combined option of options 1 and 2, against the theoretical station layout, provided greater benefits when undertaken as a package. This appraisal did not however include the further benefits available from the additional capacity for passenger and freight, opportunities for journey time improvements or any changes in operational expenditure all of which can enhance the business case. The RUS therefore concludes that the constraint is at Oxford station and recommends that the current Oxford Station Area Redevelopment scheme, in conjunction with the proposed Oxford resignalling and electrification, consider the wider strategic benefits of capacity, journey time enhancements, Seven Day Railway initiatives and performance that can be achieved through wider ranging improvements at Oxford station. The most optimum solution for the station layout can then be identified and developed.

Option 3 proposed a new flyover at Didcot East Jn with a new platform on the Up Avoiding line. This would eliminate conflicting moves at Didcot East Jn through grade separation of the junction. However, the Railsys output showed minor improvements to performance due to the grade separation being undertaken at Reading West Jn as part of the Reading Station Area Redevelopment scheme. As a committed scheme, this forms part of the RUS baseline and is included in the model layout in Railsys. The grade separation between Oxford Road Jn and Reading West Jn will enable freight services to cross onto the relief lines avoiding any conflict with the main lines. This removes further conflicting moves at Didcot East Jn. As such, the implementation of another flyover at Didcot East Jn would produce marginal benefits. The scheme offers poor value for money and is therefore not recommended. The transport economic efficiency table for this option is presented in **Appendix D.**

Option 4 reviewed extending the up goods loop from east of Steventon to connect with the up relief line. The line would be converted to passenger status and would enable slower services to be removed from the main lines. The operational impact of the scheme offered a small improvement to reliability. Due to the minimal performance benefits, this option was not taken any further.

Option 5 extends Didcot North Jn towards Appleford creating a four track section. This presented a performance improvement through the separation of non-stopping services via the Didcot Avoiding lines with services running more slowly to and from Didcot West curve. These benefits were captured in the business case and with the cost of the renewal (scheduled for Control Period 4) of Didcot North Jn included in the appraisal, the enhanced scheme generated a sufficient BCR for further development work to be undertaken during the consultation period. The transport economic efficiency table for this option is included in **Appendix D**.

From the appraisals of the aforementioned schemes, it became apparent that given the improvements in performance over the last year, the options produced marginal benefits. The baseline analysis undertaken for the RUS used performance data from 2006/07 and 2007/08 and it was from here that the pinch-point of Didcot was evident and quantified as a gap. However, since this analysis was undertaken, there has been a substantial improvement in performance in the Great Western RUS area and this is predicted to continue with the metrics to be delivered during CP4. The Railsys model also included the committed schemes that form the Great Western RUS base and with the Reading Station Area Redevelopment scheme and the Cotswold line redoubling scheme significantly improving the performance of the area, any further benefits are minimal.

Performance is, and always will be a moveable target, which has recently improved considerably. It is therefore considered that performance around the area of Didcot is no longer a key concern for the route and will remain under control. To quantify this, the baseline analysis was rerun using the 2008/09 data and presented a 27 percent improvement in performance specifically in this area compared with the baseline analysis from 2006 – 2008. Issues that now arise result from secondary delays, and the inability to recover performance by train regulation due to the lack of infrastructure capacity in the area.

The gap was therefore further analysed for capacity purposes, and with the introduction of IEP and expected growth in freight traffic, a capacity analysis was undertaken for the area to assess how the current infrastructure could accommodate such growth.

The current forecasts from the Strategic Freight Network for the Didcot to Oxford route present substantial growth to 2019 and 2030, primarily in intermodal traffic from the port of Southampton to the West Coast Main Line which is predominantly due to the current gauge enhancement scheme underway. The number of trains predicted per day in each direction is 25 to 2019 and 39 to 2030. These are incremental to today's figures.

With the proposed freight forecasts, equating to one additional freight train per hour in each direction to 2019 and two additional freight trains per hour to 2030, the 2019 and 2030 scenarios were modelled to include the additional freight with the proposed IEP service specification (January 2008). This involved the replacement of the December 2008 fast passenger services between London Paddington, Oxford and the north Cotswold line with the proposed IEP timetable with all other services timetabled around this. The characteristics of the additional freight trains were 75mph intermodal trains with a 1,200 tonnes trailing load with a sensitivity test of 1,600 tonnes.

The results of the capacity study proved that the additional freight forecasted with the increase in services following the introduction of IEP could be facilitated on the current infrastructure subject to the following enhancements:

- Didcot North Jn to Oxford: a bi-directional line between the junction and Appleford crossing
- Oxford station: revised layout sufficient to accommodate IEP and freight growth
- a review of freight regulation points at Leamington Spa (in line with the SFN and West Midlands and Chiltern RUS).

With the infrastructure at Didcot North Jn raised again through the capacity study (further to option 5 identified for performance improvements), options for the layout were reviewed in order to achieve the optimum solution for both capacity and performance improvements along with the Seven Day Railway initiative. The preferred option was to incorporate an enhancement to the junction with the planned track renewal in 2012. However, following an engineering review it became evident that it is not feasible to provide an additional line bypassing the junction due to the limited land available and the curvature of the junction. It would also be difficult to relocate the junction, again because of land issues and the close proximity of a footbridge.

Alternative options were therefore reviewed with the most practical solution being the provision of a dynamic loop on either side of the main lines between Didcot North Jn and Appleford, to be used by passenger or freight services whilst retaining access to Appleford sidings. Both loops would be designed to accommodate trains of 775 metres length. However, this option would be completed independently of the planned renewal of the junction which will continue in CP4 and the renewal savings would not be able to be captured in the business case.

This option has been further evaluated during the consultation period of the RUS, to quantify the capacity, performance and Seven Day Railway benefits through timetable and performance modelling. The scope of the option was reviewed which determined that a dynamic loop on the up line only between Didcot North Jn and Appleford Crossing would be the optimum solution to enable freight to continue to access Appleford sidings with the proposed increase in passenger services under the IEP service specification. The IEP specification used for analysis increased the number of passenger services between Didcot and Oxford from the current two trains per hour to three trains per hour. It is this increase in passenger services that drives the requirement for additional infrastructure. The existing level of passenger services, with the predicted level of freight growth, can be accommodated on the current infrastructure. The loop is therefore only required should passenger services increase above two trains per hour.

During the course of this analysis, a revised IEP specification was issued (August 2009) which maintained the current passenger service level of two trains per hour. With the uncertainty of the final service specification for IEP and with the confirmation that the infrastructure requirement is dependant on the level of IEP services, the SMG agreed that the gap should be closed under the RUS and that the option becomes an IEP led proposal. As such, it should be managed by the IEP project as a potential enhancement required dependant on the final IEP specification.

6.9.4 Option D: Improve connectivity and increase capacity on the West Midlands to South Coast corridor

On-train crowding was highlighted as an issue on the Manchester to Bournemouth and Newcastle to Reading services. CrossCountry undertook passenger counts in May 2009 which have been assessed and appraised for any train lengthening opportunities. Projections to 2019 have been produced using the Network RUS growth forecasts for the CrossCountry services under the global responsibility scenario (the highest scenario presented). The results below incorporate the Edinburgh to Plymouth and Manchester to Bristol Temple Meads/Paignton services as identified under option G: Improve connectivity and increase capacity on the West Midlands to South West corridor (6.9.7). The remaining interurban corridors of Birmingham to Stansted Airport and Nottingham to Cardiff are being assessed by the East Midlands RUS and the West Midlands and Chilterns RUS respectively.

Load factor analysis of the current situation and that predicted to arise in 2019 with forecast growth has enabled a business case to be developed for additional vehicles. The business case includes the benefits of crowding relief to passengers and estimates the revenue impact of releasing suppressed demand. Various mileage scenarios were modelled based on the May 2009 train diagramming requirements, with the assumption that these can be further optimised in the future. Figure 6.6 presents the number of additional vehicles in traffic that the business case can support for each of the corridors under the following scenarios:

- One return trip per day (theoretical minimum number of trips made by the lengthened train. For example, the service will run Manchester to Bristol Temple Meads and back again in one day. In practice, the train is likely to operate on the network throughout the day as shown in today's diagrams)
- One day diagram (using the current CrossCountry weekday May 2009 diagrams. For example, the Bournemouth to Manchester service runs to Manchester but then runs a return trip to Exeter and then forms a Manchester to Birmingham service. The rolling stock ends in Birmingham and is stabled overnight at Birmingham)
- Two day diagram (provides similar routeings as the one day diagram but over a two-day period for example, the Edinburgh to Plymouth service will run Edinburgh to Plymouth on day one and then runs Plymouth to Edinburgh on day two).

Figure 6.6 – Additional vehicles by corridor

	Mileage Scenarios		
Corridor	**One return trip per day**	**One day diagram**	**Two day diagram**
Edinburgh to Plymouth	9	9	6
Manchester to Bournemouth	9	7	2
Manchester to Bristol Temple Meads/Paignton	1	1	0
Newcastle to Reading	0	0	0
Total	**19**	**17**	**8**

Figure 6.7 – Transport economic efficiency table for train lengthening

30-year appraisal	£ million (2002 PV)		
	One return trip per day	One day diagram	Two day diagram
Costs (Present Value)			
Investment Cost	0	0	0
Operating Cost	134	123	58
Revenue	-47	-45	-25
Other Government Impacts	9	9	6
Total costs	**96**	**87**	**39**
Benefits (Present Value)			
Rail users' benefits	213	201	120
Non-users' benefits	22	21	13
Total quantified benefits	**235**	**223**	**133**
NPV	**139**	**135**	**94**
Quantified BCR	**2.5**	**2.5**	**3.4**

With these assumptions, the additional number of vehicles in traffic that the business case can support ranges from eight to 19 depending on the scenario. The final number of vehicles required will therefore be dependant on the ability to optimise future train diagrams. Figure 6.7 presents the transport economic efficiency table for this option.

To improve connectivity, and assist with capacity issues to the South Coast, the Great Western RUS has reviewed the option of extending the current Newcastle to Reading service to Southampton and/or Bournemouth. A high level economic appraisal was conducted which proved that extending to the South Coast would provide sufficient value for money for further consideration. The business case was stronger for the option of Southampton rather than Bournemouth (as it required less rolling stock) and therefore the RUS analysis focused on Southampton and would have reviewed the option to Bournemouth should this have been deemed inoperable.

A notional timetable was used for an hourly and two-hourly extension from Reading to Southampton, assuming that the paths north of Reading were fixed. Both options were assessed against the December 2009 timetable to identify any conflicts with the existing passenger and freight services. The hourly option produced a large number of conflicts with existing freight services and empty coaching stock and in order to enable all services to operate as now, a significant amount of infrastructure would be required. This option was therefore discounted due to the business case being unable to support the level of capital expenditure required.

The two-hourly option, providing an additional six trains per day in each direction between Reading and Southampton proved to be operationally feasible on current infrastructure. This was further assessed against the proposed freight growth as per the SFN forecasts to 2019 and 2030 to understand if this level of service for passenger and freight operators could be

accommodated on the current infrastructure or whether any interventions would be required. The analysis proved that the extension of the passenger service would not compromise predicted future freight growth to 2030 and that all services could be accommodated on the existing infrastructure.

The freight growth on the route is expected to be in intermodal traffic with a maximum speed of 75mph. Although initial analysis was based on current traction and loadings (up to 1,200 tonnes, hauled by Class 66 locos), sensitivity tests indicated that 1,400 tonne trains could be operated. However, increasing the load further (to 1,600 tonnes) would not be possible for every train and in particular northbound trains with 1,600 tonne loads would need to be restricted to overnight departures from Southampton unless either enhanced infrastructure were provided between Steventon and Worting Jn (on the South West Main Line west of Basingstoke) or more powerful traction were employed, this being either double-heading the locomotives or the use of a higher powered class of locomotive.

The RUS therefore recommends the option of a two-hourly extension of the Newcastle to Reading service to Southampton subject to performance modelling of the proposed service extensions in the Basingstoke station area and on the route between Worting Jn and Southampton Central. The results of the economic appraisal are presented in Figure 6.8.

The London and South East RUS is considering the impact of additional services in the South Hampshire area and this RUS recommendation will be included as part of the analysis.

Figure 6.8 – Transport economic efficiency table for proposed service extension to the South Coast

30-year appraisal (without any capital expenditure)	**£million (2002 PV)**		
	Hourly extension to Southampton	**Two-hourly extension to Southampton**	**Hourly extension to Bournemouth**
Costs (Present Value)			
Investment Cost	0	0	0
Operating Cost	58	30	89
Revenue	-30	-19	-43
Other Government Impacts	6	4	9
Total costs	**33**	**15**	**55**
Benefits (Present Value)			
Rail users' benefits	75	48	114
Non-users' benefits	11	7	17
Total quantified benefits	**87**	**55**	**131**
NPV	**53**	**40**	**76**
Quantified BCR	**2.6**	**3.8**	**2.4**

Alternative sensitivities were also tested on the Newcastle to Reading service to assess whether a change in the service routeing will assist issues of capacity and improve connectivity. The sensitivities below have been modelled against the current service routeing (Newcastle – Doncaster – Solihull – Reading) and the extension of this service to Southampton to initially understand any additional vehicles that may be required to support demand over and above those already identified in the above capacity analysis.

The following sensitivities have been applied to both the current and extended service proposition:

1. Newcastle to Reading via Leeds (instead of Doncaster)
2. Newcastle to Reading via Birmingham International (instead of Solihull)
3. Newcastle to Reading via Leeds and Birmingham International.

The analysis for sensitivity 1 has been undertaken as part of the Yorkshire and Humber RUS. This work suggested that the re-routeing via Leeds has a high value for money business case based on the assessment carried out, and demonstrated no unusual practicality or funding issues. On this basis it would normally have been recommended for inclusion in the strategy. However, the option was found to be heavily dependent on other industry processes including HLOS, the development of the East Coast Main Line regular interval timetable, and the wider socio-economic impacts that are not assessed under the RUS process. It was therefore concluded that the rerouteing option would need to be developed in more detail through other industry processes, and it is not anticipated that any of the geographical RUSs will consider this issue in any further detail.

Sensitivities 2 and 3 have been undertaken during the Great Western RUS consultation process with initial results based on the demand effects estimated by MOIRA (a computer system designed to predict how changes to the planned timetable will affect passenger demand for rail). The full appraisal will be presented in the West Midlands and Chiltern RUS and will include any infrastructure intervention costs which may be required to accommodate all services on the Leamington – Coventry – Birmingham New Street corridor.

High level demand analysis on the existing Newcastle to Reading service extended to Southampton, and the existing Newcastle to Reading service routed via Birmingham International and via Birmingham International and Leeds shows increased train loadings specifically at Coventry, Birmingham International and Birmingham New Street. However, the existing rolling stock used on the Newcastle to Reading service proves sufficient to accommodate this demand with no additional vehicles required. The rerouteing also creates more journeys from Leeds to Birmingham and Coventry but the existing supply of the Newcastle to Reading service provides sufficient capacity to meet this demand. One of the main benefits apparent from the rerouteing of the service via Leeds would be to relieve crowding on the existing Edinburgh to Plymouth services. This is achieved by passengers switching to the Newcastle to Reading services which are less crowded with sufficient capacity to accommodate demand throughout the day. In summary, the rerouteing options do not change the number of additional vehicles supported by the business case as presented in Figure 6.7.

The West Midlands and Chiltern RUS will develop this analysis further by undertaking a detailed timetable study for these routeings to assess track capacity and timetable availability. The full results, including the economic appraisal, will therefore be presented in the West Midlands and Chiltern RUS.

6.9.5 Option E: Increase capacity and improve performance through infrastructure enhancements; Swindon to Gloucester

Performance issues between Swindon and Gloucester were acknowledged through the baseline analysis. The Swindon to Kemble redoubling scheme (as discussed in **Chapter 4**) is a scheme currently being progressed to GRIP stage 4 (Single Option Development) which could assist in addressing this performance issue and is included in the RUS baseline. Although there is currently no funding commitment for its implementation, the RUS is aware of the South West Regional Development Agency's bid for £20 million as a contribution to their short-term commitments for regional funding.

Swindon to South Wales via Gloucester is also a key diversionary route when the Severn Tunnel is closed; this not only contributes to poor performance on the route but also constrains current and future capacity. This was further acknowledged by the train and freight operators as part of the western route consultation on the Seven Day Railway initiative.

The Great Western RUS built on the proposed redoubling scheme and reviewed what infrastructure requirements would be necessary to increase the capacity of the route to enable the operation of four trains per hour to accommodate future growth and for diversionary purposes. These consist of:

- an hourly passenger train (either local or high speed service) between Swindon and Cheltenham Spa calling at Kemble, Stroud, Stonehouse and Gloucester. (From 2016 this will be replaced by IEP with a proposed hourly London Paddington to Cheltenham service)
- an hourly freight service operating between Swindon (Loco Yard) and Gloucester Yard Jn (assumed a Class 6 with 2,000 tonnes trailing load)
- two London Paddington to South Wales high speed services diverted when the Severn Tunnel is closed.

A timetable model to accommodate this level of service was completed and concluded that with the resignalling works under the Swindon to Kemble scheme, four additional signals would be required (two in each direction) between Stonehouse and Standish Jn to provide improved headways along this route and allow the four services to operate. This would deliver both capacity and performance gains. The potential for a new North Swindon station and a turn back facility at Kemble were also included in this analysis. The feasibility of the scheme is being developed with GRIP 4 expected to be completed by summer 2010. It has been recognised that the incremental enhancement of the additional signals is necessary for the capacity improvements and this has since been combined with the Swindon to Kemble redoubling scheme. The scheme will therefore deliver both the performance and capacity improvements when delivered in 2012.

6.9.6 Option F: Review service proposition on the Cardiff to Portsmouth corridor

On-train crowding on the South Wales to South Coast services was identified as a gap, with two affected service groups: Cardiff to Portsmouth and Bristol to Weymouth. Capacity was assessed on these service groups throughout the day with a comparison of winter and summer months to understand any impact of seasonality.

For the Cardiff to Portsmouth service, using counts from November 2008 and predicting growth forward to 2019, three services in each direction during the morning and evening peak will have more passengers than available seats. For the Bristol to Weymouth service, one service in each direction in each peak was identified with on-train crowding.

The first stage of the option appraisal reviewed train lengthening as a short-term solution to meet the current and expected levels of demand. The results of this analysis are presented under option H: Bristol capacity (see 6.9.8). In summary, there is a case to lengthen five morning and evening peak hour services on the Cardiff to Portsmouth corridor.

As a longer-term option for the Cardiff to Portsmouth service, a change in the service proposition was reviewed to address on-train crowding and improve journey time which was identified as an interurban route under Gap 17 (see option M under 6.9.13). A service proposition was developed which involved removing several stops from the existing service and introducing an additional local stopping service for one peak morning service and one peak evening service. This therefore provided a means of addressing the capacity issues and also enabled the principal service to achieve improved journey times. Economic appraisal showed that this option provides high value for money, as presented in Figure 6.9, when taken with the potential train lengthening business case (option H under 6.9.8). The economic appraisal presented in Figure 6.9 assumes that the additional vehicle is available from Option H in order to operate the additional local stopping service and therefore its vehicle leasing cost is not included again. Figure 6.9 represents an incremental BCR above Option H and it reports the benefits of improved journey time and the additional staffing costs. The RUS recommends that this proposal is implemented. This option has no impact on freight services.

Network Rail has also established a joint Cardiff to Portsmouth Route Improvement Project Group with FGW to focus on this service group and derive initiatives to help improve performance. The group will review possible changes to the service proposition towards Portsmouth with a view to possible journey time savings across the route as a whole.

Figure 6.9 – Transport economic efficiency table for revised service proposition of the Cardiff to Portsmouth service

30-year appraisal	**£million (2002 PV)**
Costs (present value)	
Investment cost	0.0
Operating cost	2.5
Revenue	-1.3
Other government impacts	0.3
Total costs	**1.5**
Benefits (present value)	
Rail users' benefits	2.4
Non-users' benefits	0.6
Total quantified benefits	**3.0**
NPV	**1.5**
Quantified BCR	**2.0**

6.9.7 Option G: Improve connectivity and increase capacity on the West Midlands to South West corridor

On-train crowding has been highlighted as an issue on the Edinburgh to Plymouth and Manchester to Bristol Temple Meads/ Paignton services. CrossCountry undertook passenger counts in May 2009 which have been assessed and appraised for any train lengthening opportunities. The results for these services are presented under 6.9.4 option D: Improve connectivity and increase capacity on the West Midlands to South Coast corridor.

A change to the service proposition of the Manchester to Bristol Temple Meads service was assessed, through extending this service to Exeter St Davids and/or Plymouth to improve connectivity (identified under gap 16 Exeter to Plymouth) and to potentially assist in crowding relief for the Edinburgh to Plymouth service. The results of this are presented later in this chapter under 6.9.12 option L.

This option has no impact on freight services.

6.9.8 Option H: Lengthen services into Bristol Temple Meads

The option to increase peak capacity into Bristol Temple Meads (BTM) by train lengthening was devised from the baseline analysis and load factor predictions to 2019 (with predicted growth at Bristol Temple Meads as presented in **Chapter 5**). More peak services will have passengers standing either close to, or above, total capacity (this includes seat and standing allowances). A business case for providing additional vehicles has been developed using 2007/08 passenger counts and the RUS passenger forecasts to 2019. Train lengthening is considered as a short-term solution to address crowding issues with a longer-term solution of changing the service frequency examined and presented under option J in 6.9.10.

As part of their response to the Request for Proposal for HLOS, FGW propose deployment of 12 additional vehicles as one of the options to enable train lengthening on a number of routes in the West of England. This proposal has been included in the RUS analysis as the HLOS forms part of the RUS base as a committed scheme. The assessment has therefore reviewed train lengthening over and above the HLOS proposal, to identify the number of additional vehicles that would be required to accommodate demand on each corridor.

Analysis shows that there is a business case to lengthen 11 trains in total across the morning and evening peaks (07:00 to 09:59 BTM arrivals and 16:00 to 18:59 BTM departures) which in total adds 17 additional vehicles in both peak periods. As a number of the additional vehicles will operate in both the morning and evening peaks, the business case supports nine additional vehicles in traffic in order to strengthen these services.

Figure 6.10 presents the number of additional vehicles recommended per corridor combined for the morning and evening three-hour peak periods with the expected ratio of passengers to total capacity before and after the enhancement. This shows that train lengthening on the Cardiff to Portsmouth and Cardiff to Taunton corridor provides high value for money. For the Gloucester to Westbury corridor, demand is concentrated in the morning high-peak hour with a predicted passenger to seats ratio of 120 percent and a total capacity ratio of 95 percent in 2019 before the enhancement.

Train lengthening is recommended for the Gloucester to Westbury corridor subject to a review of the expected growth as a result of the relocation of Ministry of Defence employees to Filton Abbey Wood in 2011.

Figure 6.10 – Additional vehicles by corridor across the morning and evening peak (07:00 to 09:59 Bristol Temple Meads arrival and 16:00 to 18:59 Bristol Temple Meads departure)

Corridor	Number of lengthened services	Number of additional vehicles 2019/20	BCR	Ratio of passengers to total capacity without enhancement	Ratio of passengers to total capacity with enhancement
Cardiff to Portsmouth	5	9	2.8	100%	85%
Cardiff to Taunton	4	6	2.5	110%	80%
Gloucester to Westbury	2	2	1.9	70%	50%
Total	**11**	**17**			

The Great Western RUS therefore recommends the lengthening of 11 peak trains which will add 17 additional vehicles to the morning and evening peak periods on the above corridors. This option has no impact on freight services.

With the recommendation of nine additional vehicles in traffic, there may be requirements to either lengthen platforms at some of the stations to physically enable the longer trains to operate or provide Selective Door Opening (SDO). Platforms considered to require lengthening include Trowbridge, Warminster, Bradford-on-Avon, Parson Street, Filton Abbey Wood and Worle. For some stations it would not be cost effective to lengthen, for example Freshford and Avoncliff, and therefore SDO would remain or calls transferred to other services. The business case analysis for all of the corridors has been completed assessing both scenarios of either platform lengthening or SDO with the capital cost of this. The value for money for each corridor remains the same for either option and therefore the recommendation does not change under these scenarios.

It is however recognised that should SDO be fitted only to the nine additional vehicles, they would not be compliant with the rest of the fleet and therefore an operational solution would need to be found. The TEE tables are presented in Figures 6.11 and 6.12 for each of the corridors for both the scenarios of platform lengthening and Selective Door Opening.

The analysis also included the services into Bristol Temple Meads from both the Severn Beach line and Chippenham; however the option of train lengthening on these corridors provided poor value for money and is therefore not recommended. The potential for increased services on the Severn Beach line, as presented later in paragraph 6.9.10.6, would result in the provision of increased capacity through a more frequent service.

Figure 6.11 – Transport economic efficiency table for train lengthening: Platform lengthening scenario

	£million (2002 market prices)		
30-year appraisal	**Cardiff – Portsmouth**	**Cardiff – Taunton**	**Gloucester – Westbury**
Costs (present value)			
Investment cost	0.4	0.3	0.0
Operating cost	23.1	9.9	4.6
Revenue	-14.2	-5.0	-2.3
Other Government Impacts	2.8	1.0	0.5
Total costs	**12.2**	**6.2**	**2.7**
Benefits (present value)			
Rail users' benefits	19.5	9.7	2.9
Non-users' benefits	13.5	5.0	2.2
Total quantified benefits	**33.0**	**14.7**	**5.1**
NPV	**20.8**	**8.5**	**2.4**
Quantified BCR	**2.7**	**2.4**	**1.9**

Figure 6.12 – Transport economic efficiency table for train lengthening: Selective Door Opening scenario

	£million (2002 market prices)		
30-year appraisal	**Cardiff – Portsmouth**	**Cardiff – Taunton**	**Gloucester – Westbury**
Costs (Present value)			
Investment cost	0.0	0.0	0.0
Operating cost	23.2	9.9	4.6
Revenue	-14.2	-5.0	-2.3
Other Government Impacts	2.8	1.0	0.5
Total costs	**11.9**	**6.0**	**2.7**
Benefits (Present Value)			
Rail users' benefits	19.5	9.7	2.9
Non-users' benefits	13.5	5.0	2.2
Total quantified benefits	**33.0**	**14.7**	**5.1**
NPV	**21.1**	**8.7**	**2.4**
Quantified BCR	**2.8**	**2.5**	**1.9**

6.9.9 Option I: Increase capacity and improve performance through infrastructure enhancements at Bristol

The performance analysis as part of the baseline identified a high degree of reactionary delays occurring around Bristol, specifically at Bristol East Jn, due to the number of crossing and reversible moves required into and out of Bristol Temple Meads. Three infrastructure interventions were proposed in response to the identified performance issues in this area:

1. Three or four tracking from Dr Days Jn to Filton
2. A new dynamic loop (on the up line) at St Anne's between North Somerset Jn and St Anne's Tunnel
3. Extension and conversion to passenger status of the carriage line from Bristol West to Parson Street creating a four track railway.

The scope, analysis and results for each are discussed further below:

6.9.9.1 Three or four tracking from Dr Days Jn to Filton

Filton Abbey Wood and Dr Days Jn have become bottlenecks in the Bristol area as a result of the high number of passenger and freight flows traversing the junctions where the infrastructure at these locations reduces from four tracks to two. The introduction of a three or four track section from the existing four tracks at Dr Days Jn up to and including Filton Abbey Wood (known as Filton Bank) was modelled in Railsys utilising the existing layout at Dr Days Jn. This analysis demonstrated performance improvements due to the ability of services to overtake on the additional lines and the potential to segregate non-stop and stopping services along with potential journey time improvements. With the committed growth in train movements in the area with the introduction of the proposed IEP specification, it is evident from the initial timetable review that the current infrastructure cannot accommodate the additional services. The issue therefore becomes that of insufficient infrastructure capacity. A capacity study was therefore undertaken to review the current and predicted growth in both passenger and freight traffic to identify what infrastructure is required to accommodate such growth.

The scheme to enhance Filton Bank has also been identified as a key requirement for the Seven Day Railway initiative, as currently all lines have to be closed when engineering work takes place and no diversionary routes are available. With this and the proposed growth in the area, with an additional hourly IEP service, the proposed IEP depot at Stoke Gifford and the freight forecasts for the Bristol area from the Strategic Freight Network, the business case has been further developed during the consultation period of the RUS. This has enabled benefits to be defined and quantified, where possible, for Seven Day Railway, journey time and performance improvements.

The appraisal results for this study are presented in Figure 6.13. For the three track option, the scheme offers high value for money with a BCR of 2.2 and is therefore recommended under the RUS. The four track option achieves a BCR of 1.6; however this does not include the potential capacity benefits available by the additional IEP service currently proposed from London Paddington to Bristol Temple Meads via Bristol Parkway. With the benefits from IEP, of increased service frequencies, capacity and improved journey times, it is likely that the four track option will achieve a BCR greater than 2. There is therefore sufficient evidence to demonstrate that both the three and four track options are viable to develop further. The RUS therefore recommends the development of both the three and four track options for subsequent implementation during Bristol resignalling in CP5.

Figure 6.13 – Transport economic efficiency table for Filton Bank

60-year appraisal	£ million (2002 PV)	
	Three tracking	Four tracking
Costs (Present Value)		
Investment Cost	31	50
Operating Cost	0	0
Revenue	-23	-32
Other Government Impacts	5	6
Total costs	**13**	**25**
Benefits (Present Value)		
Rail users' benefits	24	33
Non-users' benefits	6	7
Total quantified benefits	**30**	**40**
NPV	**17**	**16**
Quantified BCR	**2.2**	**1.6**

An additional option reviewed as part of the above scheme, was the extension of the down goods loop from Platform 2 at Bristol Parkway to the Down Filton line. This provided an improvement for services towards Wales and Bristol Temple Meads minimising their interaction by allowing services towards Bristol to bypass the main lines at Stoke Gifford Jn. The Railsys results highlighted the removal of waiting time at Bristol Parkway for late running services towards Wales and vice versa and therefore proved beneficial in developing the business case. However, due to the high costs for the signalling alterations necessary, the scheme offers poor value for money and is not recommended to be taken any further at this stage. It may become more valuable in the future when IEP is introduced particularly when the location of the new depot is taken into account. The transport economic efficiency table for this option is presented in **Appendix D**.

6.9.9.2 A new dynamic loop at St Anne's

A new dynamic up loop between North Somerset Jn and St Anne's Tunnel, to mirror the existing down loop was proposed as an option to improve performance particularly around Bristol East Jn. Performance analysis showed that the actual position of the loop provided minimal performance benefits due to its close proximity to Bristol Temple Meads and the up and down Bristol loops locally known as Rhubarb curve; the north to east curve between Dr Day's Jn and Feeder Bridge Jn which can be used as a holding facility for regulating freight services. As such, the loop was not used at all during the perturbation simulation in Railsys. As an alternative, new dynamic loops on the up and down main line at Keynsham were modelled to see the effect of these on performance. The new loops would be positioned on the 12 mile stretch between Bath Spa and Bristol Temple Meads and could assist train service regulation. Performance analysis confirmed a marginal performance benefit, particularly for the non-stopping services. However, with the proposed infrastructure cost, the appraisal results showed that the level of benefits was not sufficient. The scheme is therefore not recommended. The transport economic efficiency table for this option is presented in **Appendix D.**

6.9.9.3 Extension and conversion of the carriage line from Bristol Temple Meads to Parson Street

To improve performance at Bristol Temple Meads to and from the west (Taunton/Weston-super-Mare), an option to extend and convert to passenger status the carriage line from Bedminster to just beyond Parson Street was considered. This would create a four track section between Bristol Temple Meads and just beyond Parson Street with the existing platforms at both stations modified to create island platforms. The scheme is also considered to provide sufficient capacity for the Bristol Metro proposals, which include linking the proposed half hourly passenger service on the reopened Portishead branch with further cross-Bristol opportunities.

The additional capacity created through the additional track reduces congestion at Bristol West Jn through the segregation of stopping and non-stopping traffic (local and long distance) across the four lines and delivers journey time improvements. It has been identified that long distance southbound services from Bristol Temple Meads will benefit most from this scheme. Economic analysis based on performance benefits alone shows that the option provides high value for money with a BCR of 2 when 26 minutes of reactionary delays per day are recovered at Bristol West Jn. Analysis on current performance confirms that this is achievable and the scheme would therefore normally be recommended.

However, with the delivery of improved performance under the HLOS CP4 targets, the business case will need re-evaluating using the latest performance figures at the time in CP5. With the resignalling for Bristol also due in CP5, the scheme should be reviewed as an incremental enhancement to the resignalling scheme where the opportunity will also arise to redesignate the four tracks into pairs of main line and relief lines.

During the consultation period, the business case for the additional track has been updated to include potential journey time benefits. This continues to show that the scheme offers high value for money with the BCR increasing significantly from 2 (with performance benefits only) to 4.6. The journey time assumptions are taken from timetable analysis of current pathing time at Worle Jn for southbound services only, and it is assumed that this is removed resulting in improved journey times to passengers. The revised TEE table is presented in Figure 6.14.

Figure 6.14 – Transport economic efficiency table for extending the carriage line from Bristol Temple Meads to Parson Street

60-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	6.0
Operating Cost	0.0
Revenue	-5.2
Other Government Impacts	1.1
Total costs	**1.9**
Benefits (Present Value)	
Rail users' benefits	7.1
Non-users' benefits	1.5
Total quantified benefits	**8.6**
NPV	**6.7**
Quantified BCR	**4.6**

This scheme is also highly favourable because of the number of economic and housing developments around Bedminster which are projected for the next five to 10 years and with the proposed reopening of the Portishead branch line for passenger services. Bedminster could also become a cross-Bristol interchange for certain services relieving pressure on the station capacity at Bristol Temple Meads. The scheme to create the four tracks will enhance the transport links from these areas into Bristol and therefore further reviews of the timetable and calling patterns of services should be undertaken. The creation of the four track section provides the capacity necessary to deliver those services.

The results of the three infrastructure options considered for performance improvements also highlights that should the timetable structure be revisited, to take account of the new infrastructure provided, then there is also the potential to realise further capacity and journey time improvements. These improvements result from the segregation of stopping and non-stopping services within the Bristol area. An initial assessment of this has been undertaken at a high level and is presented in option J.

This option has no impact on freight services with the additional capacity created through the fourth track benefiting both freight and passenger services.

6.9.10 Option J: Review service proposition across Bristol to provide additional capacity and improve performance

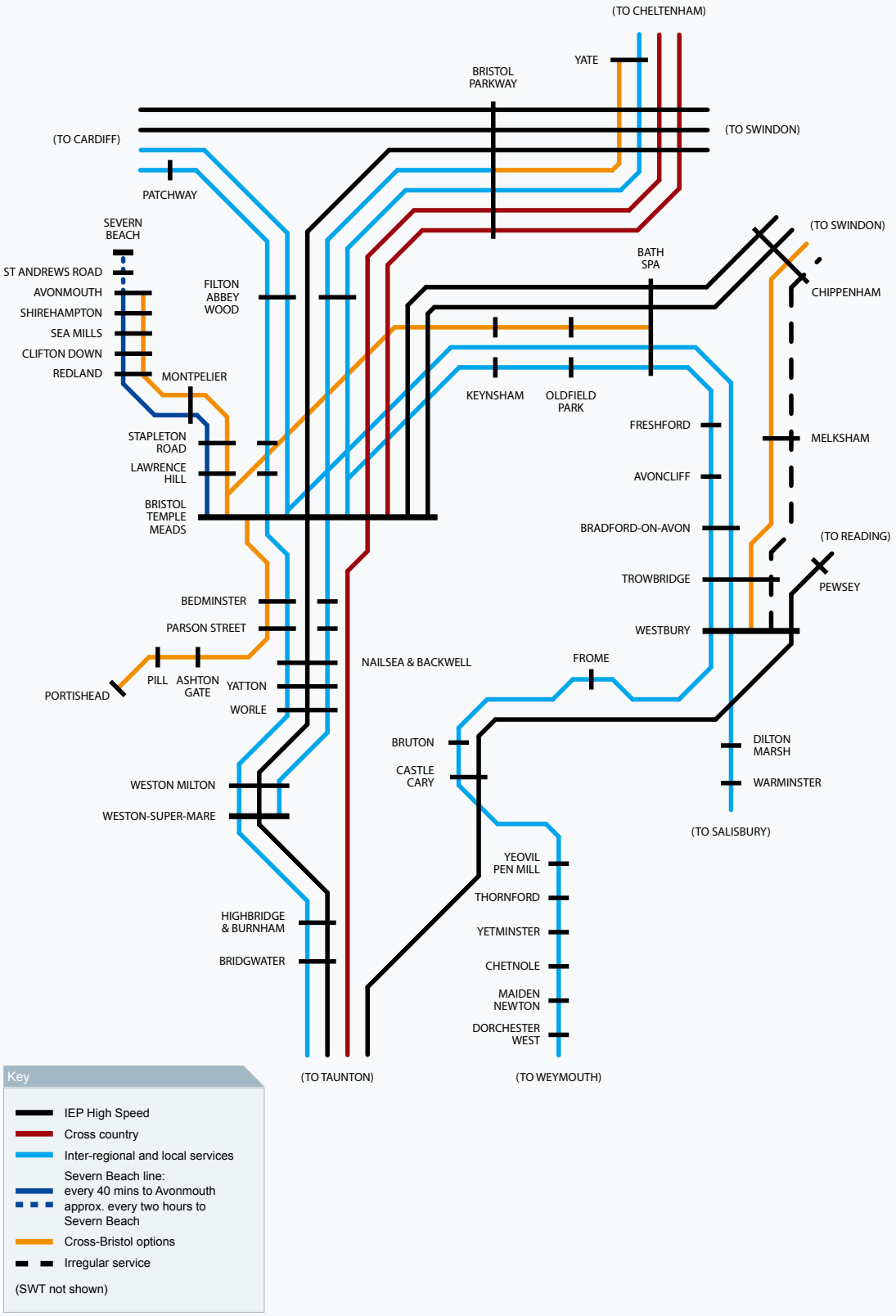
As a longer-term approach to address capacity and performance issues around Bristol, a revised service proposition was assessed to understand the potential impact of its operation and any further infrastructure that would be required to accommodate it. The objectives of the proposal were to reduce the reversing moves to the east of Bristol Temple Meads as identified in the performance baseline, improve capacity and accessibility for cross-Bristol services and improve journey times.

The service proposition creates a pattern above the current service. It assumes the proposed IEP service specification and includes all known enhancements (committed, uncommitted and aspirational), the requirements for the Portishead passenger service and the aspirations for a “Bristol Metro” based upon the West of England Partnership’s aspirations. This acknowledges the medium term bid for funding by the South West Regional Development Agency (SWRDA) for both the Portishead and Bristol Metro schemes for the period 2014 - 2019.

The revised service proposal would deliver an enhanced local rail network of services across the greater Bristol area. It is envisaged by the scheme promoters, the West of England Partnership, that with new infrastructure and rolling stock, the revised service pattern would support sustainable growth along the key corridors of Weston-super-Mare to Yate and Cardiff to Bath Spa via Bristol Parkway, Filton Abbey Wood and Bristol Temple Meads. This would increase patronage, reduce car use and road congestion and improve reliability whilst also providing additional capacity.

The preferred pattern of service for the Bristol Metro has been identified by the West of England Partnership and is presented in Figure 6.15, along with the current inter-regional services and proposed IEP specification. The concept is to provide enhanced half hourly clock face services on the Yate to Weston-super-Mare and Cardiff to Westbury via Bath and Bristol corridors with new high capacity rolling stock and new infrastructure including the reinstatement of the bay platform at Weston-super-Mare and a turnback facility at Yate. Future increments would introduce half hourly services on the Severn Beach line, linked with the reopening of Portishead and Henbury lines and possible extensions of the Metro boundaries to the north, south and east namely to Taunton, Gloucester and Chippenham. Capacity improvements would include the redoubling of the line between Worle and Weston-super-Mare, a third line on Filton Bank, Westbury station improvements and a new platform at Chippenham.

Figure 6.15 – Cross-Bristol options



The RUS has reviewed this pattern of service with a timetable study and economic appraisal. With the exception of the extensions to Gloucester (due to a lack of available paths under the current timetable), the study proved that operationally the specification is achievable. A business case for each proposal was prepared by corridor for each of the proposed changes to service provision, assessing the proposed timetable and any infrastructure requirements against predicted demand. The specification of the option and economic results are presented below by corridor. However, it is recognised that potentially greater benefits are available should the specification be reviewed as a whole cross-Bristol Metro.

6.9.10.1 Bristol Temple Meads to Gloucester corridor

Due to the unavailability of train paths for an additional service to Gloucester the option of providing an additional hourly Bristol Temple Meads to Yate service was considered.

This reviewed extending the hourly Weston-super-Mare to Bristol Parkway service to Yate, increasing service frequency at Yate from one train per hour to two, helping to reduce crowding on the Gloucester to Bristol services as well as providing additional direct services between Yate and stations south west of Bristol. The timetable study showed that it would also be operationally possible to retimetable the proposed service to operate at half hourly intervals and this pattern is assumed in the appraisal.

When all costs are considered, the scheme represents poor value for money, however, the extension of the service to Yate when taken with third party funding (for both infrastructure and additional leasing costs for the 30-year appraisal period) as per sensitivity 2, provides high value for money with a BCR of 2.5. The RUS therefore recommends this option subject to the provision of third party funding. The results of the economic appraisal are presented in Figure 6.16.

Figure 6.16 – Transport economic efficiency table for service extension to Yate

	All costs (turnback facility at Yate)	Sensitivity 1: No capital expenditure	Sensitivity 2: No capital expenditure or leasing cost
Appraisal period	**60 years**	**30 years**	**30 years**
Costs (Present Value)			
Investment Cost	5	0	0
Operating Cost	15	9	5
Revenue	-4	-3	-3
Other Government Impacts	1	1	1
Total costs	**16**	**7**	**3**
Benefits (Present Value)			
Rail users' benefits	10	6	6
Non-users' benefits	2	1	1
Total quantified benefits	**12**	**7**	**7**
NPV	**-5**	**0**	**4**
Quantified BCR	**0.7**	**1.0**	**2.5**

**sensitivity 2 devised due to potential developer funding as part of the commercial development at Yate*

6.9.10.2 Bristol Temple Meads to Chippenham corridor

The option reviewed an additional hourly service between Bristol Temple Meads and Chippenham calling at all stations. This service would improve train frequency and reduce on-train crowding and would require the construction of a bay platform at Chippenham station and two additional rolling stock units. Based on the economic appraisal, the additional Bristol Temple Meads to Chippenham service offers poor value for money and is not recommended.

Sensitivity tests show that if the cost of the bay platform at Chippenham could be met by another funding source, the Bristol Temple Meads to Chippenham service would provide medium value for money and meet the funding criteria with a BCR of 1.5 as shown in Figure 6.17 sensitivity 1.

However, further analysis demonstrates that the incremental BCR for extending the recommended Bristol Temple Meads to Bath Spa service (under paragraph 6.9.10.6) to Chippenham is 1.3 (sensitivity 2) and is therefore below the funding threshold. Analysis of the incremental BCR determines whether the additional operating cost of extending the service to Chippenham is justified. It compares the additional cost and the additional benefits of the Chippenham extension over and above the alternative option of the extension to Bath Spa.

Figure 6.17 – Transport economic efficiency table for Bristol Temple Meads to Chippenham options

Bristol Temple Meads to Chippenham – requires bay platform (Chippenham)	**All costs**	**Sensitivity 1: No capital expenditure**	**Sensitivity test: No capital expenditure - incremental BCR (Chippenham v.s Bath)**
Appraisal period	**60 years**	**30 years**	**30 years**
Costs (Present Value)			
Investment Cost	13	0	0
Operating Cost	41	26	12
Revenue	-17	-11	-4
Other Government Impacts	4	2	1
Total costs	**42**	**18**	**9**
Benefits (Present Value)			
Rail users' benefits	39	23	9
Non-users' benefits	7	4	2
Total Quantified Benefits	**46**	**28**	**11**
NPV	**4**	**10**	**2**
Quantified BCR	**1.1**	**1.5**	**1.3**

6.9.10.3 Bristol Temple Meads to Weston-super-Mare corridor

This option provides an additional hourly service calling at all stations on the route between Weston-super-Mare and Bristol Temple Meads. The option would require substantial infrastructure works with the redoubling of Worle Jn, redoubling of the single line track from Worle Jn to Weston Milton and the reinstatement of the bay platform at Weston-super-Mare station to accomodate the increase in services.

The option would also require additional rolling stock to operate the new services. The service would increase the frequency of services operating on the corridor improving the opportunity to travel and providing some crowding relief. The infrastructure could also allow additional stops to be made at Weston Milton.

Initial economic modelling indicated that greater benefits could be achieved by extending the services to Bristol Parkway and this was included in the analysis. A further option of an additional off-peak hourly service from Bristol Temple Meads terminating at Yatton was investigated as an alternative to the Weston-super-Mare to Bristol service. This option would require additional infrastructure to enable the turn back of services at Yatton and would therefore incur capital costs. Even though the infrastructure alterations at Yatton have yet to be quantified, the option of operating additional services to Yatton provides poor value for money. The results of the appraisals are presented in Figure 6.18.

Figure 6.18 – Transport economic efficiency for Bristol Temple Meads to Weston-super-Mare options

	Weston-super-Mare to Bristol Temple Meads	Weston-super-Mare to Bristol Parkway	Yatton to Bristol Temple Meads
Appraisal period	**60 years**	**60 years**	**30 years**
Costs (Present Value)			
Investment Cost	17	17	0.0
Operating Cost	37	44	1.9
Revenue	-8	-10	-0.4
Other Government Impacts	2	2	0.1
Total costs	**48**	**53**	**1.6**
Benefits (Present Value)			
Rail users' benefits	17	24	1.0
Non-users' benefits	2	4	0.1
Total quantified benefits	**19**	**27**	**1.1**
NPV	**-29**	**-26**	**-0.5**
Quantified BCR	**0.4**	**0.5**	**0.7**

The results show that the options for operating additional services to Weston-super-Mare and Yatton would be poor value for money due to the high level of infrastructure costs that would be required. The RUS does not therefore support any of the options. A review was undertaken of the minimum level of infrastructure works that could be required in order to support an increase in services through to Weston-super-Mare. This identified the need for a dynamic loop between Worle Jn and Weston Milton. However, without the further elements of infrastructure and with an increase in the number of services, it would result in trains being held in the loop for approximately five minutes incurring journey time and delay penalties. With the cost of signalling required for the loop, and the disbenefits offered, the option would be unlikely to prove value for money.

6.9.10.4 West Wiltshire Corridor: Salisbury to Chippenham

A number of options were considered for the West Wiltshire corridor to meet demand for travel from Melksham to other urban centres such as Bristol, Bath Spa, Chippenham and Swindon. The options reviewed an hourly Westbury service operating to either Chippenham or Swindon and an hourly Salisbury to Chippenham service. These options would significantly enhance the service provision on the route and offer faster journey times to London through an interchange at Chippenham. Should the service terminate at Chippenham, the construction of a bay platform at Chippenham would be required. Should the service be extended to Swindon, no additional infrastructure would be necessary.

The Draft for Consultation presented the appraisal results for these options. The Salisbury to Chippenham service failed to achieve the necessary BCR to enable the RUS to recommend it, however, the other options for a service from Westbury to Chippenham or Swindon both achieved a sufficient BCR to be able to recommend the proposals subject to operational viability. However, during the consultation period, respondees raised concerns with regard to the accuracy of the analysis and in particular the assumptions on the number of rail passengers who currently travel to and from Melksham. This is due to an earlier discrepancy with ticket purchases at Melksham station for travel between Trowbridge and Bath which was rectified in September 2008.

The initial appraisal used ticket sales data from April 2007 to March 2008 which contained the ticket anomaly. The analysis has been revised using data from April 2008 to March 2009, which shows a 29 percent fall in passenger numbers as a result of the rectification in September 2008. However, only six months of accurate ticket sales data is available. The revised appraisal results using the April 2008 to March 2009 data are presented in Figure 6.18. This shows that the Westbury to Swindon option achieves a BCR of 1.7 and is recommended as it requires no infrastructure. However the Westbury to Chippenham option only achieves a BCR of 1.7 and is therefore unable to be recommended due to the requirement to achieve a BCR of 2 or above for schemes which require additional infrastructure.

However, it is recognised that the appraisal results are particularly sensitive to current demand and the number of new passenger journeys stimulated by the scheme. For example, only an additional 30 passenger journeys by rail per day to Melksham over and above what is already assumed in the business case would be required to achieve the necessary BCR of 2. It is also recognised that MOIRA may not be able to predict demand accurately when the station currently has a low footfall and the proposed service proposition is significantly different from existing.

The RUS therefore recommends the further development of these proposals by the scheme promoter, Wiltshire Council, to include local area research to understand the demand potential and optimum service proposition and a detailed timetable study to assess the operational viability of the proposals with predicted future growth. The RUS recommends that any further work is undertaken in conjunction with the West of England Partnership as scheme promoter for the Bristol Metro.

The proposals will need more detailed modelling and operational verification to understand the timetable viability with the mix of passenger and freight services and any performance implications particularly given the emphasis placed on the freight diversionary route via Melksham as part of the Strategic Freight Network.

Figure 6.19 – Transport economic efficiency tables for West Wiltshire Corridor

	Salisbury - Chippenham	Westbury - Chippenham	Westbury - Swindon
Infrastructure requirements	**Bay Platform (Chippenham)**	**Bay Platform (Chippenham)**	**None**
Appraisal period	**60 years**	**60 years**	**30 years**
Costs (Present Value)			
Investment Cost	13.2	13.2	0.0
Operating Cost	32.3	12.4	20.5
Revenue	-10.9	-5.8	-6.0
Other Government Impacts	2.5	1.3	1.4
Total costs	**37.1**	**21.1**	**16.0**
Benefits (Present Value)			
Rail users' benefits	48.3	32.0	24.8
Non-users' benefits	5.5	3.1	2.8
Total quantified benefits	**53.8**	**35.1**	**27.6**
NPV	**16.7**	**14.0**	**11.7**
Quantified BCR	**1.5**	**1.7**	**1.7**

6.9.10.5 Bristol Metro and Freight

The proposed service proposition for the enhanced cross-Bristol services maintains a freight path every hour in each direction (as per the current timetable) and has been compared with the predicted freight growth using the Strategic Freight Network forecasts for the Bristol area. This assumed 13 additional paths; however, with the confirmed SFN forecasts to 2030, the number of predicted paths is now nine. This work clearly enables future freight growth to be accommodated. The characteristics of the freight paths used in the Bristol Metro analysis were for Class 66 locos with a 1,800 tonnes trailing load. Further timetable work will be required by the scheme promoter particularly for the West Wiltshire options, to ensure current and future freight can be accommodated within their service proposals.

6.9.10.6 Cross-Bristol opportunities

Cross-Bristol opportunities were reviewed following the analysis and results of the appraisal per corridor. For the Bristol Temple Meads to Chippenham corridor, an alternative option of a Bristol Temple Meads to Bath Spa shuttle was reviewed. This option would provide an additional hourly service between Bristol Temple Meads and Bath Spa calling at all stations, improving train frequency and reducing on-train crowding. This service does not require any additional infrastructure so no capital costs would be incurred. The scheme offers medium value for money and therefore the RUS recommends its implementation. The TEE table for this option is presented in Figure 6.20.

Figure 6.20 – Transport economic efficiency table for Bristol Temple Meads to Bath Spa shuttle

	Bristol Temple Meads to Bath Spa
30-year appraisal	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0
Operating Cost	14
Revenue	-6
Other Government Impacts	1
Total costs	**9**
Benefits (Present Value)	
Rail users' benefits	14
Non-users' benefits	2
Total quantified benefits	**16**
NPV	**7.0**
Quantified BCR	**1.8**

Figure 6.21 – Transport economic efficiency table for cross-Bristol option (Bath Spa to Clifton Down)

30-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	0.0
Operating Cost	13.1
Revenue	-7.2
Other Government Impacts	1.6
Total costs	**7.5**
Benefits (Present Value)	
Rail users' benefits	15.4
Non-users' benefits	2.4
Total quantified benefits	**17.9**
NPV	**10.3**
Quantified BCR	**2.4**

Further cross-city opportunities were then reviewed with a high level economic appraisal of the extension of the Bristol Temple Meads to Bath Spa shuttle through to Clifton Down.

This showed that the scheme would generate high value for money and as such the Draft for Consultation recommended the review of this option subject to its operational viability. The transport economic efficiency table is presented in Figure 6.21.

Following the consultation period and in light of responses, the proposed Bristol Temple Meads to Bath Spa shuttle has been further reviewed in line with increased service frequencies on the Severn Beach branch. This further develops the initial economic appraisal completed in the Draft for Consultation which identified the potential of a Bath Spa to Clifton Down service as presented above.

The first option reviewed an increased frequency on the Severn Beach branch. Two propositions have been assessed, a half hourly clock face service from Bristol Temple Meads to Avonmouth and incremental to this, an hourly service to Severn Beach. Operationally, it has been proven that these enhanced services can be accommodated on the existing infrastructure. However, in order to achieve this, long turnaround times are experienced at Bristol Temple Meads which are resource costly. Appraisal results show that both options offer poor value for money and therefore the RUS is unable to recommend the enhanced service frequency between Bristol Temple Meads and Severn Beach. The transport economic efficiency tables for these options are presented in **Appendix D**.

However, to further improve the business case, and to maximise the use of the rolling stock and resources, the option of extending the service to Bath Spa was reviewed. This utilises the long turnaround times at Bristol Temple Meads and enables a cross-Bristol service with no additional rolling stock. Therefore the provision of an additional hourly service from Avonmouth to Bath Spa, calling all stations was reviewed. Although operationally viable, the timetable constructed assumed a four minute turnaround time at Bath Spa. This option offers medium value for money with a BCR of 1.8. The TEE table for this option is presented in Figure 6.22.

Figure 6.22 – Transport economic efficiency table for Avonmouth to Bath Spa

30-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	0
Operating Cost	20
Revenue	-8
Other Government Impacts	2
Total costs	**14**
Benefits (Present Value)	
Rail users' benefits	22
Non-users' benefits	3
Total quantified benefits	**25**
NPV	**11**
Quantified BCR	**1.8**

Three alternative options are therefore available for services from Bristol Temple Meads to Bath Spa with possible through service opportunities:

- Bristol Temple Meads to Bath Spa
- Clifton Down to Bath Spa
- Avonmouth to Bath Spa.

The RUS continues to recommend the Bristol Temple Meads to Bath Spa shuttle but notes the case for the alternative options of extending the service to Avonmouth or Clifton Down and it is therefore recommended that these options are reviewed in line with future timetable reviews following the introduction of electrification and IEP.

Concerns have been raised by the current franchisee to the proposed Bristol Temple Meads to Bath Spa shuttle due to the potential negative impact on operational performance of turning back services at Bath Spa that the service may bring. It is therefore recommended subject to performance modelling and that the optimal service is assessed with the options above and in line with the notable opportunities that electrification of the Great Western Main Line brings. It is clear that alternative service provisions will be available for cross-city journeys following the electrification of the main line. The Bath Spa capacity upgrade scheme which is currently progressing to GRIP stage 4 (Single Option Development) will also increase capacity in the station by reducing platform reoccupation times and reducing signalling headways. This will therefore assist in improving performance.

6.9.10.7 Opportunities for Bristol Metro

With the commitment to the electrification of the Great Western Main Line to Bristol by 2016 and to Swansea by 2017, a number of opportunities arise for local/regional services with scope to consider the operation of electric traction drawing upon the benefits of electrification. The proposed Bristol Metro scheme would value a review, taking into account the possibilities that electrification could bring. This could identify the additional elements of in-fill that would be required in order to enable the operation of electric traction for a local cross-Bristol service.

6.9.10.8 Bristol to Gloucester connectivity

A new gap was identified through the consultation process with a lack of connectivity between Bristol Temple Meads and Gloucester via the Severn Tunnel on the South Wales Main Line. This follows on from the work undertaken in the Wales RUS, which reviewed the existing Cardiff to Cheltenham service operating on an hourly basis throughout the day. To address the connectivity gap between Bristol Temple Meads and Gloucester, a new direct service was assessed from Bristol Temple Meads, calling at Filton Abbey Wood, Severn Tunnel Jn, Chepstow, Lydney and Gloucester. Unfortunately, due to the distance of almost 70 miles and the necessary rolling stock and operational costs needed to operate this new service, the option does not provide value for money and therefore failed to achieve the necessary level to enable the RUS to recommend it. The transport economic efficiency table for this option is presented in **Appendix D**. The West Midlands and Chilterns RUS will review the demand on this corridor and asssess whether the station gaps can be addressed through the current Cardiff to Cheltenham service.

6.9.11 Option K: Improve capacity and performance through infrastructure enhancements at Westbury

Westbury was identified as a pinch-point for performance issues through the baseline analysis. A review of the reactionary delay data identified the loss of train paths when regulated for another late running train and awaiting platform as being the main causes for delays. Using this data, a review of the station area, its infrastructure and operability was undertaken in order to assess what interventions could be proposed to improve performance. Following discussions with the local operations staff, FGW and freight operators the option emerged for the creation of an island platform utilising the existing Platform 1 and constructing a new platform face on the down reception line. The analysis included the withdrawal of freight services from the station area by routeing them around the avoiding lines as recommended in the development of the Strategic Freight Network.

The area around Westbury is the subject of various future proposals which all impact on the capacity and ultimately performance of the station and the surrounding area.
Over the next five years, the Network Rail National Delivery Service will develop their current facilities at Westbury, to become one of three national Track Materials Recycling Centres. The scheme will be developed further to accommodate the scrap and long-welded rail currently stored at Thingley Jn and the residual land will be developed for a Network Rail fleet maintenance facility. Freight traffic is also expected to grow particularly with construction traffic to service the Olympics infrastructure.

The business case for the scheme was constructed using the performance data from the baseline analysis with a review of the percentage reduction in reactionary delay minutes that could be achieved through the new platform. With an estimated recovery of 70 percent of reactionary delay minutes, equating to 27 minutes per day, the scheme offers high value for money with a BCR of 2.2 as presented in Figure 6.23.

Based on this analysis using current performance from the baseline analysis (2006 – 2008), the RUS recommends the implementation of this scheme. However, as performance is a moveable target and with the delivery of improvements to meet the HLOS targets in CP4, it is imperative that the business case is re-evaluated using the latest performance data at the time in CP5. The additional capacity created by the additional platform will benefit both freight and passenger services and can be added to the business case.

Figure 6.23 – Transport economic efficiency table for Westbury Platform

60-year appraisal	£million (2002 PV)
Costs (Present value)	
Investment cost	9.9
Operating cost	0.0
Revenue	-7.7
Other government impacts	1.7
Total costs	**3.9**
Benefits (Present value)	
Rail users' benefits	6.8
Non-users' benefits	1.8
Total quantified benefits	**8.6**
NPV	**4.7**
Quantified BCR	**2.2**

An additional platform at Westbury also forms part of the mitigation plan for the Reading Station Area Redevelopment and Crossrail works to facilitate diversionary services during the construction period. This scheme could therefore be an earlier requirement than CP5 due to the need for its construction to facilitate the works at Reading. The Reading Station Area Redevelopment and Crossrail mitigation team are currently reviewing this with a view to developing the scheme subject to funding.

6.9.12 Option L: Increase connectivity between Exeter and Plymouth

Issues at Exeter and Plymouth were raised during the process of identifying gaps, these needed to be further defined to understand whether the gap related to station congestion, train capacity, performance or connectivity. Station managers confirmed that although there were busy times at both stations, there was not a congestion problem. In terms of train capacity, FGW commissioned a report in September 2008 in respect of the HLOS capacity metric which identified that total capacity was sufficient into and out of Exeter St Davids during the morning and evening peak periods with the current deployment of rolling stock and the HLOS capacity parameters.

However, aware that some services across Exeter are overcrowded, a passenger survey at Exeter Central was undertaken to review the services from Exmouth. A train count from Exeter St Davids to Plymouth was also completed, both of which showed on-train crowding in the morning peak periods. The RUS therefore recommends that such services (Barnstaple to Exmouth and Exeter to Plymouth) could benefit from train lengthening in peak periods and recognises that this will be reviewed as part of the FGW HLOS work. A decision as to the number of additional vehicles and the services that will benefit from them is awaited.

The focus therefore remained on connectivity between Exeter and Plymouth, a long standing issue remaining from the Strategic Rail Authority's Great Western Main Line RUS (June 2005). Following a review of previous studies and timetable outputs, a service proposition was developed to improve connectivity. A timetable study was completed using the December 2008 timetable (incorporating May 2009 changes) with the following additions:

- current local service pattern as May 2009 with the following proposed changes to local services - half hourly all stations Exmouth to Paignton and an hourly St James Park to Barnstaple;
- an hourly London Waterloo to Exeter St Davids service (as per December 2009)
- proposed replacement services west of Exeter
- aspirational half hourly service from Axminster to Exeter St Davids.

This became the base timetable. With the exception of the 'aspirational' half hourly Axminster to Exeter St Davids service, the other proposals are operationally compatible and can be accommodated on the current infrastructure.

In order to facilitate the additional Axminster service, a significant amount of infrastructure would be required either at Exeter St Davids (with a new bay platform) or throughout the route with dynamic loops, sidings and an element of double track. The economic appraisal included the impact of the new Cranbrook station. As a detailed infrastructure solution was not produced, the option was appraised without the capital cost of the infrastructure to see if there was a case for further development. The results of the economic appraisal showed that without any capital expenditure, the benefit cost ratio is 0.8 and therefore this option for an additional Axminster to Exeter St Davids service was not further developed and is not recommended. The transport economic efficiency table is presented in **Appendix D**.

The option to change the current service provision by terminating the existing Barnstaple to Exmouth services at St James Park and operating a new half hourly Paignton to Exmouth service was reviewed in the Great Western RUS Draft for Consultation and recommended for implementation in 2018 when the business case achieved the necessary BCR of 1.5.

However, during the consultation period a review of FGW local services was undertaken in line with replacement services west of Exeter, and aligning with consultation responses, an alternative option is now proposed. This delivers an additional all day hourly service from Paignton to St James Park and maintains the existing hourly Barnstaple to Exmouth and Paignton to Exmouth services.

Figures 6.24A and 6.24B illustrate today's service against the proposed service.

The additional service can be provided on the current infrastructure, although four trains per day during the inter-peak would need to terminate at Newton Abbot rather than Paignton to allow the long distance services to continue to operate to Paignton. The business case for this option with the increased service frequency, and taking cognisance of the summer 2009 passenger counts (detailed below under option O paragraph 6.9.15.2) and the benefit of crowding relief achieved through the additional service, achieves a BCR of 1.5 in 2016. The RUS therefore recommends this additional service for implementation in 2016. The transport economic efficiency table for this option is presented in Figure 6.25.

Figure 6.24a – Current service provision, standard hour

Figure 6.24b – Proposed service provision, standard hour

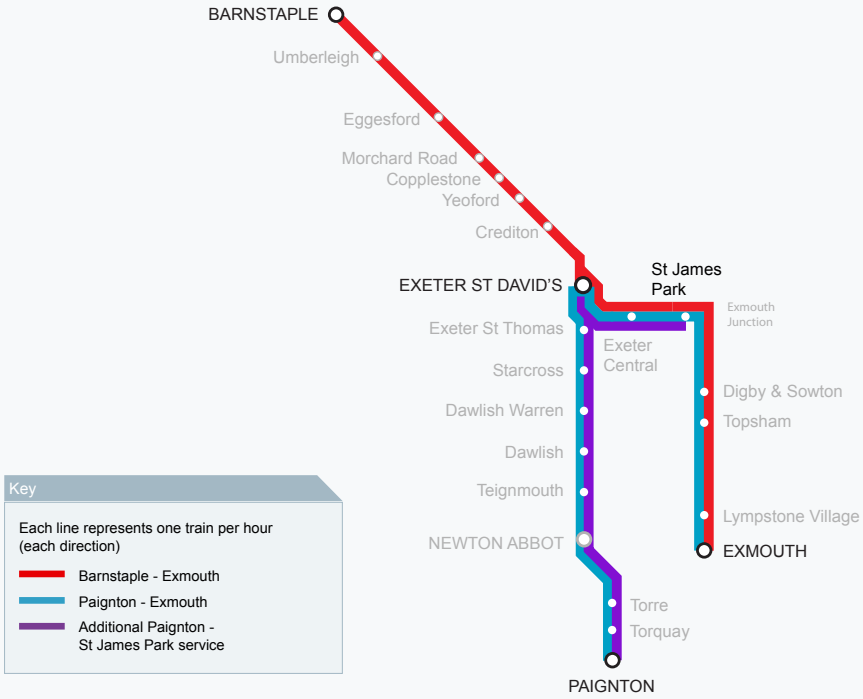


Figure 6.25 – Transport economic efficiency table for Exeter local services

30-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	0
Operating Cost	18
Revenue	-5
Other Government Impacts	1
Total costs	**13**
Benefits (Present Value)	
Rail users' benefits	17
Non-users' benefits	2
Total quantified benefits	**20**
NPV	**6**
Quantified BCR	**1.5**

The RUS also reviewed the extension of this new Paignton to St James Park service to Pinhoe, Honiton and/or Axminster to improve connectivity and to achieve the aspiration of a half hourly Exeter St Davids to Axminster service as part of Devon County Council's Devon Metro proposal. The analysis also included the provision of a potential stop at the new Cranbrook station. However, in line with the analysis that was previously undertaken the scheme is constrained by the long section of single track between Pinhoe and Honiton and would require infrastructure works (a dynamic loop to the east of Whimple) which the business case fails to support. Even without the infrastructure cost, the BCR is 1.6 which is below the recommendation threshold of 2.0 for schemes which require infrastructure.

An alternative option was reviewed, which provides a two-hourly service from St James Park to Axminster on alternative hours, through the extension of the new Paignton to St James Park service. This can be achieved on the current infrastructure. However, the appraisal results generate a BCR of 1.2 which is beneath the necessary threshold to be able to recommend.

It is, however, appreciated that the appraisal results are particularly sensitive to the demand forecast. The above analysis has demonstrated an additional service is operationally feasible, and identified the required infrastructure in order to achieve an additional hourly service. Although there is not a sufficient business case at present to be able to recommend the option, the proposals should be reviewed with third party funding opportunities and in line with predicted growth and patronage of the new Cranbrook station. This could result in a positive business case in the future. The transport economic efficiency tables for these options are presented in **Appendix D**.

Three further options for extending long distance services to Exeter St Davids and/or Plymouth as a method for improving connectivity across the area were modelled on the above base timetable:

- Option 1: extend the proposed London Paddington to Bristol Temple Meads via Bristol Parkway IEP service to Exeter St Davids/Plymouth
- Option 2: extend the Manchester Piccadilly to Bristol Temple Meads service to Exeter St Davids/Plymouth
- Option 3: extend the Cardiff to Taunton service to Exeter St Davids/Plymouth.

Option 1 proved problematic due to the incompatibility of the current IEP service specification and the December 2008 timetable. With the improved journey times for IEP, the services did not fit into the current paths. It is recognised that the IEP proposal could introduce a standard pattern throughout the day between Bristol, Exeter, Plymouth and Penzance. This may enable the extension of a further IEP service to be accommodated should future demand require it. The latest IEP service specification (August 2009) includes the extension of the additional third London Paddington to Bristol Temple Meads service via Bristol Parkway to Paignton for two services throughout the day (one in the morning and one in the afternoon). This can therefore assist in providing additional connectivity from Bristol to Exeter, Paignton and through connections, onto Plymouth. In the longer-term, there could also be opportunities to extend the proposed IEP services further west.

With option 2, the Manchester Piccadilly to Bristol Temple Meads service is perceived to be less crowded than the Edinburgh to Plymouth service, therefore an extension to Plymouth could assist in effectively managing demand whilst also providing an additional service from Bristol to Plymouth. The benefits from providing crowding relief to the Edinburgh to Plymouth service were also included in the business case.

The results of the timetable study for the potential extensions of the Manchester Piccadilly to Bristol Temple Meads (option 2) and the Cardiff to Taunton service (option 3) proved that either of these extensions could be accommodated on the current infrastructure subject to minor amendments to the timetable and calling patterns. However, the economic appraisal of the options reviewed scenarios for extending some or all of the services to Exeter St Davids and/or Plymouth and all generated poor value for money due to the additional operating costs. The level of benefits is therefore not sufficient to justify the high expenditure cost and on this basis, the RUS does not recommend the extensions of these services. The transport economic efficiency tables for these options are presented in **Appendix D**.

6.9.13 Option M: Improve linespeeds and changed calling patterns on interurban journeys

This option tested increasing linespeeds and/or changing calling patterns on a number of interurban routes in order to improve journey times. The RUS scope area was divided into 20 route subsections and a high level assessment of the benefits associated with a one minute journey time improvement was estimated (see **Appendix F**). From this, the maximum level of capital expenditure that could be supported to achieve a good value for money business case (a BCR greater than 2) was quantified and is presented in Figure 6.26.

Key

- £0 - £9m
- £10 - £49m
- Over £50m

The coloured boxes provide an indication of the maximum level of capital expenditure that could be supported by the economic benefits generated from a one minute journey time improvement on various sections of the GW RUS scope area. The analysis assumes that all passengers, regardless of train operator, direction, or where passengers joined the route section would benefit from the journey time improvement.

All figures shown are in 2007/08 factor prices before optimism bias is applied

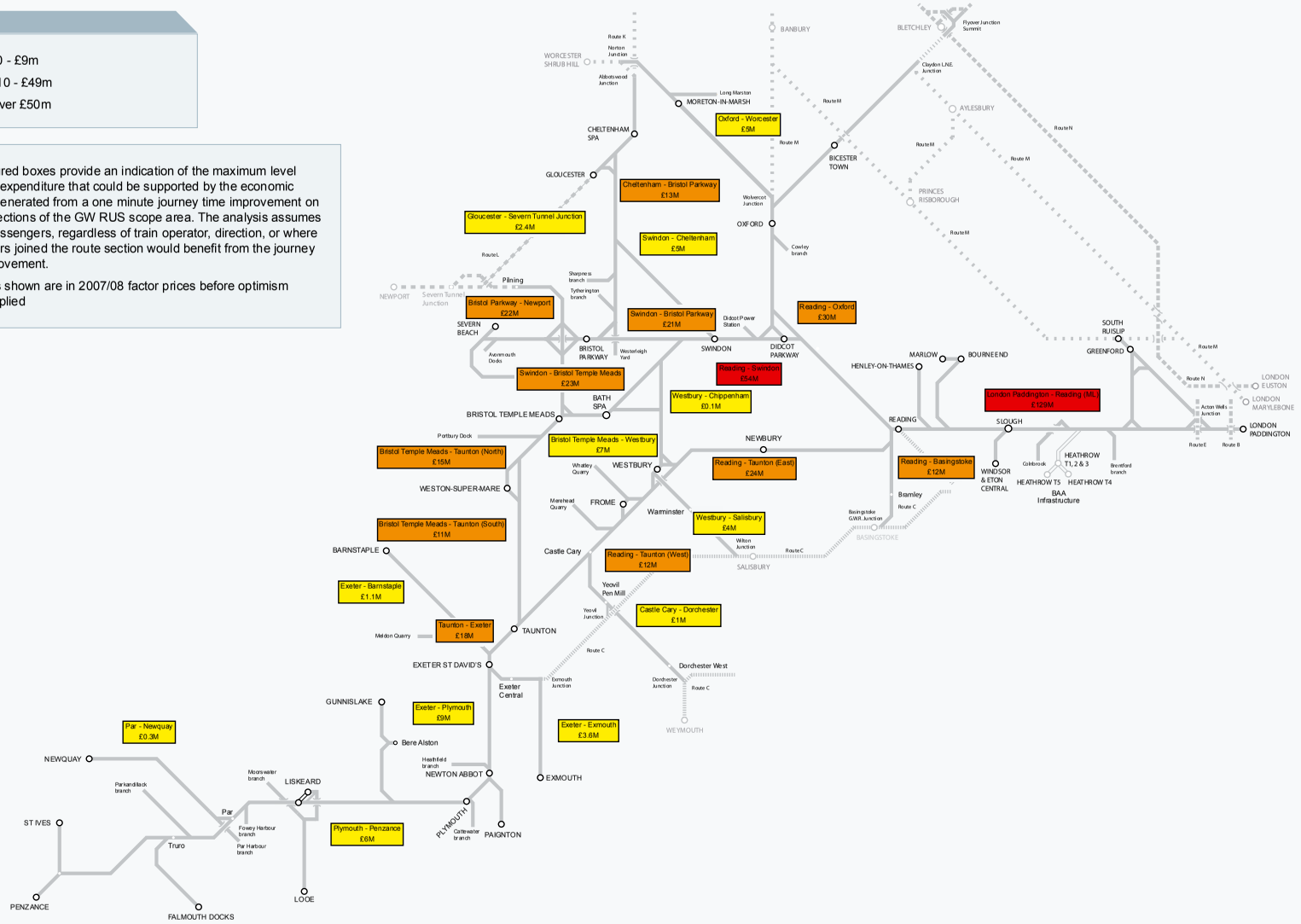


Figure 6.26 – Gap 17 – Interurban Journey Times

The various route sections were then ranked in order of probability as to whether a linespeed or change in calling pattern was deemed achievable taking account of known renewal and enhancement schemes. The subsections were then modelled in “Route Runner” (an Excel-based model using infrastructure and train characteristics to calculate potential journey time benefits or disbenefits across a route section) and the estimated minutes that could be saved were calculated. This analysis concluded that the route sections with the most achievable benefits that were worthy of further review were:

- **linespeed increases:** Bristol to Taunton and Gloucester to Severn Tunnel Jn
- **change in calling patterns:** Reading to Swindon, Oxford to Worcester, Bristol to Westbury and Plymouth to Penzance.

6.9.13.1 Linespeed increases

- Bristol to Taunton
  Following an initial review by Network Rail engineers, the scope for this linespeed improvement was reduced to Bristol Temple Meads to Bridgwater due to the embankment formations across the Somerset levels. The potential speed increase of the Bristol to Bridgwater section to 125mph would provide a notional saving of three minutes. Based on a three minute journey time improvement analysis showed that a maximum of £50 million of capital expenditure could be spent. The RUS recommends this scheme is progressed. This option has no impact on freight services.
- Gloucester to Severn Tunnel Jn
  The current linespeed on the route between Gloucester and Severn Tunnel Jn is a mix of speeds due to the high number of level crossings and the existing track curvature of the route. An initial desk top study confirmed that there are opportunities for raising some linespeeds and based on a one minute journey time improvement analysis it showed that a maximum of £2.4 million of capital expenditure could be spent per minute of time saving. Through the process of route classifications, the route has recently been identified as a key diversionary route for the Seven Day Railway initiative as it can provide diversionary benefits for the Bristol to Birmingham and London to Cardiff services, and by improving the linespeed, can assist in achieving the Seven Day Railway targets for reduced journey times on diversionary routes. The RUS recommends the development of linespeed proposals through raising the Permanent Speed Restrictions and it has been agreed that this scheme is taken forward by the Seven Day Railway programme which will complete a detailed engineering study and confirm the opportunities available to services seven days a week. The scheme will then be fully appraised under the normal process with a view to implementation during CP4. This option would also benefit freight services.

6.9.13.2 Change in calling patterns

- Reading to Swindon
  On the Reading to Swindon section of the GWML, analysis into the removal of stops at Didcot Parkway on certain services found that short-term and long-term options were achievable. FGW’s proposed December 2009 timetable includes this change with further work underway to improve journey times between South Wales and London Paddington.

- As a longer-term recommendation, the proposed IEP specification (January 2008) removes the stop at Didcot Parkway from alternative services from South Wales, notionally improving the journey time between London and Swansea by up to 10 minutes. A further journey time improvement may be possible with the electrification of the GWML of up to 19 minutes, the earliest opportunity for this is anticipated from 2018. These benefits are achieved through the change in calling patterns and through the acceleration and braking capabilities of the IEP trains. The proposed level of service at Didcot Parkway under the IEP specification matches the level of service offered today. The RUS therefore recommends that this element is retained in the IEP proposition.
- Oxford to Worcester
  Following a review of this service and its current calling pattern, it was agreed that due to the minimal benefits that could be achieved from removing stops, the service should remain as it currently is.

  The RUS recommends a frequent review of the requirements and usage, particularly following the completion of the redoubling of the Cotswold line and any impact from this in line with IEP service developments.
- Bristol to Westbury
  As part of the revised service proposition for the Cardiff to Portsmouth service as presented in 6.9.6, there will be a journey time improvement of up to nine minutes for a morning Portsmouth to Cardiff service between Westbury and Bristol Temple Meads and a two minute journey time saving on one return evening service between Bristol and Westbury. This option has no impact on freight services.
- Plymouth to Penzance
  Initial analysis focused on local service provision, removing various stops (with a proposal for an additional local stopping service implemented) to improve end-to-end journey times by circa 15 minutes. Various tests were also completed on revising the main line calling pattern with the journey time savings ranging from nine minutes to 18.

However, it became evident that there were potential benefits that could be gained through a review of the strategy of local services between Plymouth and Penzance. Due to the complexities that needed to be considered with the single line sections, park and ride opportunities and main line and branch line connections it was proposed that a detailed timetable study should be developed to review this. After discussing this with FGW, it transpired that such timetable work had been undertaken and a number of service changes have been introduced from May 2009. Going forwards, this will form part of the continual process of timetable reviews.

The May 2009 changes included the extension of two evening peak services from London Paddington through to Plymouth and the removal of a number of calls from selected services to the far west in order to improve journey times. An enhanced service was provided on the Truro to Falmouth branch, with two services per hour Monday to Saturday enabling a clockface pattern to operate for most of the day. This enhanced service delivers 29 return trips per day, instead of the previous 13. Additional round trips have also been provided on winter Sundays on the Exmouth branch.

This option was therefore closed with the recommendation to continually review requirements and the calling patterns for journey time improvements as an ongoing timetabling activity with the joint timetable improvement group established between Network Rail and FGW.

6.9.14 Option N: Improve passenger throughput at known constrained stations

A number of stations were identified as experiencing station congestion as part of the gaps process – London Paddington, Ealing Broadway, Windsor and Eton Central, Reading, Oxford and Bristol Temple Meads. The majority of these are subject to major

station enhancement schemes which will rectify existing overcrowding as well as cater for expected levels of growth:

- London Paddington – The proposed remodelling scheme will address congestion issues and future proof the area for growth. Proposed for 2015
- Reading – A pedestrian flow study confirms the new station layout is sufficient to cater for estimated future growth. Programmed for 2016
- Oxford – Oxfordshire Council's station enhancement scheme addresses the station area, footbridge and interchange currently programmed for 2010
- Bristol Temple Meads – station enhancement scheme underway to address station congestion, improve access/egress and station facilities, estimated 2011.

It was therefore agreed that these gaps could be closed as far as the RUS is concerned; the remaining stations of Ealing Broadway and Windsor and Eton Central are discussed further below:

6.9.14.1 Ealing Broadway

The station at Ealing Broadway is due to be rebuilt as part of the Crossrail scheme. Analysis by Crossrail Limited, Network Rail and Transport for London of ticket gate data assumes that the new station to be built will rectify the current issues of congestion and passenger flow. However, with the rebuild programmed for 2014 it was questionable whether current levels of overcrowding could be allowed to continue until then. In addition to a recommendation that the station rebuild is brought forward, the RUS reviewed a short-term option of an additional entry and exit point.

The proposal to reroute passengers and provide an additional entry and exit point is not new and has been campaigned for by local transport and passenger user groups, other operators and supported by Network Rail for several years. However, due to the physical works (and cost) required to facilitate this (relocation of food outlets, retail units and demolition of a wall) the proposal fails to achieve a business case as a stand alone scheme. The Crossrail programme team will continue to review the programme of works for the station rebuild and ensure delivery is completed as early as feasibly possible.

6.9.14.2 Windsor and Eton Central

Overcrowding on the platform at Windsor and Eton Central station was identified through the process of gap quantification – a station count was completed in January 2009 with a number of issues identified. Over 1.4 million passengers used the station during 2007/08, with further pedestrians using the area as a through walkway from the coach park to the town centre. A fence divides the platform into two routes, one for the passengers alighting and boarding the trains and the other for the through pedestrians. This severely limits the space available for those using the train.

Although the through walkway has not acquired public footpath status, the footway was first leased from British Rail to the Royal Borough of Windsor and Maidenhead in 1984. The fence dividing the platform is erected as a duty of care in order to prevent non-railway passengers from entering the main platform area; as such it would require a formal risk assessment and review between all the parties to consider whether the removal of the fence would result in a greater risk.

As part of the RUS option assessment a number of interventions were proposed; the installation of ticket gates, widening the existing platform or constructing a second platform face. The option of constructing a second platform face was discounted due to the ownership of the station area and land available. The other two options provide short-term and longer-term improvements; the first being the installation of ticket gates as a means to manage and direct the flow of passengers alighting and boarding the train, the second being to widen the existing platform face by up to 1 metre to extend the surface area available.

Due to the number of ticket gates that would be required to appropriately route passengers through the area and the additional operational costs of this, this option proved not to be economically viable. The longer-term option of widening the platform face by slewing the track has been appraised. Analysis shows that the benefits associated with walk time improvements to passengers were not sufficient to justify the cost of construction.

Therefore this option is not recommended in the RUS.

The introduction of three-car trains on Saturdays during the summer months in 2009 assisted in reducing overcrowding and conflicts between alighting and boarding passengers on the platform area by spreading passengers across the platform space available. FGW evaluated the business case for increasing the service provision on a Saturday to three trains per hour but this is not sufficient to implement. FGW will therefore continue to review the provision of an additional car on weekend services subject to rolling stock availability during the summer months.

6.9.15 Option O: Seasonal Fluctuations

Seasonal fluctuations in supply and demand were identified through the baseline analysis. As shown in **Chapter 3**, the demand variations to, from and within Devon and Cornwall during the summer and winter months are significant with up to 30 percent variations.

Along with the capacity analysis of the main line services, it was proposed to review those branch lines where the service offered through the summer differed to that provided through the winter in particular assessing those branch lines where Long Distance High Speed (LDHS) services also operated, namely Newquay and Paignton. With the focus on the mix of long distance and local services on the Newquay and Paignton lines, load factor analysis on these areas for summer Saturdays was completed, the results of which are presented below.

6.9.15.1 Newquay

For the main line services to Newquay, the capacity analysis for the London Paddington to Newquay services, showed that there was sufficient capacity on the LDHS services on summer Saturdays from 2009 to 2019 with an estimated 35 percent passenger growth. This could be further enhanced with potential IEP services, increasing capacity and frequency to the west.

A review of the operability of both the local service and the LDHS to see what would be required to accommodate this should it be a feature in the future was undertaken. At present, during the summer timetable only the LDHS service operates running non-stop from Par to Newquay on Saturdays, the local stopping service is withdrawn, and there is no service available for the intermediate stations between Par and Newquay.

Timetable analysis has identified that three additional local stopping services could be operated on a Saturday in each direction based around the summer (May 2009) LDHS timetable. In order to facilitate this, a new dynamic loop (potentially at St Columb Road) would be required. The economic appraisal of this option (without the capital costs of the new dynamic loop) showed the scheme offered poor value for money. Based on this, the RUS is not able to recommend the additional services. The transport economic efficiency table for this option is presented in **Appendix D**.

Despite being below the threshold, it is still worthwhile to review the scheme further. The economic appraisal is very sensitive to the demand forecast and therefore local area research would be appropriate to understand the market potential. Again, it is recognised that MOIRA may not be an appropriate demand forecasting tool for Newquay as demand for rail fluctuates substantially during the year.

Cornwall Council has raised an aspiration to review the service provision for Newquay as a result of the confirmation of the eco-town at St Austell. A GRIP 2 study (Pre-feasibility) has been commissioned to assess potential enhancements which could be delivered on the Newquay branch line to enhance the frequency and potentially the capacity of the branch line to achieve a clock face hourly service. The review includes an assessment into reconnecting the Burngullow to Parkindillack freight only branch line to the Newquay line at St Dennis which would provide a direct connection to St Austell avoiding the route via Par. The review will also consider the aspiration for new stations at Blackpool or Nanpean, near St Austell, for the eco-town community and identify the current maximum capacity at Newquay station and propose how the station infrastructure can be enhanced to meet expected demand.

6.9.15.2 Paignton

Capacity analysis on the local and long distance services into, and out of Paignton has been completed during the RUS consultation period using passenger counts undertaken during August 2009 by both CrossCountry and FGW. The current levels of demand, projected to 2019 with predicted growth have been reviewed. For the local services, this has been reviewed in line with the proposed service change under Option L (6.9.12).

The results of the analysis show that with the proposed train lengthening opportunities presented under option D (paragraph 6.9.4) for the long distance CrossCountry service, Manchester to Bristol Temple Meads/Paignton, will enable sufficient capacity to accommodate predicted growth to at least 2019 on both weekday and weekends in the summer period. Therefore no further interventions are recommended for the long distance services at Paignton.

For the local services, the capacity analysis has enabled the proposed change to the service provision as detailed in option L (paragraph 6.9.12) to be introduced at an early stage in 2016 rather than 2018. This is because the capacity analysis has supported the business case for a revised service pattern to be operated during the week and at weekends and is sufficient enough to achieve the necessary BCR of 1.5 by 2016. With this change in service frequency, no further interventions are required. The RUS therefore recommends this change to the service provision.

This option has no impact on freight services.

With the remaining branch lines, those with self contained services, assessments will be undertaken and addressed through the Community Rail Route Plans (CRRP). This has already been completed for the St Ives line and is expected to be completed for the Barnstaple branch in 2010.

The CRRP concept continues to be developed. Experience with the Barnstaple plan, plus the earlier plan for the St Ives branch, will help determine the form that future CRRPs will take to add most value to Community Rail lines, whether as stand alone plans or, for example, encompassed within the wider Network Rail Strategic Route Plans. Once this work is complete it will be possible to draw up a single programme to address the remaining 16 designated Community Rail lines and nine designated services across the network.

Furthermore, there are a number of initiatives which will enhance the local area which Network Rail will continue to support and assist the local council and the Community Rail Partnerships. The completion of the new dynamic loop and station facilities at Penryn is an example of this, with the Falmouth Branch line providing the improved service of two trains per hour to meet Cornwall Council's specifications.

A Park and Ride facility at St Erth station is being developed by Community Rail and Cornwall Council as a means of reducing demand on parking and road infrastructure within St Ives, encouraging a modal shift to rail. The scheme will include station enhancements such as a new booking office, tourist information facility, café and display areas. FGW have been engaging with Cornwall Council with the view to enhancing the service on the St Erth to St Ives branch to accommodate anticipated demand and will review lengthening the service potentially up to five cars for a longer period than just the summer months.

There are aspirations for a Park and Ride facility on the Looe branch with the facilities to be provided at Moorswater – this is currently being assessed with a pre-feasibility study underway, similarly a Park and Ride facility at Trelusswell (between Perranwell and Penryn) is being reviewed to serve the Truro to Falmouth branch. Opportunities for through ticketing are also being explored which will enable passengers to use the same ticket on any bus from Truro station onto their final destination.

6.10 Summary

6.10.1

There are a number of key outputs from the gaps and option appraisal process which are drawn together and presented into a strategy for the short, medium and longer term. This is presented in **Chapter 8**.

7. Consultation process

7.1 The Draft for Consultation

The Great Western Route Utilisation Strategy (RUS) Draft for Consultation was published on 1 September 2009 for a 12 week consultation period which ended on 27 November 2009.

The document outlined a number of gaps between the present capability of the rail network throughout the RUS area (in terms of capacity and performance), and the predicted demand for both freight and passenger traffic up to 2019. A set of options was proposed for bridging those gaps. In line with the Government White Paper (2007) 'Delivering a Sustainable Railway'; the Draft for Consultation also looked in more general terms towards a 30-year horizon.

The Draft for Consultation was distributed to a wide range of stakeholders. During the consultation period, stakeholders were invited, either collectively or individually, to briefing sessions held by both Network Rail and Passenger Focus. A number of individual meetings were also held with stakeholders as requested.

This chapter outlines the key outputs from the consultation period and explains how the responses have helped shape the development of the final strategy.

Figure 7.1 – Table of responses

Train and Freight operators	3
Government and other industry stakeholders	52
MPs	14
Rail User Groups	46
Businesses	14
Members of the public	27

Note: multiple responses received from several groups and members of the public, which for Figure 7.1 have been counted as one response only

7.2 Consultation responses

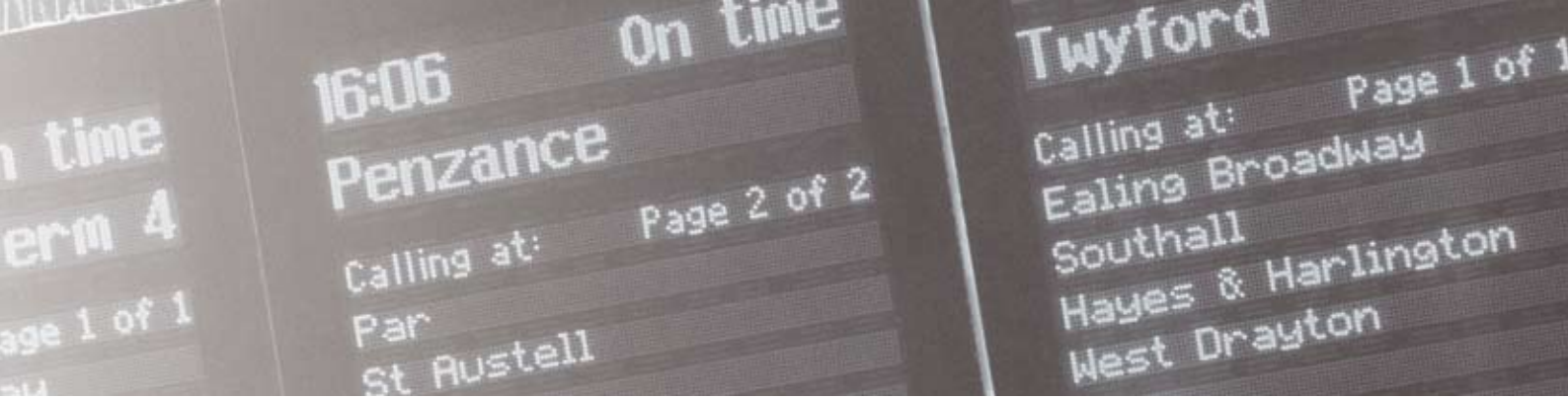
The Great Western RUS Draft for Consultation received a total of 156 responses.

Copies of the various responses can be found on the Network Rail website at **www.networkrail.co.uk**.

7.3 Key themes

7.3.1 Introduction

The consultation responses have been grouped into key themes, a summary of each theme is presented along with reference to any further work or analysis that has since been completed.



7.3.1.1 Positive reaction

General reaction from most respondents was positive, welcoming the fact that the Great Western route was the subject of a detailed study and with the recent announcement of the electrification of the Great Western Main Line (GWML) respondents demonstrated their support to this commitment. Responses were generally supportive of the gaps identified, the overall direction of the RUS, and the work being done, recognising the considerable challenge of the large and varied geographical area covered by this RUS along with the high-profile investment schemes already planned over the next five to 10 years.

7.3.1.2 Electrification, Intercity Express Programme and Crossrail

With the announcement to electrify the GWML made two weeks prior to the publication of the Draft for Consultation, the RUS was only able to present the details known at the time. As such, many respondents requested clarity on the scope and boundaries for electrification and for further in-fill schemes to be reviewed.

Chapter 4 confirms the scope for electrification under the GWML scheme and details the additional elements that have been included.

Further work will be completed, to evaluate additional schemes for electrification to follow the completion of the GWML. These further schemes are presented in **Chapter 9**.

From the responses, the following routes were also requested to be reviewed:

- Thames Valley branch lines (Henley, Marlow and Windsor)
- North Downs line (Wokingham to Aldershot S Jn as a 3rd rail scheme)
- Basingstoke to Southcote Jn
- Newbury to Exeter (Berks and Hants line)
- Newbury West to Westbury Yards via Lavington and diversionary route via Melksham
- Westbury to Bathampton Jn and Bradford Jn to Thingley Jn
- Bristol area for local services to include Stoke Gifford Jn to Avonmouth and Bristol West Jn to Portbury Docks
- Bristol Temple Meads to Plymouth.

With the GWML electrification scheme extending along the Berks and Hants route to Newbury, many questioned how the Kennet Valley services to Kintbury and Bedwyn would operate in the future. This is being addressed as part of the Intercity Express Programme (IEP) review and through the electrification scheme.

With the implementation of IEP, concerns were expressed with regard to through services from electrified to non-electrified parts of the network and the possible effect this would have on connectivity. Further detail has been presented in **Chapter 4** explaining the operation of the bi-mode trains which should ease concerns regarding the effect on through services.

With the electrification of the GWML, a significant amount of consultation responses requested that consideration be given to Crossrail services being extended to Reading. This is for the sponsors of Crossrail, the Department for Transport (DfT) and Transport for London to review.

Concerns were raised with regard to the proposed provision of Crossrail services, particularly the effect that they may have on through services from Bourne End and Henley to London Paddington and the impact of services at Slough.

Consultation responses requested further details on the timetable and service specifications on the relief line service patterns following the introduction of IEP and Crossrail. The RUS presents the latest specification available in **Chapter 4** however, the final specifications and combined timetable for both IEP and Crossrail will not be available until late 2010 after publication of the strategy.

7.3.1.3 Rail access to London Heathrow Airport

Considerable support was presented for western rail access to London Heathrow Airport; this was particularly evident from businesses based in Slough who pledged their support for a Slough to Heathrow rail link to provide both economic and environmental benefits.

7.3.1.4 Passenger growth forecasts

It was suggested by consultees that growth forecasts needed to be reviewed to take account of the impact of the GWML electrification scheme. This work has been completed with the incremental growth attributed to electrification highlighted in **Chapter 5**.

Many believed that the passenger growth forecasts used in the Great Western RUS underestimated the expected level of growth and that predicted specifically in the South West's draft Regional Spatial Strategy. This is particularly evident for Bristol, Exeter and Plymouth where it was felt the forecasts did not take into account historic and actual growth to date and misrepresented the current and future situations. Concern was expressed that in some areas growth was occurring at a more rapid rate and that if the trend continued the actions proposed in the RUS would be overtaken by events.

The forecasts for Bristol, Exeter and Plymouth as explained in **Chapter 5** (paragraph 5.8.4) do take into account the recent acceleration in rail demand growth and an alternative methodology to the industry standard forecasting model has been developed and used for this RUS (paragraph 5.8.1.4).

Consultees requested the review of the impact of the current recession on rail demand and growth over the RUS 10-year forecasting period. The Great Western RUS Draft for Consultation reported passenger demand forecasts produced in summer 2008, using the then current view of key demand drivers including employment and Gross Domestic Product (GDP). Since then, the severity of the recession has worsened and therefore a fall in rail demand might be expected. However, a review of the latest ticket sales data shows that over the last two years, rail demand in the Great Western RUS area continued to increase and has not been affected in the way the industry standard forecasting models would have predicted. Furthermore, the RUS passenger forecast represents a medium to long-term view of growth and therefore should not be affected by short-term fluctuation in demand. Therefore the RUS forecasts (except in the case of the incremental effect of electrification) have not been revised.

7.3.1.5 Rolling stock and capacity up to 2014

Many expressed concern with the delay to the rolling stock order for additional diesel units following the electrification announcement, and questioned how the expected increase in passenger growth would be accommodated prior to 2014. It is recognised that short-term interventions are required for regional services to accommodate known growth and to support additional modal shift. The DfT is currently reviewing its rolling stock plan and proposals with a revision expected in 2010.

7.3.1.6 Bristol Metro

Although many welcomed the analysis that the RUS had completed on behalf of the West of England Partnership, many noted their preference for the Bristol Temple Meads to Chippenham option and were disappointed in its failure to achieve the necessary Benefit Cost Ratio (BCR) to be able to be recommended in the RUS. This was also supported by a campaign for the reopening of Corsham Station with 23 postcards received from the Lockleaze Voice Transport Group.

Additional propositions for a 'Bristol Metro' were provided by consultees who recommended the inclusion of various local services and an extension of the boundaries further north, west, south and east.

As presented in **Chapter 6**, the analysis of the West Wiltshire options has been amended to reflect more accurate passenger numbers. The recommendation still stands for the scheme promoter, Wiltshire Council, to review the options available and pursue the optimal service pattern, in conjunction with the West of England Partnership for their aspirations around Chippenham.

An objection was received to the recommendation of the additional Bristol Temple Meads to Bath Spa shuttle due to fears of the potential negative operational performance at Bath Spa. This is discussed further in **Chapter 6** with opportunities available for a cross-Bristol service following electrification.

742 postcards were received as part of a campaign led by the Friends of Suburban Bristol Railways (FOSBR) who interpreted that the Draft for Consultation was recommending a reduction in the current service pattern on the Severn Beach line. The Draft RUS for Consultation had not reviewed, or proposed, any amendment to the current service pattern. However, as an area of further work following the postcard requests, the RUS reviewed increasing the service frequency to half hourly on this line. The analysis and results are presented in **Chapter 6** under paragraph 6.9.10.6.

A new gap was identified through the consultation responses with the lack of connectivity between Bristol and Gloucester via Severn Tunnel Junction on the South Wales Main Line and perceived overcrowding at the stations on that route, namely Severn Tunnel Junction, Chepstow and Lydney. Strong support was also noted for additional stops at Lydney. As such, the RUS carried out a high level assessment of demand for this route, including a station stop at Filton Abbey Wood. Using current passenger numbers and a predicted growth of 41 percent to 2019, with the necessary operating costs of a vehicle, fuel and staffing costs, the scheme offers low value for money. As such, the option was not taken any further. This analysis is presented in **Chapter 6** under paragraph 6.9.10.8.

7.3.1.7 Exeter, Plymouth, Devon and Cornwall

Responses noted minimal recommendations for the South West and felt more should be done.

The proposed recommendation in the Draft RUS for Consultation for the change in local services at Exeter, terminating the existing hourly Barnstaple to Exmouth service at St James Park, was strongly opposed. This has been reviewed with First Great Western (FGW) and an alternative recommendation is proposed in the final strategy which maintains the hourly Barnstaple to Exmouth and hourly Paignton to Exmouth services and instead introduces an additional hourly service from Paignton to St James Park. This is detailed in **Chapter 6** under paragraph 6.9.12.

A further extension of this Paignton to St James Park service has also been assessed with the continuation of the service to Pinhoe, Honiton and/or Axminster. This follows aspirations under the Devon Metro for two trains per hour from Exeter St Davids to Axminster, enhancing the hourly service introduced in December 2009. The results of this analysis are also presented in **Chapter 6** under paragraph 6.9.12.

Many requested that the proposed Devon Metro received the same level of analysis as the Bristol Metro, and although many elements of this scheme were initially completed for the draft strategy it was not presented as such and **Chapter 6** has therefore been updated to reflect this, with further details of the proposal in **Chapter 9**.

Faster journey times to enable a London to Plymouth service in under three hours was requested and this will be reviewed in line with IEP and the enhanced acceleration and braking capabilities of the new trains, along with electrification and the European Rail Traffic Management System, which will enable end-to-end journey times to be improved.

Respondents also requested a regular direct service from London to Torbay. FGW are currently reviewing the case for a direct London Paddington to Paignton service, which is subject to Service Level Commitment (SLC) consultation, which would address this requirement whilst also enabling an earlier morning arrival than is currently available to Exeter and, through a connection, to Plymouth.

Opportunities for increasing capacity through reducing signalling headways and improving linespeeds will be undertaken for Devon and Cornwall in line with the resignalling and renewal proposals in Control Period 5. This will help shape the future strategy of the railway. Following consultation responses, we have estimated the maximum level of capital expenditure that could be justified to achieve a one minute journey time saving on the Barnstaple and Newquay branch lines and these have been added to Figure 6.26 in **Chapter 6** and in **Appendix F**.

7.3.1.8 Stations

Some consultation responses expressed concern that there was no clear strategy in the RUS for access to stations and integration with other transport modes. The RUS has reviewed synergies with other initiatives such as Access for All and the National Stations Improvement Programme which is illustrated in **Chapter 4.**

A review of the initiatives to improve stations has been completed and further detail presented in **Chapter 3**. It was also suggested there was insufficient coverage of low footfall stations and a review of these has been undertaken with the results presented in **Chapter 3**.

It was believed that stations where car parking capacity is already fully utilised should have been analysed and this has since been reviewed and managed consistently in line with other RUSs with the details presented in **Chapter 3**.

7.3.1.9 Depot strategy

Some of the options in the Draft RUS for Consultation recommended lengthening services or increasing the number of trains. Some respondents wanted to see a clear strategy for depots, including whether the current facilities are able to cater for the additional vehicles, and if not, what options are preferred and the likely cost implications.

However, at the present time, the size of the depot requirements to accommodate the additional vehicles from the High Level Output Specification (HLOS) is the subject of further discussion between FGW and DfT. Similarly, the depot requirement for long distance high speed services will become clearer as IEP develops with the initial requirements presented in **Chapter 4**.

Using the current assumptions, it is expected that the new depot to be constructed under the Reading Station Area Redevelopment scheme will be sufficient to accommodate IEP and any additional vehicles in the Thames Valley. Depot facilities for the West of England are dependant on the depot strategy for IEP and the mix of rolling stock to be delivered by the revised rolling stock plan.

The Network RUS will consider depot issues both for existing and future rolling stock types, including electric vehicles.

7.3.1.10 Aspirations

Many of the responses received are categorised as aspirations under the RUS process. However, many believed that these proposals should be included in the strategy, as although they still require funding solutions, they provide an indication of what could be done in the future and are of particular importance for planning and development

purposes. **Appendix G** presents the aspirations for new or reopened stations and lines for either freight or passenger services.

A number of responses proposed improvement of services at individual stations or on routes where no gap had been identified by the RUS process. Such proposals fall more naturally to be developed within the normal dialogue between the local authorities and train operators concerned. Responses which propose options identified as being outside the RUS remit will be passed to railway specifiers and funders for their consideration. Meanwhile, the RUS has sought as far as possible to incorporate the views of stakeholders commensurate with the resources and aspirations of funders.

7.3.1.11 RUS review

Due to the number of uncertainties still evident with the major enhancement schemes such as electrification, IEP and Crossrail, many responses requested that following confirmation and clarity on these then a review of this element of the RUS is undertaken.

Under its Network Licence, Network Rail is obliged to maintain RUSs so that they remain fit for purpose. Given the complexities of the schemes particularly for the London Paddington to Reading corridor it is anticipated that a review will be required once the impacts of both Crossrail and the IEP programme are fully understood.

8. Strategy

8.1 Introduction

8.1.1

This chapter draws together the conclusions from the Great Western Route Utilisation Strategy (RUS) analysis into a strategy to 2019. The RUS process has considered the current freight and passenger markets and assessed the future growth in each. It has then sought to accommodate this growth effectively and efficiently, in accordance with the route utilisation objective specified in Licence Condition 1.

8.1.2

The key themes that have emerged from the analysis of the current railway and what is required of it in the future are capacity (at stations, on trains and of the network), performance pinch-points and local and regional connectivity. The most acute issue evident is accommodating the growth in commuter and leisure journeys at various points across the Great Western RUS area. These are predominantly into London Paddington, Reading and Bristol Temple Meads.

8.1.3

The strategy for Control Period 4 (CP4) from April 2009 to March 2014 is presented along with specific options from the RUS which can potentially be included within this timeframe. The remainder of the chapter focuses on the recommendations to be taken forward into Control Period 5 (CP5) from April 2014 to March 2019.

8.2 Strategy for Control Period 4 (2009 – 2014)

8.2.1

In July 2007, the High Level Output Specification (HLOS) was published. The HLOS set out the improvements in the safety, reliability and capacity of the railway system which the Secretary of State for Transport wishes to secure during CP4. In March 2009, Network Rail published its CP4 Delivery Plan which details how these outputs for infrastructure and capacity enhancements will be delivered. Whilst the RUS is a 10-year strategy, it is important to emphasise that this strategy is aligned with the delivery of the key outputs specified within the HLOS and in the Delivery Plan.

8.2.2

Much of the short-term strategy for the Great Western RUS area is contained in the Delivery Plan. The strategy primarily consists of measures to increase capacity on peak passenger services specifically into London Paddington and other key urban areas such as Bristol through train lengthening and to provide infrastructure capacity enhancements for freight and passenger growth. Various schemes also target improvements in capacity and performance most notably with the Reading Station Area Redevelopment and the Cotswold line redoubling scheme. National initiatives such as Seven Day Railway and the Strategic Freight Network (SFN) also form part of the CP4 deliverables and where relevant these are incorporated in the strategy for the Great Western RUS area.

8.2.3
The strategy is also based around ensuring services continue to run at a level consistent with growing passenger demand, whilst a major programme of investment – including the Reading remodelling – is underway. This requirement will continue into CP5 with the implementation of Crossrail, electrification and the European Rail Traffic Management System (ERTMS). In addition to the specified schemes for CP4, work will commence on the development of these schemes to be delivered in the next control period along with the Intercity Express Programme (IEP).

8.2.4
Recommendations for additional vehicles for train lengthening are dependent on the availability of rolling stock. The Department for Transport (DfT) proposed its Rolling Stock Plan in January 2008 which set out how rolling stock will be used to deliver increased capacity and hence contribute to the capacity outputs required over the period to 2014. The strategy set out in this chapter takes account of the key provisions of this Rolling Stock Plan. However, a revised rolling stock plan, required as a result of the commitment to electrification, is expected to be published in 2010, and until then the current assumptions have been used.

8.2.5
The committed strategy for CP4 therefore encompasses the following elements from the HLOS with other committed schemes as presented in **Chapter 4**;

- delivery of the HLOS capacity metrics specifically for London and Bristol by means of the HLOS rolling stock allocation determined in the DfT's Rolling Stock plan (2010)
- delivery of the HLOS capacity programme for the RUS area by means of the:
  - Reading Station Area Redevelopment
  - Twyford and Maidenhead relief line platform enhancements[1]
  - Cotswold line redoubling
  - Westerleigh Jn to Barnt Green linespeed improvements
- delivery of the HLOS performance metrics
- development of electrification proposals
- delivery of all other committed schemes:
  - Southampton to West Coast gauge enhancement and the diversionary route via Andover and Laverstock
  - Reading Green Park station
  - Up and Down goods loops at Oxford
  - Evergreen III project (Bicester Chord)
  - Bath Spa capacity upgrade.

8.2.6
The completion of this investment programme will develop the existing rail network providing the necessary infrastructure to operate an increased service level and longer trains whilst also improving journey times, reliability and performance.

8.2.7
The CP4 strategy also enhances the capability of the railway for freight services with the Southampton to West Coast gauge enhancement scheme and the development of the Strategic Freight Network.

1 Should the HLOS capacity metric for London be met by the rolling stock plan this project would not be required for HLOS purposes

8.2.8 Strategic Freight Network

8.2.8.1

As described in **Chapter 4**, the SFN will provide an enhanced core trunk network, capable of accommodating more freight trains, potentially longer in length, with a selective ability to handle wagons with higher axle loads and greater loading gauge to allow for the expected growth in traffic. This will include appropriate diversionary routes. The objective is to enhance the network used by freight trains and reduce conflict between freight and passenger traffic. The programme of works will deliver improved capacity along with infill gauge and train lengthening schemes enhancing capability. Further to **Chapter 4**, various schemes were presented in **Chapter 6**.

8.2.9 Network Availability: Seven Day Railway

8.2.9.1

The Seven Day Railway programme included in the CP4 Delivery Plan is developing a number of initiatives to increase network availability and enable an increased level of services to operate in the late evenings and particularly on Sundays. These Seven Day Railway initiatives and the schemes to deliver them are described in **Chapter 4** representing the strategy for improving network availability on the Great Western RUS area.

8.2.9.2

To date, network availability has been restricted by engineering works to maintain, renew and enhance the railway which have traditionally been planned overnight and during the weekend, when passenger demand was lower. The Seven Day Railway programme reflects the increasing demand for passenger services at weekends with the requirement to mirror more closely the Monday to Friday service and the growing need of freight customers for consistent daily continuity of supply, in line with what is generally available from the road transport industry. The commitment is to ensure there is less bus replacement (bustitution) with passengers remaining on trains. The target for CP4 is to provide an increase of 37 percent availability for passenger services and no decrease in availability for freight.

8.2.9.3

The Seven Day Railway programme also considers options to improve capacity, provide a diversionary route and reduce the extended journey times that can be incurred for some diversions. On the Great Western RUS area, there are several constraints on the network where no diversionary route is available – between Dr Days Jn and Filton Abbey Wood (Filton Bank) and between Barnwood Jn and Abbotswood Jn. The RUS recommendations for CP5 support the objectives of the Seven Day Railway initiative. This is specifically evident with the proposal to create an additional track on Filton Bank, provide additional capacity for diversionary purposes between Swindon and Gloucester and increasing the linespeed between Gloucester and Severn Tunnel Jn in order to reduce diversionary journey times. These recommendations are discussed under section 8.3.

8.2.9.4

With the improvements to network availability, and the ability for an increasing number of passenger services to operate – particularly on Sundays, there is likely to be an increase in demand as suppressed demand is released for these services and for those on other days of the week. This is through the extension of through services without the need for rail replacement and a continuation of the timetable. Suppressed demand can also be released from the freight market with the continuation of operations at times attractive to customers.

8.2.10 Engineering access

8.2.10.1

Existing levels of engineering access across the RUS area are described in **Chapter 3**. For changes in the possession regime to be effective there needs to be the ability to deliver the current work outputs (renewals and maintenance) in less time. The successful development and introduction of a revised cyclical weeknight maintenance strategy across the network from the start of the December 2009 timetable has assisted this, specifically benefiting freight operators.

8.2.10.2
Further initiatives under the Seven Day Railway programme are aimed at improving the productivity and efficiency of maintenance and renewal activities so that engineering work can be undertaken with less disruption to train services, these include:

- adjacent line open proposals including additional bi-directional signalling and fixed/mobile warning systems for engineering staff
- modular track renewals
- facilities to enable the increased use of mechanised track patrolling at night (such as lighting in tunnels and at junctions and the use of trolleys)
- facilities to improve efficiency (such as safe refuges, pedestrian and vehicle access points and the location of gantry ladders adjacent to access points).

8.2.10.3
These schemes must demonstrate that they will contribute to an improvement in the availability of the infrastructure for passenger services without reducing availability for freight services. Furthermore, the schemes must not have an adverse material effect on capacity, performance or journey times for freight or passenger services.

8.2.10.4
Most of the RUS recommendations relating to additional services concern either the commuter peaks or the main part of the day, the latter on both weekdays and weekends. These are times when there is currently no maintenance access. A number of routes in the RUS area are used by high numbers of passenger services and freight tonnages and the increases in services will generally not be sufficient to raise the current maintenance category for the specification and scheduling of maintenance inspections and work.

8.2.10.5
The RUS recommendations on some routes to run additional or lengthened services may drive the need for additional maintenance access but application of the Seven Day Railway principles will aim to minimise the effect of this on all passenger and freight flows. It is therefore essential that a long-term maintenance and renewal strategy is developed, focusing on smarter engineering access methods which achieve greater productivity but in shorter access times or require the closure of fewer tracks with an available track open for traffic. The appropriate reviews and amendments to documentation will be completed as required.

8.2.11 Capacity and Performance metrics
8.2.11.1
The HLOS capacity metrics establish the additional demand to be accommodated by the end of CP4. For the Great Western RUS area, the focus is on increasing capacity on peak passenger services specifically into London Paddington and other key urban areas such as Bristol. The delivery of these metrics will predominantly be through train lengthening as detailed in Figure 8.1.

Figure 8.1 – Operational plan to meet HLOS capacity metrics

Area	Additional Vehicles	Station served	07:00 - 09:59 capacity impact	08:00 – 08:59 capacity impact
Strengthening of Thames Valley services	40	London Paddington and Reading	3360	1520
Strengthening of cross-Bristol services	12	Bristol Temple Meads	1230	380

8.2.11.2
For London Paddington, the HLOS target for the three-hour peak is to deliver capacity for an additional 2900 passengers, 1400 of these are in the high-peak hours. The provision of the 40 additional vehicles for the Thames Valley area sufficiently meets this requirement. For other urban areas, the target is to provide additional capacity for 3600 passengers in the three-hour peak and 2000 during the high-peak hour. The other urban areas are formed by six locations, including Bristol, which are key cities outside of the London area. With the additional capacity to be provided in Bristol, this significantly contributes to the other urban area capacity target.

8.2.11.3
However, the key assumption with this is the provision of additional vehicles by the DfT to enable the delivery of the capacity metric. At present, the rolling stock plan is being revised. Discussions between the DfT and First Great Western (FGW) are on-going to understand the means as to how this capacity can be delivered.

8.2.11.4
The RUS recommendations further contribute to the provision of additional capacity, specifically through train lengthening, to accommodate growing levels of demand in CP5 and beyond. These recommendations are detailed in paragraph 8.3.9.

8.2.12 Performance
8.2.12.1
The HLOS performance targets set the aspirations from 2009 to 2014; the forward projection from 2014 is still to be determined. Nationally, the Public Performance Measure (PPM) trajectory is targeted for 92.6 percent by 2014 with an overall 25 percent Network Rail reduction in delay minutes.

8.2.12.2
Figure 8.2 presents the performance delivery plan up to 2014 which illustrates the contributions to PPM outputs for England and Wales which will assist in the delivery, and achievement of the 92.6 percent PPM by March 2014. The development of long-term performance plans which describe the agreed action plans and forecasts of performance outputs for each train operator have enabled a coherent plan to be produced on how the regulatory outputs will be achieved. These plans have been jointly produced between the Train Operating Company (TOC) and Network Rail. Figure 8.3 illustrates the PPM to be achieved each year to 2014 for FGW and CrossCountry in order for the final target to be achieved.

8.2.12.3
The key initiatives contributing to the improvement in PPM in CP4 are:

- more robust and realistic timetables, through the introduction of new systems and improved modelling
- management and process improvements, including maintenance benchmarking and network availability initiatives (Seven Day Railway)
- measures to prevent incidents which impact on performance, for example remote condition monitoring, rail grinding and the new measurement train
- improved control initiatives, including incident management arrangements and contingency planning
- performance benefits from the asset renewals programme and implementation of the enhancements programmes.

8.2.12.4
The delay minute contribution to the achievement of the PPM targets for FGW and CrossCountry are shown in Figure 8.4. This presents the forward trajectory to 2014 for overall delay minutes, split between those delay minutes accountable to Network Rail, delay minutes caused by the TOCs to themselves, and the delay minutes caused to TOCs by other TOCs (TOC on TOC delay). Freight delay minutes are also targeted on a per 100 train kilometres basis for Network Rail caused delays. Figures 8.5 presents these forecasts for DB Schenker and Freightliner.

Figure 8.2 – Performance delivery plan for England and Wales

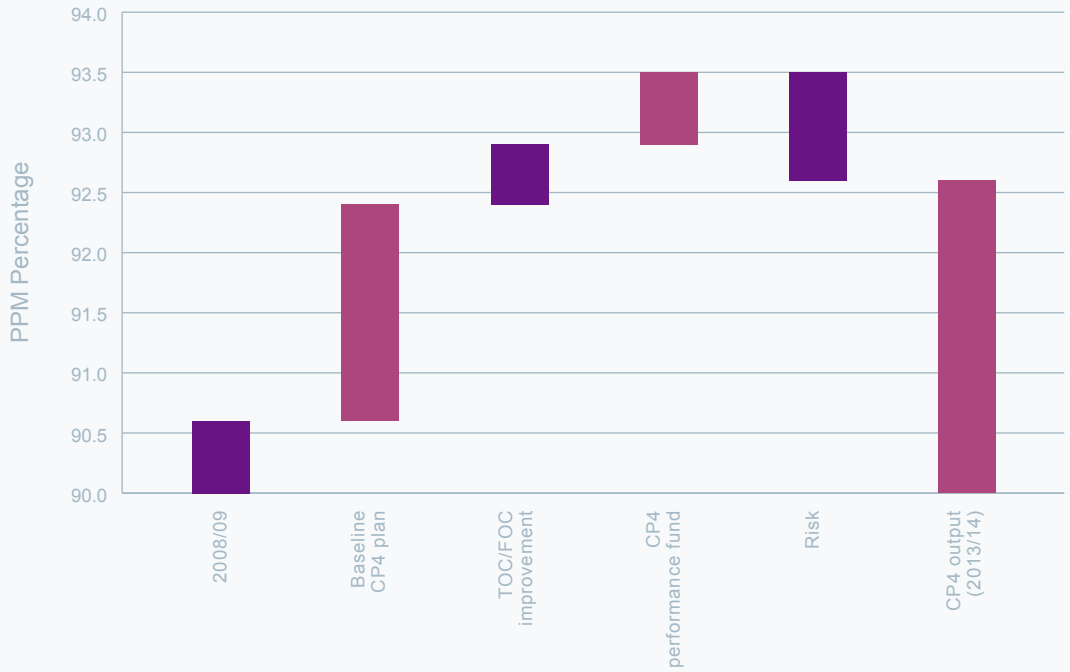


Figure 8.3 – First Great Western and CrossCountry Public Performance Measure targets to 2014

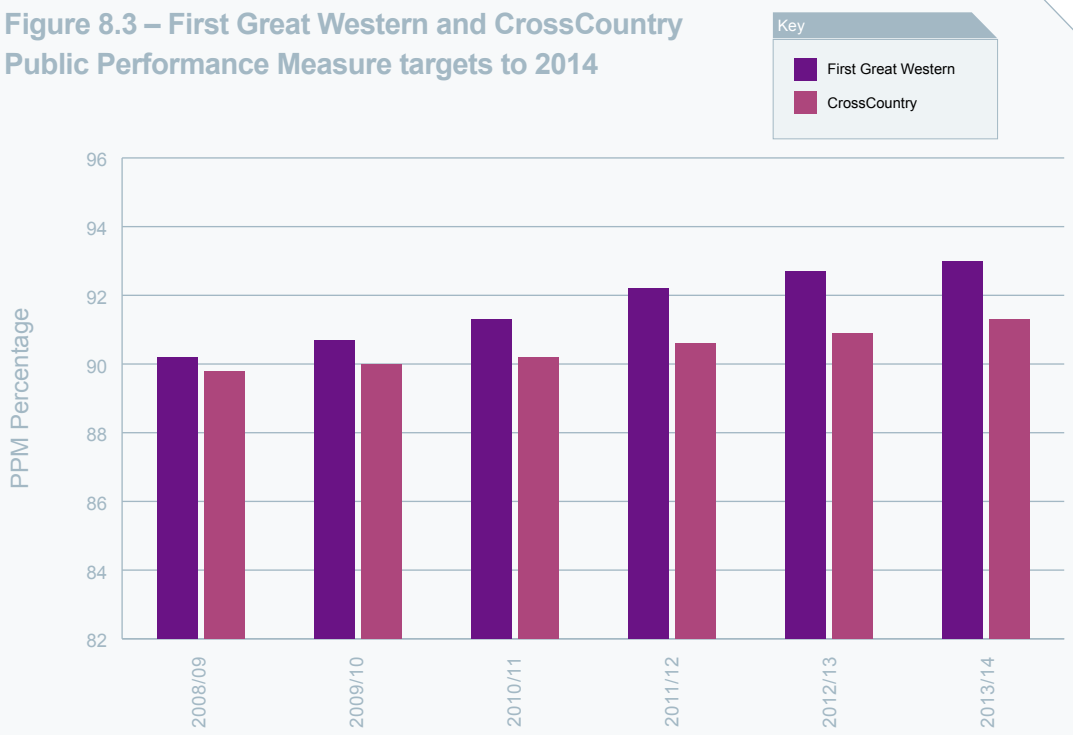


Figure 8.4 – First Great Western and CrossCountry delay minutes targets to 2014

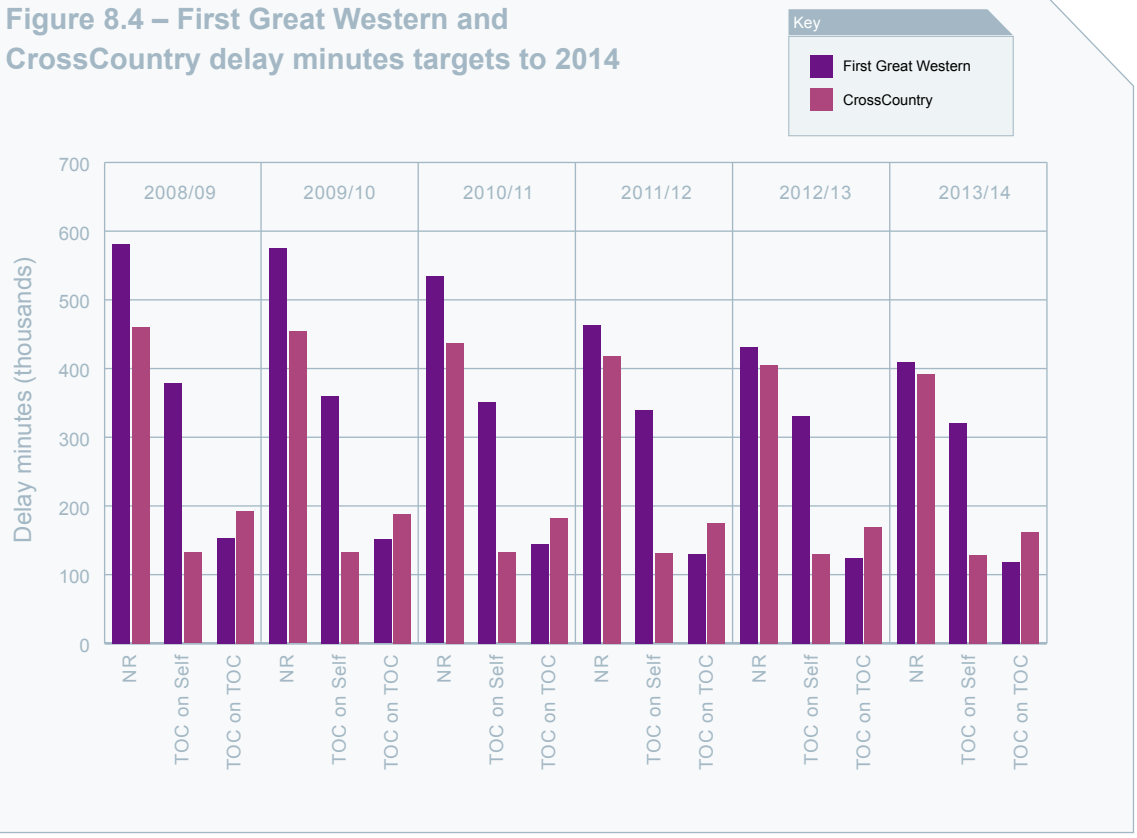
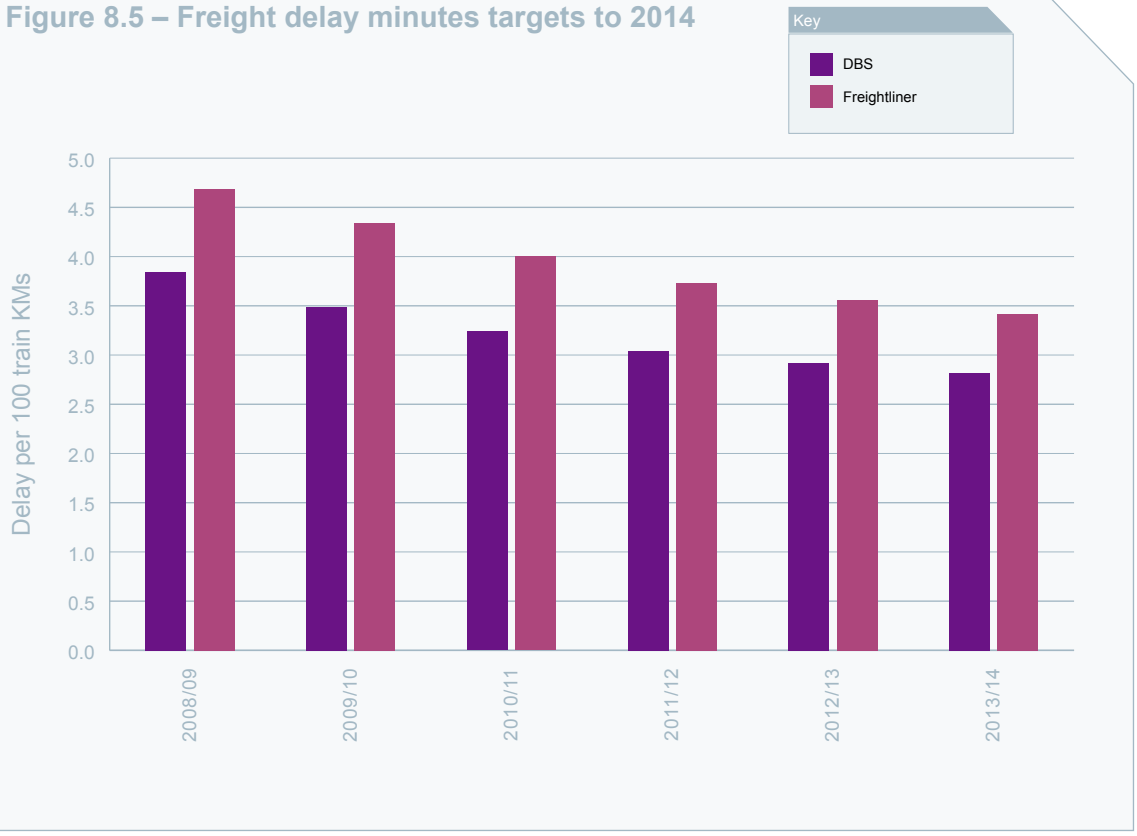


Figure 8.5 – Freight delay minutes targets to 2014



8.2.12.5

The HLOS also requires reductions in the number of cancelled and significantly late (over 30 minutes) passenger services by 2014. The trajectory to 2014 sees the levels of Cancellations and Significant Lateness (CaSL) fall to 3.9 percent for long distance services, 2.0 percent for London and South East services, and 2.3 percent for regional services within England and Wales. The forecast trajectory for reducing cancellations and significant lateness for FGW and CrossCountry is presented in Figure 8.6.

8.2.12.6

Funding has been allocated under the national performance fund for the Great Western RUS area to assist in achieving the performance targets for PPM and CaSL through the delivery of schemes such as track circuit reliability, Uninterrupted Power Supplies (UPS) and points heating. Other performance schemes include the widespread implementation of remote condition monitoring to points and other signalling equipment and other initiatives to improve asset reliability.

8.2.12.7

A number of enhancement schemes, as presented in Network Rail's CP4 Performance Delivery Plan, will assist in the delivery of these performance improvements. For example, the implementation of the Reading Station Area Redevelopment is forecast to bring a 37.7 percent improvement in train delay minutes.

Figure 8.6 – Cancellations and Significant Lateness targets to 2014

8.2.13 Other schemes

It is also recognised that many of the uncommitted third party enhancement schemes discussed in **Chapter 4**, can assist in addressing the gaps identified by the RUS by bringing additional network and service capacity and capability that can benefit the area. Several of these schemes provide significant interfaces with the HLOS capacity programme, specifically with the Cotswold line redoubling and the Westerleigh Jn to Barnt Green linespeed improvements as presented below:

Cotswold line redoubling:

- the proposed Didcot to Oxford capacity enhancement redeveloping the station area and providing a four track section between Radley and Wolvercot Jn
- Oxford to Bletchley strategic route development for passenger and freight
- East West Rail upgrading the line between Oxford and Milton Keynes
- Evergreen III infrastructure works to facilitate a new Oxford to London Marylebone service via High Wycombe (now committed).

Westerleigh Jn to Barnt Green Linespeed improvements:

- interaction with the Bromsgrove station relocation project
- interaction with Bromsgrove electrification and Redditch branch improvement
- interaction with Birmingham Gateway
- cross-Bristol service increases with the proposed 'Bristol Metro.'

8.2.14 Station enhancements

In the initial period to 2014, there are also a number of programmes and initiatives proposed to address and improve the general station environment at various locations across the RUS area:

- the National Stations Improvement Programme (NSIP) seeks to improve station facilities. In addition, the continuation of the Access for All programme aims to improve the accessibility of stations by providing step-free access to platforms. A number of stations in the RUS area benefit from these programmes as discussed in **Chapter 4**
- there are also third party enhancement proposals for a number of stations as presented in **Chapter 6** which include London Paddington, Ealing Broadway (as part of the Crossrail programme), Reading, Oxford and Bristol Temple Meads. These schemes will address current pedestrian congestion as well as provide sufficient capacity and capability to accommodate future growth
- through the Crossrail programme, various stations in the Thames Valley area will be enhanced through station works and platform lengthening where necessary. Works will commence during CP4 for completion in CP5. Stations include Maidenhead, Taplow, Burnham, Slough, Langley, Iver, West Drayton, Hayes and Harlington, Southall, Hanwell, West Ealing and Acton Main Line.

8.2.15 RUS options

A number of options identified through the Great Western RUS are recommended, where possible, to be completed during CP4. This is due to their ability to be combined with current schemes during this timeframe aiding the development and potential implementation of the options.

Infrastructure schemes

- construction of an additional platform face at Westbury station for capacity and performance benefits. Although the RUS recommends this as a stand alone scheme from CP5 onwards (subject to business case evaluation), there are benefits from implementing this scheme as part of the mitigation plan for Crossrail and the Reading Station Area Redevelopment works as it provides a viable diversionary route during the construction period. Under this proposal, the platform needs

to be operational by early 2011. The business case for the scheme would be enhanced to include performance, capacity and diversionary benefits but is subject to funding

- to improve capacity and performance on the Swindon to Gloucester route, the RUS supports the development of the Swindon to Kemble redoubling scheme recommending the inclusion of the incremental enhancement to signalling headways between Kemble and Standish Jn.

Journey time

- linespeed improvements between Gloucester and Severn Tunnel Jn (to be developed as part of Seven Day Railway).

Timetable changes

- the RUS recommends a continual review of existing timetables as an ongoing measure. This forms part of the Joint Timetable Improvement Group with Network Rail and First Great Western. This should include a review of the timetable for the Oxford to Worcester services following the implementation of the Cotswold line redoubling scheme during CP4, in view of the emerging changes to the service provision expected to be introduced with IEP
- the RUS recommends a continual review of existing long distance interurban timetables between the RUS area, Manchester, the East Midlands and the North East as an ongoing measure with CrossCountry.

8.2.16

When drawn together, the combination of these initiatives will result in significant changes to the capacity, capability and operation of the railway, substantially improving the current network over the next five years. The predominant focus of this strategy is capacity improvements through infrastructure, station change and rolling stock. This strategy is the first step to achieving the transformation of today's railway, when combined with the strategic elements for CP5 the transformation will be significantly greater.

8.3 Strategy for Control Period 5 (2014 – 2019)

8.3.1

The HLOS for CP5 will not be published until 2012. The Government's detailed priorities for the railway in this period are therefore not fully defined at present. It can, however, be expected that the strategy outlined in the "Delivering a Sustainable Railway" White Paper (2007) will continue, enabling the network to handle the doubling of passenger and freight demand over the next 30 years. With the White Paper in mind, the RUS can recommend further enhancements for the Great Western RUS area in CP5, where there is evidence that these have a robust business case and are required to resolve a strategic gap.

8.3.2

It is also evident that by CP5, there will have been the provision of additional rolling stock to meet capacity and the introduction of the High Speed Train (HST) replacement programme will commence with the new IEP 'super' trains. This will create a number of opportunities for improving capacity, performance, fuel efficiency and the attractiveness of rail services to passengers – amplified with the electrification of the Great Western Main Line also programmed for completion during CP5.

8.3.3

Such capacity improvements can also create improvements in connectivity and journey times. Options to improve performance at the known pinch-points are also recommended along with a view on their ability to further enhance the capacity and capability of the network, which may be required over the longer term. The options can also offer greater benefit when incorporated with future timetable changes. To accommodate the predicted levels of growth, the RUS strategy identifies changes to service provision, including train lengthening, along with infrastructure enhancements required to facilitate such growth for both the passenger and freight markets.

8.3.4
The proposals, where applicable, align with the Seven Day Railway initiative to improve network availability for both passenger and freight.

8.3.5
The recommendations for the strategy for CP5 are presented below; firstly by committed schemes followed by recommendations from the Great Western RUS.

8.3.6 CP5 committed schemes
The committed strategy for CP5 encompasses the following elements as part of the CP4 HLOS along with other commitments:

- delivery of electrification on the Great Western Main Line extended from Maidenhead to Swansea, Bristol Temple Meads, Oxford and Newbury
- delivery of the Intercity Express Programme
- delivery of the European Rail Traffic Management System
- Crossrail (to Heathrow Airport and Maidenhead).

8.3.7
IEP and Crossrail are both expected to introduce a significant increase in capacity, through longer trains and an increase in service provision benefiting passengers travelling into London as well as those travelling throughout the RUS area. The implementation of both electrification and ERTMS will modify the existing railway system and generate significant advances in track capacity and enhanced capabilities. Together, these can also deliver considerable improvements to journey times and connectivity.

8.3.8
The strategy as recommended by the Great Western RUS is presented below by the generic RUS gaps of Capacity, Connectivity, Journey times and Performance. A number of schemes offer combined interventions when brought together; this is particularly significant for capacity and performance where many of the options will provide opportunities to address both gaps, which in turn, can assist in journey time improvement and support the Seven Day Railway.

8.3.9 Capacity and connectivity
Recommendations to address capacity and connectivity are:

- four additional vehicles in traffic to deliver capacity improvements on the Reading to Gatwick Airport service for two morning and two evening peak services
- between eight and 19 additional vehicles in traffic (dependant on train diagramming) for interurban services to address crowding on the following corridors; Edinburgh to Plymouth, Manchester to Bournemouth and Manchester to Bristol Temple Meads/Paignton
- nine additional vehicles in traffic (over and above the HLOS proposal of 12 vehicles) for services into and out of Bristol Temple Meads in particular to address crowding on the following corridors:
  - Cardiff to Portsmouth: five additional vehicles to enhance two morning peak services and three evening peak services
  - Cardiff to Taunton: three additional vehicles to enhance two morning and two evening peak services; and
  - Gloucester to Weymouth: one additional vehicle to enhance one morning and one evening peak service
- an extension of the existing Newcastle to Reading service to Southampton on a two-hourly basis to improve connectivity to the South Coast and provide crowding relief to the current Manchester to Bournemouth service subject to performance modelling of the Basingstoke station area

- an enhanced cross-Bristol service, requiring additional rolling stock, will improve connectivity as well as supplying additional capacity through the provision of the following additional services throughout the day:
  - hourly Bristol Temple Meads to Yate (subject to third party funding);
  - hourly Bristol Temple Meads to Bath Spa calling all stations to be reviewed in line with potential service extensions to Clifton Down or Avonmouth (subject to performance modelling)
  - hourly Westbury to Chippenham or Swindon (subject to local demand assessments and operational viability)
- a revised local service pattern from 2016 for cross-Exeter services improving connectivity and providing additional capacity through an additional hourly Paignton to St James Park service.

8.3.10 Capacity and Performance

The following options are recommended to address performance (subject to business case evaluation in CP5) and also deliver extra capacity:

- an additional platform at Westbury station (subject to inclusion within the Crossrail and Reading Station Area Redevelopment mitigation plan in CP4)
- an extension of the carriage line from Bristol Temple Meads to Bedminster and onto Parson Street to provide a four track section
- development of options for three or four tracking between Dr Days Jn and Filton Abbey Wood.

8.3.10.1

Analysis has been undertaken on the effect that these proposed performance improvement schemes, as recommended in the RUS, will have and how these will contribute towards achieving performance targets. This has reviewed the projected delay minute saving attributed to each scheme and correlated this to the percentage of Public Performance Measure to provide an indication of how much benefit each scheme will contribute to the targets of PPM and Cancellations and Significant Lateness (CaSL).

With the continuous changes in performance, this analysis presents a moment in time view of the potential benefits that could be available based on current performance levels. There are also freight performance benefits available which have not been captured in this analysis. The results presented in Figure 8.7 provide a total potential benefit across all passenger service groups.

Figure 8.7 – Estimate performance benefits of recommended schemes

Scheme	PPM benefit	CaSL benefit
Westbury Platform	0.07%	0.11%
Four tracking from Bristol Temple Meads to Parson Street	0.097%	0.07%
Filton Bank (three track option)	1.13%	0.43%
Filton Bank (four track option)	1.58%	0.63%

8.3.10.2
It is evident that these schemes will significantly contribute to improvements to PPM and CaSL and when taken together as a package, will provide greater benefits.

8.3.11 Relationship between capacity and performance

8.3.11.1
On the basis of the evidence presented in **Chapter 5**, significant passenger growth is expected specifically on all routes into London Paddington, Reading and Bristol Temple Meads over the 10-year RUS period. Many trains in the high-peak hour already have more passengers than available on-train capacity. For this reason the primary focus of the RUS has been to develop a set of options that will deliver the capacity that is required to accommodate this growth. This is entirely consistent with HLOS and the capacity metrics for London Paddington and other urban areas.

8.3.11.2
On this basis the RUS has taken the following approach to delivering the HLOS performance targets with further capacity enhancements:

- develop a set of options that can deliver the HLOS capacity metric without significantly worsening train performance
- identify a set of timetabling and/or infrastructure intervention measures for options which can improve performance at key locations
- identify where other schemes funded can improve performance at key locations For example the Cotswold line redoubling is specifically aligned to reliability and punctuality improvements
- identify the potential for major improvements in performance through schemes for CP5.

8.3.11.3
The overall package of train lengthening and peak additional services proposed for CP5 will reduce the concentration of boarding and alighting passengers and reduce the level of delay caused by excessive station dwell times. This will be of particular benefit at key capacity pinch-points such as Reading and Bristol Temple Meads. This performance benefit will transpire through from CP4 as the passenger to capacity ratios will be lower than current, following the implementation of the HLOS additional rolling stock, and the number of cancellations that are required to recover from perturbation in the peak will reduce as a result.

8.3.11.4
The RUS recommendation of an additional platform at Westbury will further contribute to improve performance as well as offering an increase in the level of operational flexibility which will also have the potential to reduce overall delay. Further timetable developments, with the changes in service provision through IEP and additional services, will also enable a timetable review which can assist in both performance and capacity improvements. Further infrastructure enhancement schemes with the Bath Spa capacity upgrade, electrification and ERTMS will all contribute to improvements in signalling headways, generating capacity and improved operational reliability.

8.3.11.5
In CP5 it is likely that some further infrastructure at Oxford station will be required to provide robust performance, capacity and operational flexibility as it is evident that there are currently significant constraints in both capacity and performance within the station area and the approaches into and out of the station. It is predicted that the number of peak services using the station will be close to the maximum that can be reasonably accommodated and with the potential increases in services in the area with IEP and freight growth, a redevelopment will be required. Proposals for this are initially discussed in **Chapter 6**.

8.3.11.6

The effect of increasing passenger numbers on the performance of services at stations has been analysed. Station and unexplained delay has been extracted from the data warehouse 'Performance Systems Strategy' (PSS) and combined with the passenger data from LENNON ticketing system to produce a mean station delay per passenger metric, this has then produced a forecast station delay for 2019 based on the expected increase in passenger numbers[1].

8.3.11.7

The ten most used stations in the Great Western RUS area in 2007/08 have been used for this analysis with the results presented in Figure 8.8.

Figure 8.8 – Predicted annual station delay

Station	Station delay minutes in 2007/08	Passenger per annum (millions) in 2007/08	Mean station delay per million passengers in 2007/08	Passenger growth to 2019	Forecast mean station delay per million passengers in 2019	Forecast station delay minutes in 2019
London Paddington	9,912	29.1	340	42%	483	14,075
Reading	24,410	17	1,435	31%	1,881	31,977
Bristol Temple Meads	24,920	7.4	3,367	37%	4,613	34,140
Slough	5,401	5.5	982	31%	1,286	7,075
Oxford	17,144	4.7	3,647	31%	4,778	22,459
Bath Spa	7,064	4.3	1,642	37%	2,250	9,678
Maidenhead	855	3.9	219	31%	287	1,120
Ealing Broadway	1,722	3.5	492	31%	644	2,256
Didcot Parkway	6,370	2.6	2,450	31%	3,209	8,345
Swindon	4,984	2.6	1,916	31%	2,511	6,529

Source: LENNON (rail) ticket sales (excluding interchange)

Note: Transport for London (TfL) travelcards sold at outlets other than National Rail stations are not included

1 Demand forecasts predict an all day growth of 37 percent in passenger demand between 2008 and 2019 for the Bristol area. Specific growth forecasts for London Paddington and Reading are used with a 42 percent all day growth predicted for London and a 31 percent growth rate for Reading. For stations served by the suburban services to Paddington, the Reading growth forecast has been used. Growth in demand at Bath Spa is assumed to be the same as Bristol Temple Meads for the purpose of this analysis

8.3.11.8
The forecast station delay in 2019 provides an indication of the magnitude in delays expected to occur due to the increase in passenger numbers. The impact of these numbers on performance is significant, particularly at locations on the Great Western Main Line such as Bristol Temple Meads, Reading and Oxford. However, there are major station redevelopment works programmed at each of the stations through Crossrail and other third party enhancements. As presented in **Chapter 6**, London Paddington, Reading, Bristol Temple Meads and Oxford will be redeveloped to provide improved facilities for the throughput of passengers. Slough, Maidenhead and Ealing Broadway are being reviewed under the Crossrail programme of works and there is a third party scheme for Bath Spa. Didcot Parkway and Swindon are subject to minor station improvement works under the National Stations Improvement Programme and in conjunction with the local authorities. These schemes will help address station crowding issues and enable the accommodation of predicted passenger growth.

8.3.11.9
The introduction of IEP on the main line services will also assist in ensuring there is minimal impact from the increased passenger numbers on performance. The IEP trains are longer and will enable passengers easier access to the train. These trains also have the ability to accelerate and brake more quickly so should enable delays to be minimal. With continued improvements in performance, other initiatives will also assist in mitigating any impact from an increase in passenger numbers.

8.3.12 Journey times
Options recommended to improve journey times are:

- revised calling patterns for one morning and one evening Cardiff to Portsmouth service which reduces journey times by up to nine minutes. Intermediate station calls are catered for by an additional stopping service between Westbury and Bristol Temple Meads
- linespeed improvements between Bristol Temple Meads and Bridgwater
- linespeed improvements between Gloucester and Severn Tunnel Jn (unless delivered in CP4 as part of Seven Day Railway).

8.3.13
When brought together, the elements of the strategy will deliver substantial improvements to capacity, connectivity, performance and journey times whilst supporting the Seven Day Railway initiative across the entire RUS area. The delivery of this strategy can enhance the capability of rail, increasing the attractiveness and potentially increasing rail's market share. When combined with the electrification of the Great Western Main Line, the benefits from these initiatives will be extensive.

8.3.14
It is recognised that substantial freight growth is forecast and in order to accommodate this additional infrastructure will be required. The RUS analysis has included the growth forecasts from the Strategic Freight Network and presents the infrastructure schemes in the strategy as a means to address this growth whilst maintaining performance.

8.3.15 Passenger growth forecasts
8.3.15.1
The demand forecasts used in the RUS are growth projections based on the industry standard forecasting framework, using demand drivers such as housing, population and employment forecasts contained in the DfT's TEMPRO model. An alternative forecasting approach was used for Bristol and interurban flows which includes bespoke overlays to reflect the recent acceleration of growth in rail demand. Longer-term demand forecasts are uncertain and extremely sensitive to economic conditions.

8.3.15.2
The Government's 2007 White Paper "Delivering a Sustainable Railway" aspires to provide a network capable of handling the doubling of both passenger and freight traffic nationally over the next 30 years. It is recognised there may be wide variations in growth on individual routes or parts of routes according to local circumstances. In the event of rapid growth it is clear the strategy should focus on making the best use of the existing network in the first instance, and then identify opportunities to develop the network more widely.

8.3.15.3
The RUS strategy is expected to cater adequately for forecast growth in passenger and freight demand in the next decade. In the event that growth in demand does not meet the RUS forecasts, it will be possible to delay or abandon interventions. It is essential that such decisions are made in time to avoid major expenditure commitments. Equally, if growth in demand exceeds the forecast over the next decade, then some of the measures for the longer term may have to be accelerated. Therefore, early planning for major infrastructure interventions, such as those described above, will be crucial and must be kept under review.

8.3.16
Figure 8.9 provides a visual representation of the strategy from the Great Western RUS.

8.4 Future strategy

8.4.1
In addition to the above RUS recommendations, the current HLOS and third party schemes underway will significantly contribute to the future CP5 strategy and beyond. Predominantly within the Thames Valley region, these schemes will fundamentally change the current capacity and capability of the railway. When brought together, and completed, such schemes will transform the railway, addressing current issues whilst providing a railway that meets the requirements of the 21st century.

8.4.2
The completion of the Reading Station Area Redevelopment in 2016 and the implementation of electrification and Crossrail from 2017 will deliver major enhancements providing essential capacity and connectivity improvements into and across London and throughout the route. Crossrail, together with the Thameslink programme, will enable passengers to use services across and through the capital – north, south, east and west.

8.4.3
When these schemes are combined with the introduction of the Intercity Express Programme, further benefits are achieved through additional capacity, connectivity and journey time improvements from London to South Wales, the Thames Valley and the West of England. With the addition of electrification, these benefits are amplified. The opportunity to implement these schemes together provides further benefits and enables a complete package of developments to be delivered cohesively.

8.4.4
The following chapter expands on this, with the delivery and implications of these major schemes incorporated with a longer-term view looking at a 30-year planning horizon.

8.4.5
Figure 8.10 presents the current picture of committed schemes for the RUS area along with the recommendations from the strategy of the Great Western RUS to provide a view of what the future will potentially look like.

Figure 8.9 – Recommendations for RUS strategy

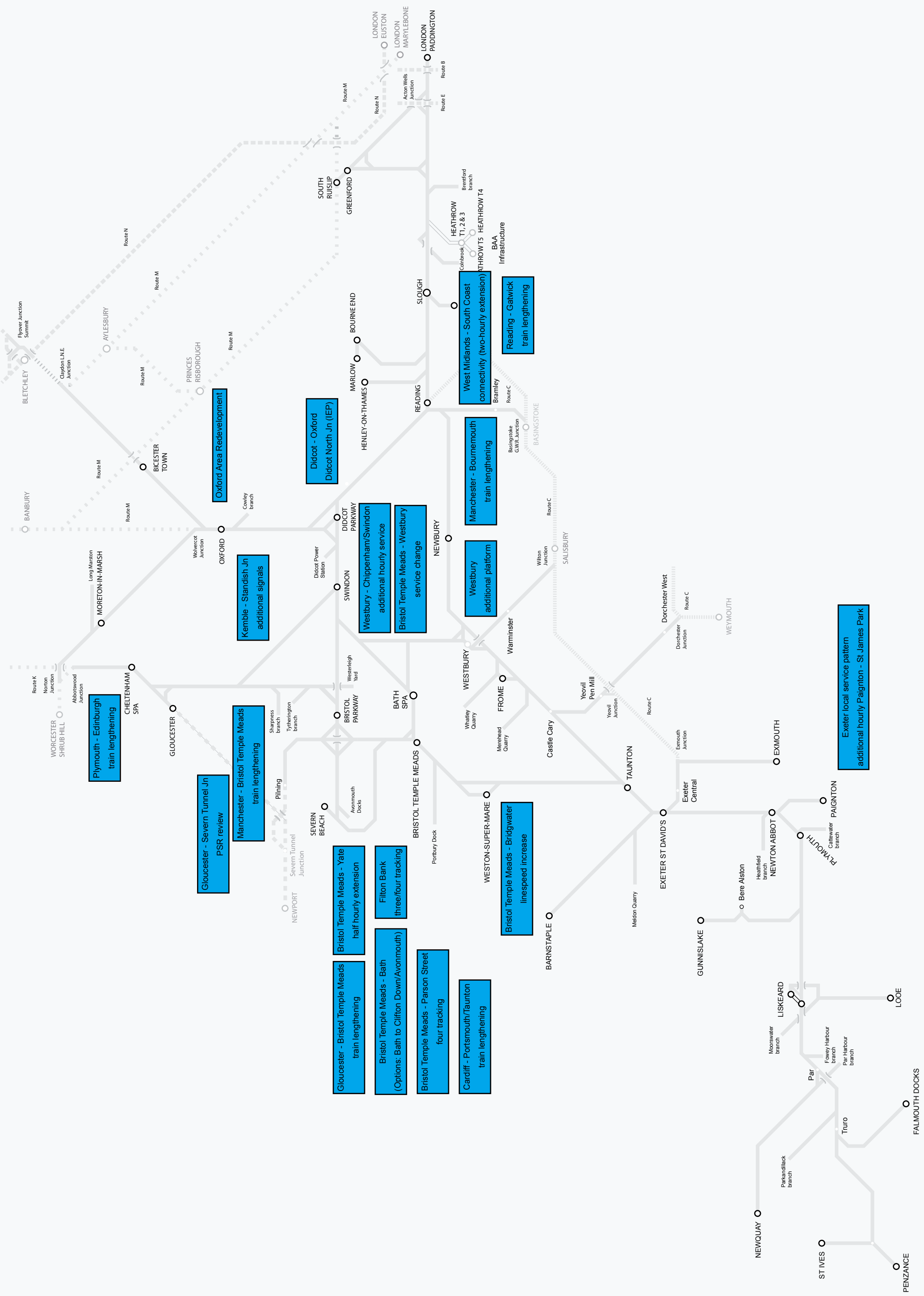
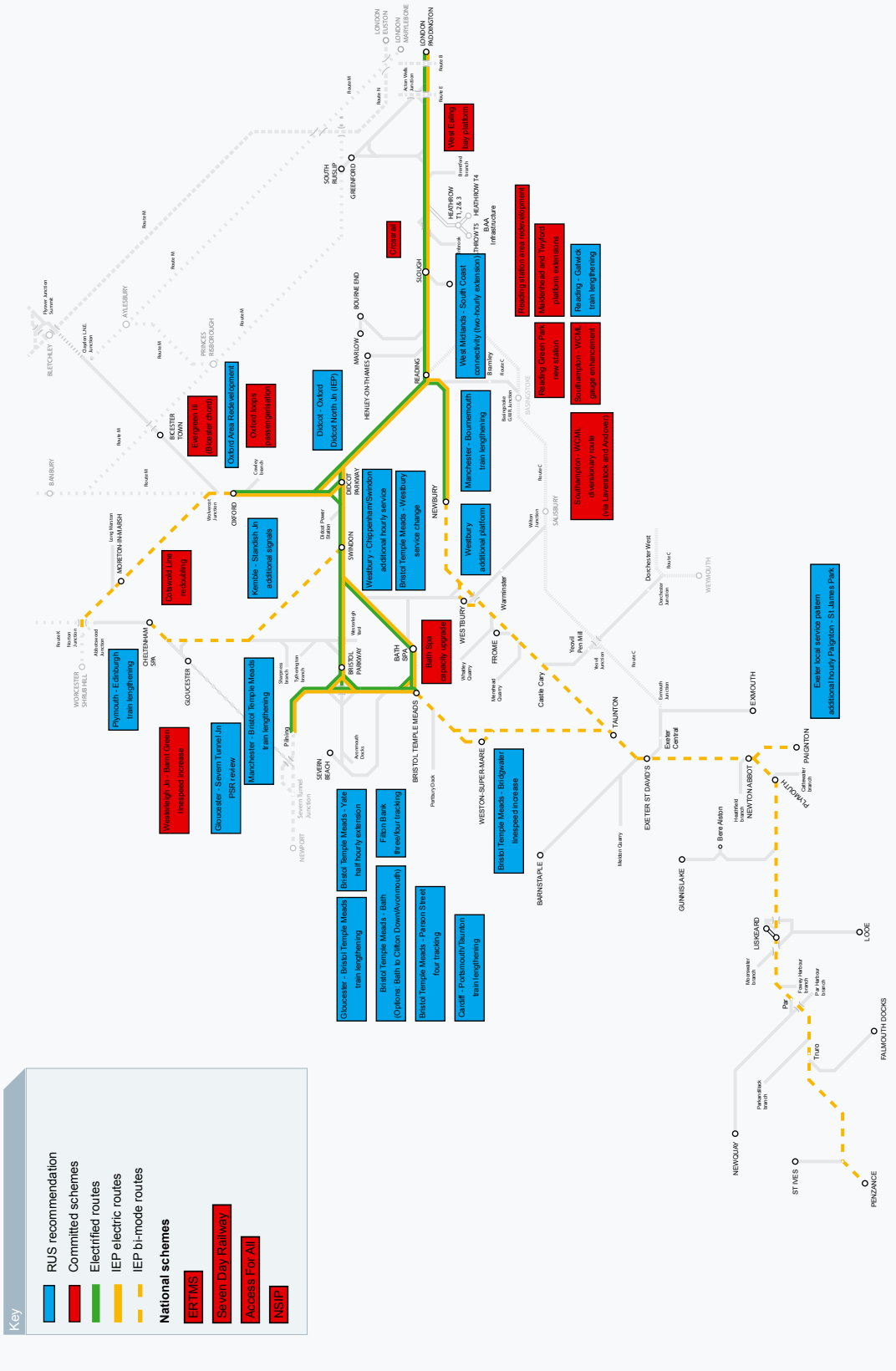


Figure 8.10 – Recommendations for RUS strategy with committed schemes



9. A longer-term view

9.1 Introduction

9.1.1

Previous chapters have provided the results of analysis regarding potential options for implementation within the first 10 years of the Great Western Route Utilisation Strategy (RUS) up to 2019. This chapter provides further detail on a number of major developments proposed within this time period, predominantly in the Thames Valley, which will significantly impact on the current capacity and capability of the network influencing the future strategy of the route.

9.1.2

This is followed by a longer-term view of how the proposed developments up to 2019 can help shape the future. Also presented are other potential enhancements that could be required over the following 20 years, which would contribute to the development of the Great Western RUS area over the 30-year planning horizon.

9.1.3

The Great Western Main Line (GWML) has experienced sustained compound growth over the last 15 years which is expected to continue, despite the recent recession. Although the focus to date has mostly been on the London and Thames Valley areas, which continues with the major investments programmed over the next 10 years, it is recognised that in the longer term the radial routes from London (towards Oxford, Birmingham, the South Coast and South West) and those in the regional locations will need significant investment to develop the network to make it consistent with the GWML.

9.2 Developments up to 2019

The greatest concentration of traffic on the GWML is on the initial 36-mile section between London Paddington and Reading, after which flows diverge to the South Midlands, Bristol, the South West and South Wales. The strategic direction for this section of the RUS area has been established for the next 10 years with the funding allocation for the delivery of major enhancement works, principally under the High Level Output Specification (HLOS) with other third party funding commitments. This includes the remodelling of the Reading station area to address performance and provide necessary capacity for current and future growth; electrification and the Intercity Express Programme (IEP) which would provide further increases in capacity, service frequency and improved journey time opportunities along with the installation of in-cab signalling through the European Rail Traffic Management System (ERTMS). When taken together this programme of enhancements significantly changes the dimensions of the railway and meets projected increases in demand whilst promoting a modal shift from other modes of transport.

The GWML is the longest non-electrified intercity route in Britain, of vital strategic importance to both England and Wales. Electrification has a central role in the modernisation of the railway and can significantly improve rail's product offering to its customers. The Great Western electrification project will be complemented by the £16 billion construction of Crossrail, which will extend electric train services from Essex and the new east-west tunnel through central London to Heathrow and Maidenhead by the end of 2017. With electrification now to

be extended beyond Maidenhead, it would be possible for Crossrail to operate to Reading and beyond rather than Maidenhead from the outset. Electrification could also facilitate improvements for rail access to Heathrow Airport from the west.

Major changes to the overall pattern of operation at London Paddington will be triggered by the construction, below street-level, of two new low-level platforms for Crossrail. Additional works below ground will enable passengers to interchange between these new platforms and the London Underground lines. In this way, passenger circulation will be improved, and platform capacity will be released at London Paddington surface level for main line use, in line with projected improvements as IEP trains are progressively introduced.

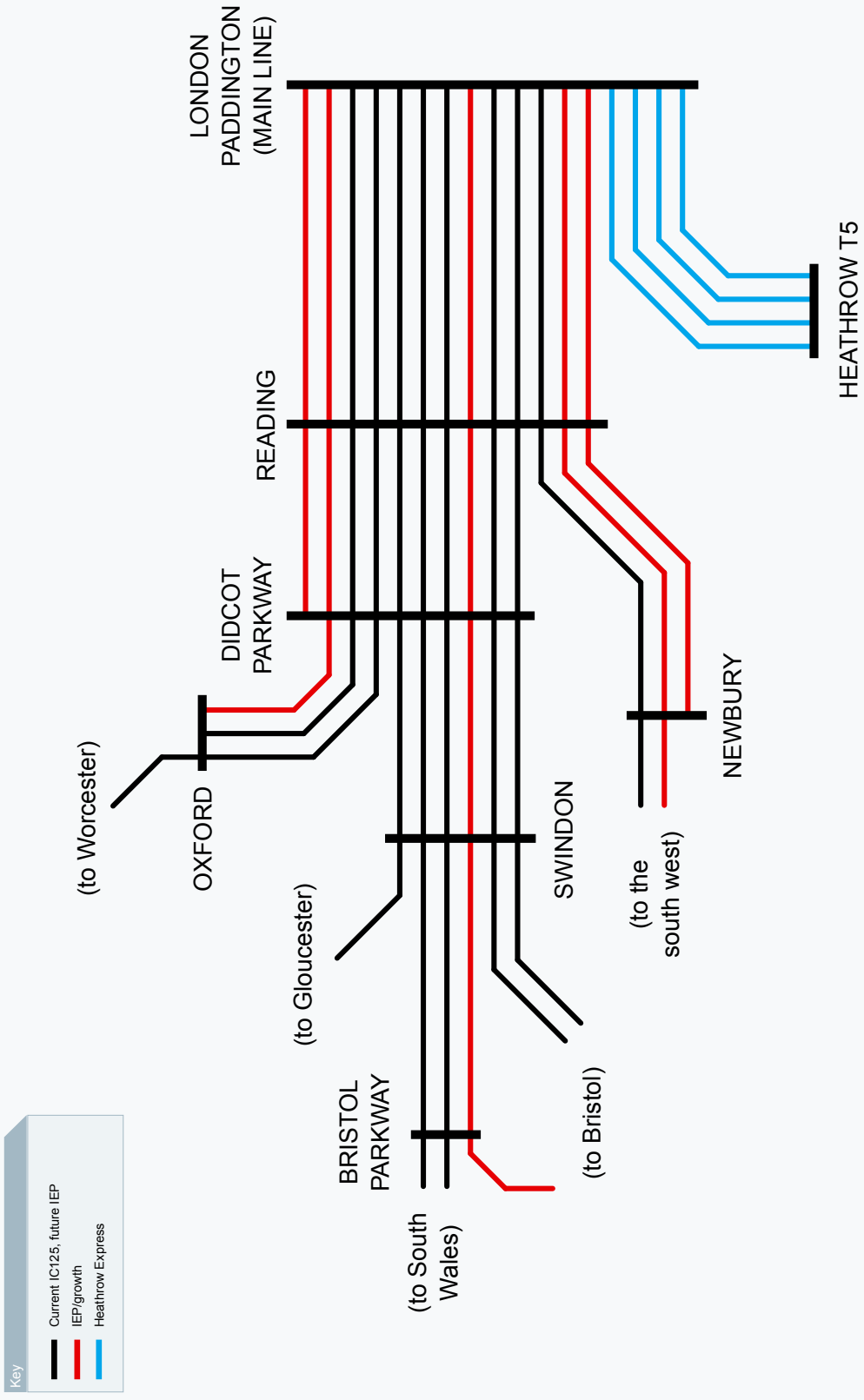
Figure 9.1 illustrates the volume of growth in the medium term on the main lines, where additional frequencies are expected to be provided on certain of the interurban and long distance routes following the introduction of IEP.

Between London Paddington and Reading, the more intense utilisation of the relief lines as a result of the increased suburban frequencies from Crossrail will be achieved through infrastructure enhancements, which include platform lengthening at most stations in order to accommodate the longer 10-car trains. The extra passenger movements generated by the increase in Crossrail services will place added pressure on freight capacity particularly between Reading and Acton. Acton Yard offers a dual role for local aggregate deliveries as well as being a staging point for multi-portion aggregates trains across London (via the North London Line) to the East and the South East.

The Crossrail enhancements to the current four track railway assist with addressing these continuing freight requirements as well as the expected growth in both freight and passenger services. Some sections of five tracks will be provided, with reversible signalling capability on the additional track to enable fluidity of movements. The two most significant enhancements will be completed at Acton (West) and Airport/Stockley Jns. Enhancements to Acton West Jn will permit westbound freight services to depart from Acton Yard without conflicting with eastbound Crossrail services. The upgrade of Airport/ Stockley Jns will permit more frequent Heathrow stopping services to operate directly between the airport and the relief lines without being in conflict with Heathrow Express and the Long Distance High Speed (LDHS) services on the main lines. This will also secure robust freight train paths on the relief lines.

Figure 9.2 illustrates the volume of growth in the medium term on the relief lines, where additional suburban services will be provided in the peak hours following the opening of the east-west Crossrail tunnel and with the introduction of standard 10-car formations. Freight traffic will normally share the relief lines with electrified Crossrail services and utilise additional, reversibly-signalled sections of the new five track railway.

Figure 9.1 – GWML London Paddington to Reading and beyond (tph): proposed IEP (cross-country not shown)



Electrification will enable the current outer suburban services between Oxford, Reading and London Paddington to be operated with vehicles redeployed from the existing Thameslink fleet by the end of 2016. From 2017, inner suburban services currently operating into and out of London Paddington will operate through the new Crossrail tunnel to central London and destinations to the east of London. This change will release much needed capacity at Paddington station for long distance services to meet forecast demand.

Electrification offers further opportunities to increase capacity, service frequencies and connectivity through the reallocation of rolling stock on other routes. The service reliability, journey time and environmental benefits of electrification result in an improved product for the passenger. New journey opportunities can also arise with the combination of electrified routes and service recasts which can potentially provide new through journey opportunities for existing passengers as well as attracting new passengers.

Similarly, there is potential for freight operators to reduce journey times, potentially with lower operating costs. The ability of freight operators to do this potentially increases as more of the network is electrified. It is envisaged that infill electrification – linking routes which are already electrified – would enable cost savings to be achieved on some routes for operators with existing electric locomotives. Further electrification potentially increases the availability of diversionary routes for electric vehicles, reducing the need for bus substitution for passenger services, improving the freight product and easing the provision of access for maintenance work.

The redevelopment of Reading, as presented in Figure 9.3, and the adjacent complex of junctions will enable significantly greater volumes to be carried on the east-west section of the GWML between London Paddington and Reading. This will benefit both the main lines, following the introduction of IEP, and the relief lines, in order to address a combination of increased services as a result of Crossrail and continuing freight growth to and from London and the South East. The electrification proposals for the GWML, would result in these Crossrail services (originally proposed to operate from the east and South East of London to Maidenhead) being able to be extended to Reading and beyond. There will also be major capacity benefits on the north to south cross-country route, which crosses the GWML at Reading, as a result of grade separation for freight movements and long distance services to the South West via Castle Cary. This will continue to provide performance benefits throughout the route by reducing the need for any further conflicting movements.

Figure 9.2 – GWML London Paddington to Reading (tph): relief lines

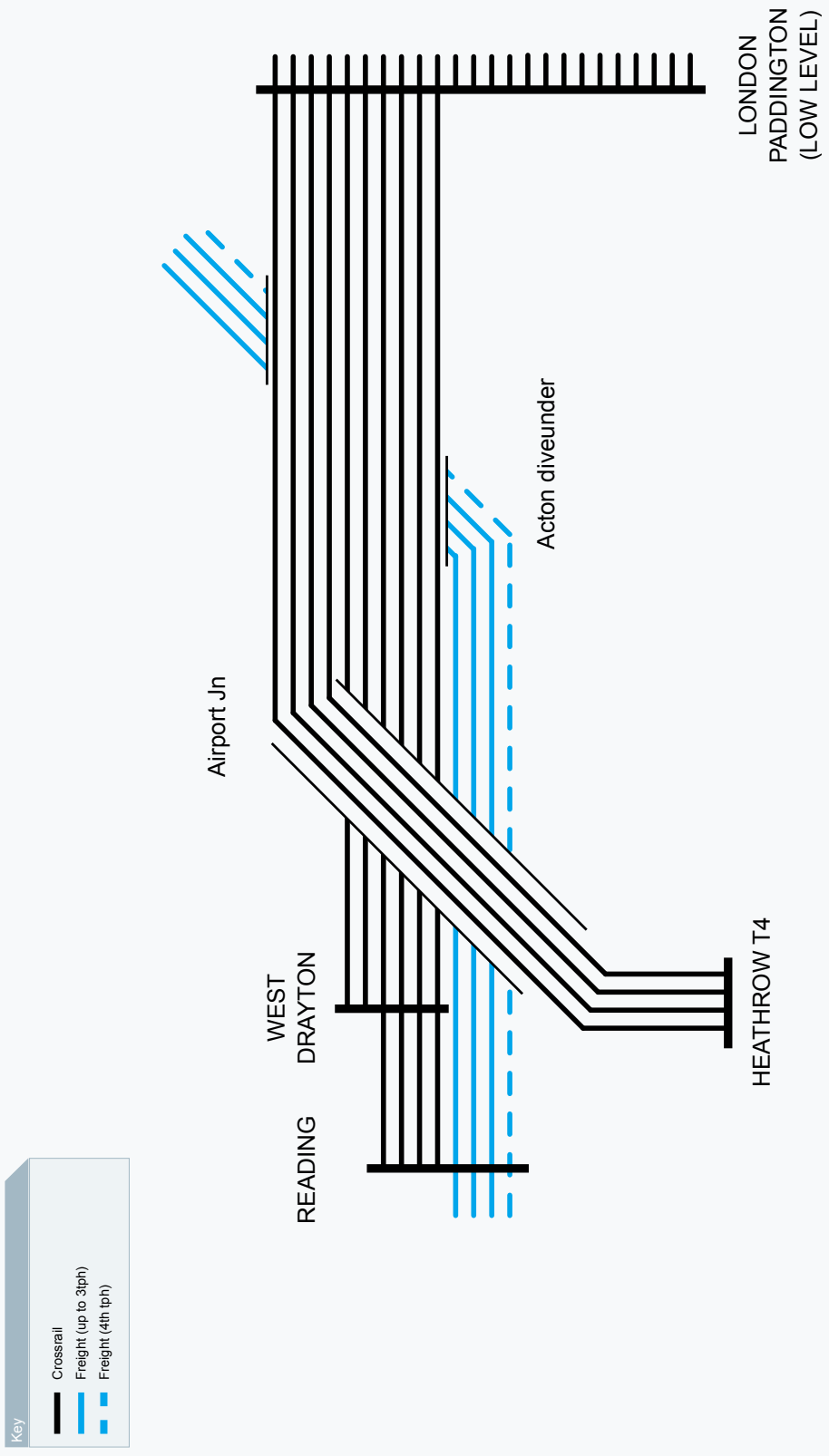
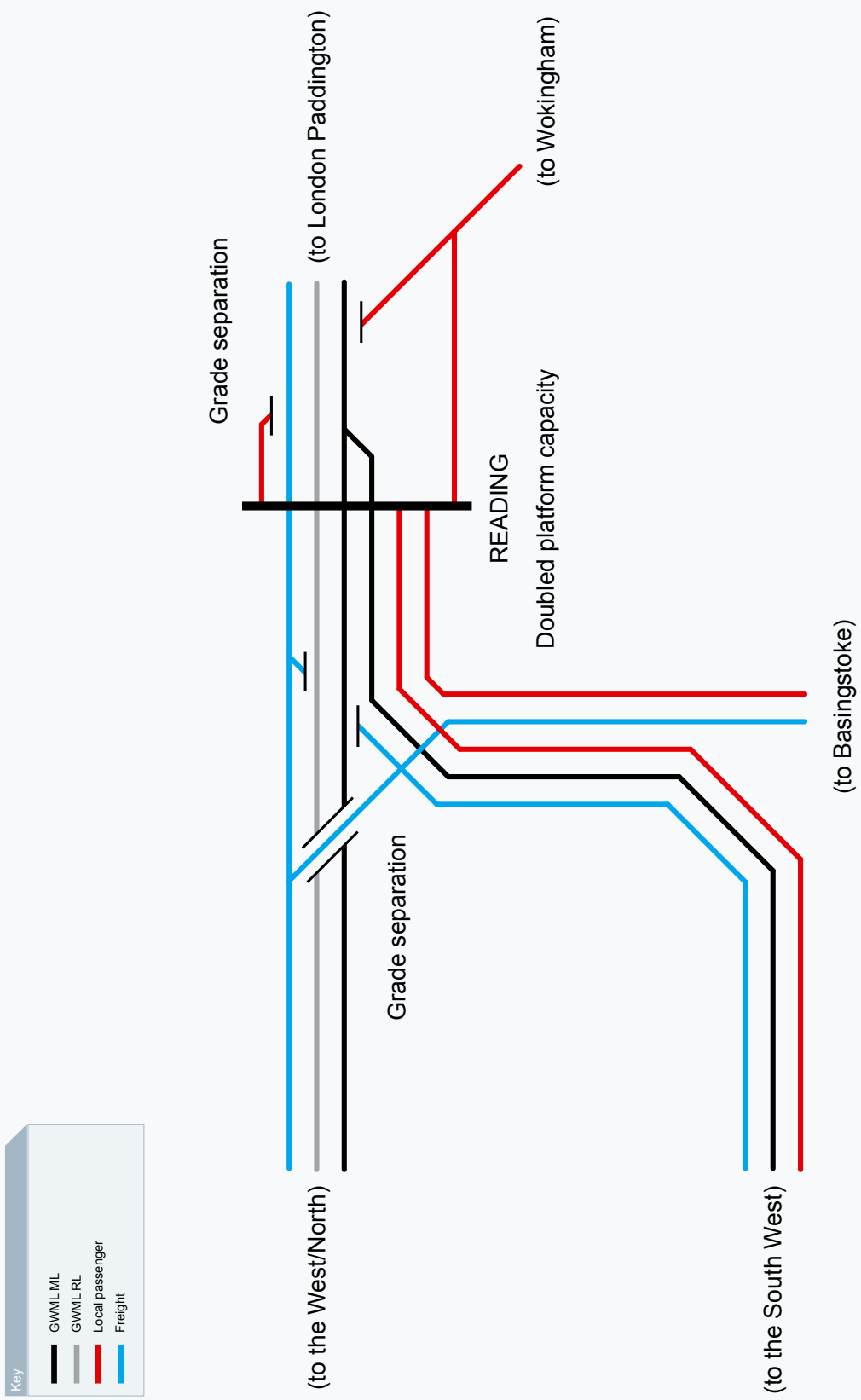


Figure 9.3 – Reading remodelling – proposed layout



9.3 Heathrow Airport

Whilst Heathrow Airport primarily serves the South East of England, with rail links to and from London by Heathrow Express, Heathrow Connect services and London Underground services, rail access to the airport from the west is presently by means of road services from Reading, or by interchange from Thames Valley stopping services at Hayes and Harlington and then via the Heathrow Connect services to Heathrow Terminal 4.

The proposed AirTrack scheme would improve this through the construction of a new section of railway line from Heathrow Terminal 5 to the South Western “inner” lines at Staines, over which it is intended, in the medium term, that a new train service could link Heathrow Airport and Reading via Ascot and Wokingham. The Reading Area Station Redevelopment incorporates additional platform capacity for this future service, and thus improved additional interchange potential with all GWML services. There is also the potential for other AirTrack services to link Heathrow Terminal 5 to the inner South Western lines for Staines and London Waterloo, plus Guildford, subject to further capacity and operational evaluation.

In addition to the AirTrack scheme, the alternative of a more direct link to Heathrow Airport via Slough on the GWML has been identified as a longer-term aspiration. This envisages a south to west chord from the existing Colnbrook freight only line (which runs to the west of Heathrow Terminal 5, intertwined with the M25 motorway) joining the GWML west of West Drayton. Fast electric services (calling Slough and Maidenhead) could link Heathrow Terminal 5 with Reading, and share the relief lines with Crossrail stopping services.

This proposal would necessitate substantial upgrading of a central section of the relief lines between London Paddington and Reading. It potentially has a good strategic fit with the Crossrail works to the west of West Drayton, which allow for GWML five tracking to Iver, by utilising railway land towards Langley and Slough without significant further land take, although some bridge reconstruction would be necessary.

Figure 9.4 illustrates the overall linkages between the GWML between London Paddington and Reading, the AirTrack scheme, and a possible western access to the airport.

9.4 Gatwick Airport

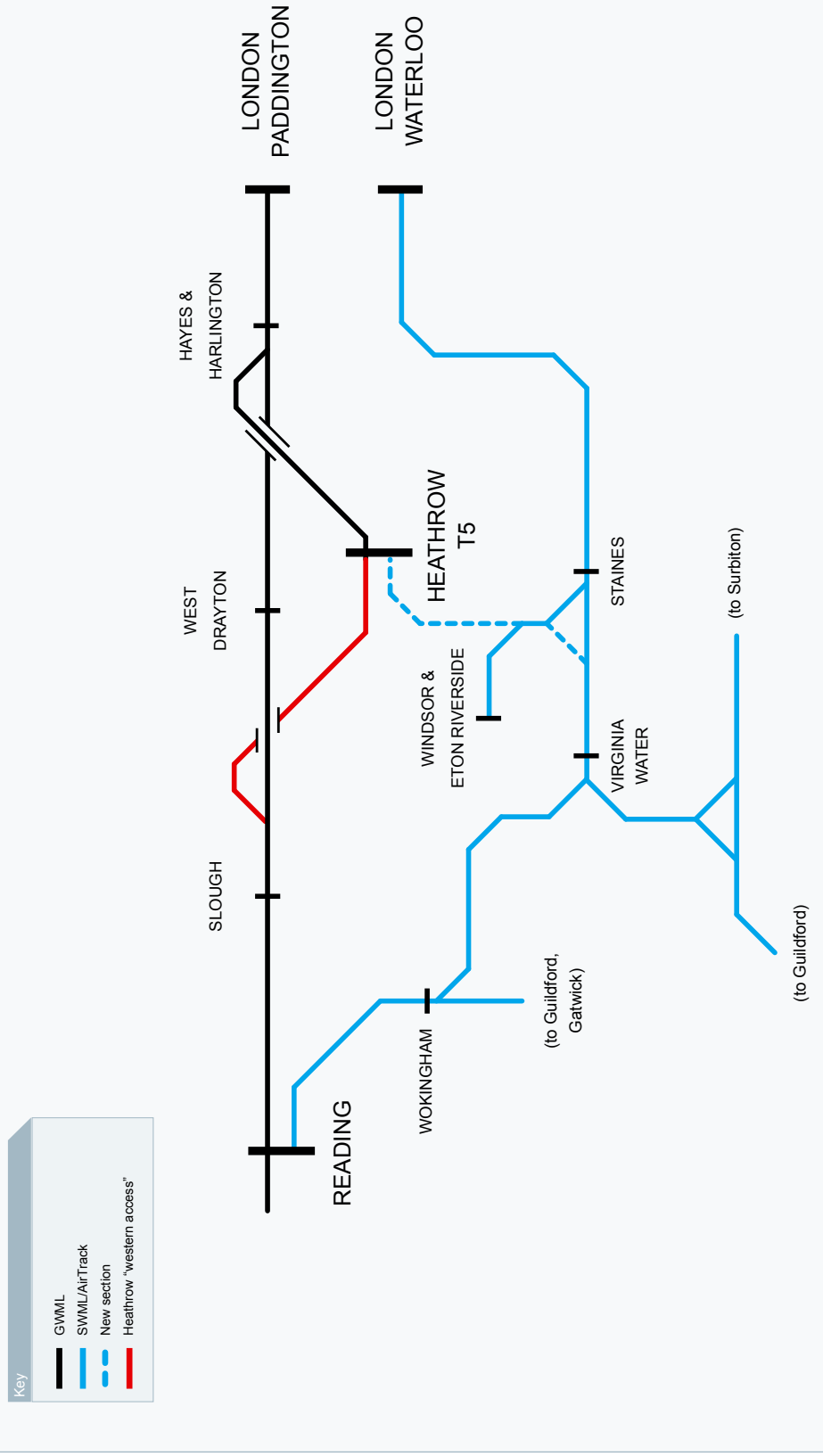
Like Heathrow, Gatwick Airport primarily serves the South East of England. Direct rail links to and from Reading via Guildford (and principal intermediate stations) are well-established and provide interchange with all GWML services from the West of England. In addition, connections with CrossCountry services from the Midlands and North are also possible. Reading to Gatwick Airport services utilise the South Western inner route platforms 4a/4b at Reading without directly running on the GWML tracks. The future remodelling of Redhill station, and infrastructure enhancements at Gatwick Airport station, would enable a more standard interval of service.

The completion of the Reading Station Area Redevelopment will also incorporate a new, grade-separated underpass to the east of Reading station. This will permit the linkage of train services from west of Reading (on the relief lines) with the Gatwick Airport route. One such linkage might be to connect the Oxford to Reading local services with those between Reading and Gatwick Airport, providing greater opportunities to improve connectivity. The new underpass would also permit through operation of (additional) long distance services.

9.5 Oxford

Capacity is constrained on the route to the West Midlands, between Didcot and Oxford due to the high volume of services and mix of passenger and freight. As well as being an important route for long distance services linking the South with the Midlands and North, the completion of gauge enhancement works on the Southampton to West Coast Main Line during Control Period 4 (CP4) is expected to stimulate significant growth in freight, particularly for deep sea intermodal traffic.

Figure 9.4 – GWML – proposed London Paddington to Reading linkages



This will increase the pressure on route capacity at Oxford with access required to be maintained for Appleford sidings, (as discussed in **Chapter 6**) and additional infrastructure may be required, such as a dynamic loop, to enable the operation of an increased number of passenger and freight services. It is anticipated that the signalling renewal (early in Control Period 5 (CP5)) will provide the potential to integrate enhancements in order to create additional platform capacity, consistent with planned frequency improvements linked to the introduction of IEP later in CP5.

Restoration of a substantially four track railway from the south of Oxford (at Kennington Jn) through Oxford station towards the north of Oxford (at Wolvercot Jn where the Cotswold Line diverges) could achieve greater capacity for passenger trains, whilst opening up more long distance freight paths, by addressing the pinch-point that the current Oxford layout represents. The inadequate capacity here is exacerbated by the substantial number of passenger train turnback movements which are necessary. As presented in **Chapter 6**, the combination of these enhancements with a redevelopment of the Oxford station area can generate significant improvements for the future capacity and performance for both passenger and freight services. The commitment of electrification could offer a significant change to the current operation of the station.

Capacity constraints and traffic congestion continue north of Oxford towards Banbury and these will be reviewed as part of the West Midlands and Chiltern RUS.

9.6 Bristol

Development of the proposed 'Bristol Metro' services, as presented in **Chapter 6**, on the cross-Bristol axis of Bristol Parkway/Filton Abbey Wood through Bristol Temple Meads, and with the proposed restoration of four track capability from Bristol Temple Meads through to Parson Street (on the route to Weston-super-Mare and Taunton), could enable the segregation of faster LDHS services from more frequent stopping services, such as those linking Severn Beach and Avonmouth with Bristol on Filton Bank, north of Bristol Temple Meads. The introduction of these schemes will deliver additional capacity to support the exceptional growth experienced in Bristol. Opportunities exist to review and enhance this service offering and in conjunction with the electrification of the GWML, propositions for an electric local service and alternative service patterns extending the local services could become feasible.

With the proposed increase of services under the current IEP service specification, along with projected growth in freight, the already constrained section between Bristol Temple Meads and Bristol Parkway is expected to exceed its current capacity. The RUS recommendation for an additional track along the Filton Bank will prove essential for the development of much needed future capacity. The impact will be significantly greater with the proposed IEP depot at Stoke Gifford which may determine the requirement, and support the business case, for the fourth platform at Bristol Parkway.

An additional local passenger service between Bristol and Portishead (on the existing Portbury freight only line) would share the Taunton route with the faster, long distance services and would likely utilise the enhancements south of Bristol with the additional fourth track from Bristol Temple Meads to Parson Street to accommodate the increase in services. Such local service upgrades in the greater Bristol area are dependent on a successful outcome of business case evaluation and regional funding bids for rail enhancements in CP4 with construction anticipated for CP5. The proposed Portishead and Bristol Metro schemes form part of the recent bid by the South West Regional Development Agency (SWRDA) for medium-term funding commitments for the period 2014 to 2019. The land adjacent to the existing Bristol Parkway to Parson Street two track corridor (north and south of Bristol Temple Meads) would be required and is designated accordingly.

Other regional housing and economic developments around the surrounding area, with aspirations for potential new stations and services (**Appendix G**), will also contribute to the requirement to increase the capacity and capability of the area south of Bristol Temple Meads. With the area due for resignalling in CP5, opportunities exist to combine these interventions to produce an all-encompassing development of the area maximising capacity, reducing journey times and improving performance. This could include the potential redesignation of the main and relief lines for long distance and stopping services to match that provided on the route towards London Paddington.

The development of Worle station as a potential Parkway station could further enhance services and improve access to Bristol Airport through the creation of a transport interchange. This could be linked with metro and cross-country opportunities, subject to business case, for improved local and long distance connectivity to the airport and to the north-south axis. This could also assist in relieving congestion and releasing capacity at Bristol Temple Meads.

Furthermore, with the implementation of electrification and ERTMS, the benefits of an area review are magnified. As outlined in earlier chapters, opportunities exist with the electrification of the GWML, for local services to be operated by electric traction. For example, a local service from South Wales to Filton/Bristol Parkway and onto Chippenham and/or Swindon/Oxford could be operationally feasible and practical subject to business case evaluation. Other opportunities presented include the operation of a local cross-Bristol service. This would need elements of electrification in-fill to enable its operation but this would be incremental to the main line and may be preferable in the longer term and worthy of review.

9.7 Exeter, Plymouth, Devon and Cornwall

Aspirations exist for a ‘Devon Metro’, which will form part of Devon County Council’s Local Transport Plan 3 and Exeter City Council’s Core Strategy. Exeter City Council has previously submitted an expression of interest for this for Regional Funding under Allocation 2. The proposition for the Devon Metro is a 15 minute frequency on the Exeter to Exmouth line, with the necessary infrastructure works to facilitate this; four-car units with all platforms to be lengthened to accommodate the longer vehicles, new stations at Monkerton and Newcourt to support the planned developments in the area in line with the draft South West Regional Spatial Strategy and a half hourly service between Exeter St Davids and Axminster and the necessary infrastructure works. The proposal also includes the reopening of Kingskerswell, Cullompton and Wellington stations. Developments towards the Devon Metro were presented in **Chapter 6** with the RUS reviewing an additional service on the Exmouth branch and expected demand/capacity analysis for this in addition to an additional Exeter to Axminster service to complement the hourly service introduced in December 2009.

The role for rail in Plymouth is also subject to review with increasing aims for a ‘Plymouth Metro’ to support and enhance the local rail network and sustain the forecasted growth in the draft South West Regional Spatial Strategy.

9.8 Beyond 2019

The combination of the major works outlined above is expected to cater for predicted growth in the medium to long term, through a combination of higher capacity trains and, on certain routes, increased frequencies. This is presented within the context of the Government’s target in the “Delivering a Sustainable Railway” White Paper (2007) to provide a reliable network capable of handling double the number of passengers over the next 30 years as an overall framework for the future development of the railway.

The Network RUS: Electrification strategy published in October 2009 identified a number of gaps between today's railway and a future railway which could exploit the benefits of electrification. In addition to the electrification of the GWML, the strategy provided a "Western" package of schemes for which business cases should be developed further to review the benefits of electrification which could be achieved following completion of the main line electrification. The key areas identified are:

- Swindon to Cheltenham enabling electric operation from London Paddington to Cheltenham
- routes south of Birmingham:
  - via Coventry and Solihull to Reading and Basingstoke (enabling Bournemouth to Birmingham and Manchester services to be operated by electric traction)
  - the Birmingham Camp Hill line, Bromsgrove to Cheltenham and Westerleigh Jn (Bristol Parkway) and Bristol to Plymouth and Paignton
- Severn Tunnel Jn to Gloucester enabling Cardiff to Birmingham and Nottingham services to run with electric traction and providing a diversionary route from Swindon to South Wales avoiding Severn Tunnel
- the Berks and Hants line (from Newbury to Taunton)
- Basingstoke to Exeter enabling electric traction on services from London Waterloo to Salisbury and Exeter
- West London infill schemes (bridging a gap between the GWML, the Midland Main Line and the West London Line) for traffic to the south of London and the Channel Tunnel.

These schemes will be further developed from the initial review undertaken as part of the Network RUS: Electrification strategy to assess the business case and value for money. The committed GWML electrification scheme will provide active or passive provision as appropriate where there are interfaces with the lines listed above.

Electrification of the Thames Valley branch lines (Windsor, Marlow and Henley-on-Thames) could also provide additional benefits with through services to London Paddington. Under Crossrail proposals, these services operate only as branch line shuttles with the retention of one morning peak service direct to London Paddington.

For continued freight operations, electrification of the following lines has been identified as being significant by freight operators for their operation. The completion of such infill electrification linked with electrification of the GWML would enable cost savings to be achieved on some routes for freight operators with existing electric locomotives:

- Acton West Jn – Acton Wells Jn via Acton Goods Lines, Acton Reception Lines and Acton East Jn
- Acton Wells Jn – Willesden No.7 via Acton Canal Wharf Jn
- Acton Canal Wharf Jn – Cricklewood South Jn via Cricklewood Curve Jn
- Dudding Hill Jn – Silkstream Jn via Brent Curve Jn
- Stoke Gifford Jn – Avonnmouth BBHT
- Filton West Jn – Patchway Jn/Filton South Jn
- Bristol West Jn – Portbury Docks
- Newbury West – Westbury Down and Up Yards via Lavington
- Thingley Jn – Westbury Down and Up Yards via Bradford Jn.

In the longer term it is evident that through further electrification, there are a number of extensions from the GWML electrification scheme that will provide opportunities for enhanced and alternative service propositions. These will be considered and evaluated going forwards, and where feasible, opportunities may exist for infill electrification to be included prior to 2019.

Routes with diversionary capability for electric traction also need to be considered following the commitment to the electrification of the GWML. In some cases the availability of an electrified diversionary route may ease the provision of access for maintenance, enabling further benefits to be achieved through the Seven Day Railway initiative.

With the commitment of electrification on the GWML, the opportunity arises to complete a major service recast across the Great Western RUS area following its implementation. This would enable improvements in capacity, connectivity and journey times to be recognised and achieved to their full potential. When integrated with the other programme of enhancements across the area, and potential electrification on other routes, there could be a revolutionary change in the entire service provision of the rail network within the Great Western area which could positively impact on adjoining areas.

The long-term procurement of electric rolling stock, and the redeployment of existing rolling stock, will be reviewed as part of the Network RUS looking into CP5 and beyond. This will present further opportunities for improvements to service provisions, particularly when combined with service recasts and further elements of electrification.

The enhancements programmed result in the capacity utilisation on both the main and relief lines, specifically on the London Paddington to Reading corridor, being pushed towards its practical limit. Whereas on the main lines trains typically operate non-stop between London Paddington and Reading, the comparatively large number of intermediate stations on the relief lines dictates that the number of paths that can be made available is lower.

HS2 is a new company established to review the development of potential high-speed lines and Network Rail has completed a New Lines Programme to investigate the provision of new lines as additions to the network to provide such additional capacity. Various options for new lines are being reviewed.

In the longer term a number of further measures are likely to be needed. These could involve timetable alterations, or more physical upgrade works to further increase capacity. In the former case, Crossrail tunnel construction together with provision for very high service frequencies (ie. close headway capability) and the Westbourne Park turnback facility means there will be some potential west of London Paddington (at Low Level) for running more trains through the tunnel and on to the GWML instead of as turnback services at Westbourne Park from Shenfield/Abbey Wood. One possibility would be to switch the Heathrow Express services from terminating at London Paddington to become “fast Crossrail” services instead, which would in turn release more platform capacity at Paddington. Such a switch would need to exploit more systematic use of the six track section east of Ladbroke Grove, together with some comparatively minor alterations to track and signalling.

Further west, development of the relief lines between London Paddington and Reading could enable greater utilisation to be achieved for a mix of stopping and semi-fast passenger trains alongside freight. Construction of a longer section of five track railway, between Slough and West Drayton, suitably fitted with reversible signalling, would enable peak hour semi-fast passenger services to overtake stopping services (whilst these called at Langley, Iver and West Drayton stations) and then remain on the relief lines, thus avoiding the necessity to switch the semi-fasts onto the main lines. At present this causes performance risks and uses scarce main line paths sub-optimally. In the off-peak hours the additional relief line capacity provided could then be used to handle the expected freight growth once the Crossrail service pattern has been fully established.

In this manner, such semi-fast services (for example Reading/Maidenhead/Slough) running through the Crossrail tunnel direct to the west end, city, and Canary Wharf would offer an attractive alternative to an underground interchange at London Paddington. The slightly longer relief line journey time between Reading and London Paddington, with the potential two intermediate calls, would be offset by the fact that passengers would no longer incur an interchange time penalty from a main line journey. It would also reduce the risk of the main lines becoming overloaded and reduce crowding on other London Underground services.

9.8.1 Beyond the Thames Valley (east to west)

The GWML west of Reading is essentially a flat and reasonably straight route to Bristol running at 125mph. The route is a mixed-traffic railway in that the mostly two track section west of Didcot used by existing interurban and long distance services is shared with freight trains of lower speed capability. The absence of intermediate stations (apart from Didcot and Swindon) gives faster journey time potential, which is of benefit to through trains to Wales via the Severn Tunnel. This can be further enhanced through the completion of electrification on the GWML.

Higher speed potential to reduce journey times over the western portion of the main line from Didcot through Swindon could be achieved through a combination of additional tracks to enable improved segregation of high speed passenger and other, slower-moving traffic, and grade separation at Wootton Bassett Jn, to the west of Swindon where the Box line (to Chippenham, Bath and Bristol) diverges from the Badminton line (to Bristol Parkway and South Wales). Depending on the exact mix of station calls specified on the three service groups west of Didcot (to Bath and Bristol, to Bristol Parkway and South Wales, and the Stroud Valley from Swindon to Gloucester) additional platforms at Didcot and Swindon could create further journey time improvements, by permitting better segregation of non-stop high speed services from those requiring to call at intermediate stations.

Options to increase the linespeed above 125 mph will be reviewed in line with electrification and resignalling opportunities as ERTMS becomes deployed across the RUS area.

Further aspirations exist for an enhanced local Bristol network, with the West of England's Joint Local Transport Plan highlighting long term rail schemes which include the reintroduction of a local service between Avonnmouth and Filton through the reinstatement of the Henbury loop and development of services on the Bristol to Chippenham corridor.

On the Berks and Hants route to the South West, significant journey time reductions could be achieved for the Plymouth and Cornwall services through the provision of faster services calling only at principal stations between Reading and Taunton. The principal intermediate stations in Wiltshire and Somerset can be catered for by another group of trains, duly flighted to enable exploitation of the maximum linespeeds (between 100 – 110mph) which are expected to remain on this more curved route.

9.8.2 Beyond the Thames Valley (north to south)

On the long distance corridor linking the North and Midlands with Bristol and the South West via Cheltenham Spa, and South Wales via Chepstow, linespeed improvements are envisaged between Bromsgrove and Westerleigh Jn (where the cross-country route joins the GWML to the east of Bristol Parkway). This forms part of the HLOS commitment for the current control period as discussed in **Chapter 4**. In the period up to 2014, Network Rail is also funded to deliver electrification from Barnt Green to Bromsgrove in the West Midlands. Further benefits could be delivered through the extension of electrification via Cheltenham through to Bristol and on to Plymouth.

With the increased number of trains anticipated through Standish Jn, to the south of Gloucester, there are potential future conflicts which may only be resolved through further enhancements at Standish Jn with grade separation or a double junction. As a longer-term proposal the review of Standish Jn and its potential developments would be required to facilitate potential service increases between Swindon and Gloucester.

As the route moves towards the west, increases in capacity and capability will be achieved with the introduction of IEP and resignalling, (either conventional or in-cab signalling (ERTMS)), scheduled for the latter part of CP5 and early in Control Period 6 (CP6). This will present opportunities to reduce headways on several of the longer route sections particularly between Newton Abbot and Plymouth, significantly increasing capacity and reducing end-to-end journey times on key interurban routes. With the current proposal for IEP services, passengers will benefit from improvements to end-to-end journey on services to the west due to the improved acceleration and braking capabilities of the trains and these will radiate across the route. Further extensions of IEP services could support strategic developments for modal shift and provide improved journey times into the major cities. Opportunities also arise for extending electrification through to Plymouth.

Minor enhancements to the station layout at Exeter St Davids could assist with increased capacity which may be required in the longer term.

For services on the Devon and Cornwall branch lines it is envisaged that train lengthening opportunities will cater for future growth in the longer term. It is recognised that the area has physical and capacity constraints which may need a further review with infrastructure improvements for increasing capacity, connectivity and journey times. Future development of services, for both the main line and branch lines, may be constrained through the single track sections in Cornwall. A service recast of the GWML, following IEP and electrification, will assist with capacity and constraints and will be further enhanced when developed in line with the branch lines.

Further aspirations for longer-term passenger services and reinstatement of rail links are noted in **Appendix G**.

9.9 Freight

The Department for Transport's White Paper published in 2007 suggests a doubling of both passenger and freight traffic over a 30-year period. However, it is recognised that there may be wide variations on individual routes or parts of routes according to local services. This is particularly evident for freight. The development of the Strategic Freight Network (SFN) will continue into CP5 following its introduction in CP4, and this in itself will continue to analyse and prioritise nationally, the strategic needs of the rail freight market. It is accepted that the SFN will need to evolve over time to reflect emerging issues and the changing nature of the freight market. The importance of safeguarding for future requirements is therefore more significant for freight, and wherever there is a business case the SFN will consider this. This will ensure that the network provides the required capacity and capability (gauge, length of trains, axle loads) to enable growth to be achieved. The SFN will review expected growth and identify areas across the network which may need enhancing to ensure this growth can be accommodated. The forecasts to 2019 are still being refined but will provide an indication to the level of expected growth. The forecasts to 2030 have been agreed and these have been incorporated into the Great Western RUS analysis where applicable.

For the Great Western RUS area, the most significant increase in freight is expected to be in intermodal traffic on the route between the port of Southampton and the West Midlands.

The gauge enhancement scheme will enable route clearance to W10 and is the first step to accommodating this growth. As previously discussed, other initiatives are underway by the SFN and Seven Day Railway programme to review train lengthening on this route as an alternative means to increase capacity and to ensure sufficient diversionary routes are available.

Further opportunities to support the aims of the SFN as part of other interventions will be sought, for example enhanced loading gauge clearance will be reviewed as part of the electrification works where feasible. All routes within the current scope of electrification are on the designated SFN. Each of the routes, with the exception of the route from Thingley Jn to Bristol Temple Meads via Bath (which is still under review), is designated to ultimately become a W12 route.

It is recognised that the clearance of all major routes used by freight to a loading gauge of at least W9 and W10, and ultimately to W12, is essential for the future development of freight, specifically for intermodal traffic in the Great Western area. Growth is also expected with the aspirations of the Bristol Port Company for the Bristol area and this will be reviewed as future commitments arise. A review of the route, its capacity level and any interventions that may be required to accommodate such growth will be undertaken when required.

Future provision of freight terminals need to be considered going forwards as there will be a likely need for new multi-modal terminals and it is recommended that potential sites (on railway land, or at sites capable of being easily and cost-effectively connected to the network) be suitably safeguarded. It is recommended that a range of sites across the country be nominated accordingly, and protected by regional plans. The sites should be set out in the regional transport plan. For the Great Western RUS area, the proposed expansion by the Bristol Port Company of container-handling facilities at Avonmouth is expected to generate a significant throughput of containers. The scheme is currently under review.

There are also aspirations to reopen the former rail route from Stratford-upon-Avon through Long Marston and Honeybourne towards Cheltenham Spa (known as the Honeybourne Line). There is the potential for the development of a number of new rail freight markets and additional capacity for through passenger services on the route, both for diversionary purposes and also for permanent traffic as a relief to existing rail lines that are already approaching full capacity.

The reinstatement of the former curve close to Honeybourne would allow access to/from the Cotswold line in the direction of Oxford. As previously discussed, the north Cotswold route between Oxford and Worcester is currently being upgraded and, in conjunction with a link to Stratford-upon-Avon, would provide an alternative to the existing route between the Midlands and the Thames Valley via Banbury.

There are also benefits evident to passengers with the reopened line offering the potential to increase services on existing routes by freeing up capacity and through the reopening or creation of new stations along the route. The scheme is currently an unfunded aspiration and is included in **Appendix G**.

9.10 Sustainability

Looking into the longer-term, rail has a powerful role in providing sustainable travel, reducing congestion, improving local environments and increasing local accessibility. Sustainable travel promotes initiatives that can reduce congestion, improve local environments and encourage healthier and safer lifestyles.

Sustainability demands a broader look at priorities for the railway to find the best balance between the needs of the economy, society and the environment. The importance of delivering an affordable and sustainable rail service, as part of an integrated transport system, fit for the 21st Century is recognised.

Rail has many advantages over other modes of transport in terms of speed, lower carbon emissions and its ability to move large numbers of passengers or volumes of freight. Rail has advantages over air and road: trains emit less carbon per passenger mile than road or air and this will get even better with further electrification of the network and new trains. Less than one per cent of the UK's carbon emissions come from rail.

The opportunities of electrification to contribute to sustainable developments are evident as it is an environmentally friendly product less reliant on potentially insecure energy sources and can comply with changing environmental legislation. Rail transport is currently a more environmentally friendly method of travel than its major competitor (road) but it is important that it improves its environmental credentials even further in the light of government initiatives to reduce emissions-related climate change.

Electrification potentially has an important role to play. It is the only means, with currently available technology, of achieving a step change in the carbon emissions of rail services. Electric vehicles tend to be more environmentally friendly than their diesel counterparts, and the capability for regenerative braking increases their energy efficiency. On average there are less emissions from electric passenger trains ie. 20 to 30 percent less CO2 emissions than diesel vehicles (source: RSSB 2007).

The concept of continental-style tram trains is currently being reviewed as a sustainable form of rail transport, with a feasibility study underway to trial electric vehicles for a new service linking Rotherham and Sheffield. Tram-trains are a light-rail public transport system, with the trams designed to run on both the tracks of an urban tramway network and on the existing railways for greater flexibility and convenience. The rolling stock for these trams will be lightweight, environmentally friendly and efficient.

The current trial will review the environmental benefits, operating costs and technical suitability of tram-trains. It will also test the popularity of the trains with passengers on this line. There are aspirations for further trials in the West of England. Subject to the outcome of the trial, there are benefits evident from tram-trains in a number of locations across the Great Western RUS area.

Delivering a Sustainable Transport System (DaSTS) is the DfT's new approach to long-term transport planning as outlined in **Chapter 5**. DaSTS outlines five goals for transport, focusing on the challenge of delivering strong economic growth while at the same time reducing greenhouse gas emissions. It outlines the key components of the national infrastructure and discusses the difficulties of planning over the long term in the context of uncertain future demand and describes the substantial investments to tackle congestion and crowding on transport networks. This work stream will be key in leading the way for sustainability.

10. Next steps

10.1 Introduction

This Route Utilisation Strategy (RUS) will become established 60 days after publication unless the Office of Rail Regulation (ORR) issues a notice of objection within this period.

The recommendations of a RUS form an input to decisions made by industry funders and suppliers on, for example, franchise specifications, investment plans and the Government's High Level Output Specification (HLOS).

10.2 Network Rail's Route Plans and Strategic Business Plan

For planning purposes the Great Britain rail network is divided into 17 strategic routes. Network Rail publishes a plan for each strategic route, listing all significant planned investment on the route including the larger scheduled renewals as well as committed and aspirational enhancements.

The plans for Strategic Route J – London and West, Strategic Route K – West of England as far as the boundary of the Wales RUS at Pilning form the focus of the Great Western RUS scope area. However, the RUS also covers lines on Strategic Route C - Wessex to the boundary of the South West Main Line RUS (Basingstoke, Wilton Jn and Dorchester West) and to the boundaries of the West Midlands and Chiltern Route RUS (Strategic Route M) at Norton Jn and Bletchley.

The recommendations of the RUS will be incorporated in these plans. The Route Plans are published as part of Network Rail's Strategic Business Plan and are updated regularly and support the Control Period 4 (CP4) Delivery Plan. The next edition (April 2010) will incorporate the RUS conclusions as well as the Delivery Plan recommendations. The plans are available at **www.networkrail.co.uk**.

10.3 Access Charges Review

The ORR review of Network Rail's funding requirements and access charges for Control Period 4 (2009 – 2014) was concluded in October 2008. This RUS has embedded these decisions as part of its baseline for the predictions for future demand, capacity and capabilities.

10.4 Control Period 4

In July 2007, the Department for Transport (DfT) issued its HLOS to define the outputs it wishes to buy from the rail network during the next Control Period (2009 – 2014). This statement and the accompanying Statement of Funds Available (SoFA) has been used by ORR to set Network Rail's funding requirements over that period, taking into account other obligations and funder's reasonable requirements. Network Rail published its Delivery Plan for CP4 in March 2009. The Delivery Plan sets out Network Rail (and, where applicable, whole industry) outputs for safety, train performance, network capacity, capability and availability and asset performance. It provides a high level summary of train operators actions and a delivery programme for all aspects of Network Rail outputs.

10.5 Control Period 5 (CP5)

The planning cycle for the following control period (2014 – 2019) has recently commenced. The DfT has recently consulted on a process for Developing a Sustainable Transport System (DaSTS). This process will compare interventions between transport modes and will be applied to the development of the HLOS for CP5, which is due to be published in summer 2012. This RUS will inform the input into the next High Level Output Specification for CP5.

10.6 Ongoing access to the network

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

10.7 Review

Network Rail is obliged to maintain a RUS once it is established. This requires a review using the same principles and methods used to develop the RUS:

- when circumstances have changed
- when so directed by ORR or
- when (for whatever reason) the conclusions may no longer be valid.

Appendices

Appendix A – Station facilities

Key	Category	Total in GW RUS area
National Hub	A	1
National Hub (Major Station)	A (MS)	1
Regional Hub	B	4
Important Feeder	C	20
Medium, Staffed	D	19
Small, Staffed	E	36
Small, Unstaffed	F	116
Facilities exist in part only	P	0
Facility exists	Y	0

Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Acton Main Line	FGW	E	N/A	N/A	N/A	N/A	N/A	N	N	N	N	N	N
Aldermaston	FGW	F	46	Y	N/A	60	N/A	Y	N	Y	Y	N	N
Appleford	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Ascott-under-Wychwood	FGW	F	N	N	N/A	N/A	N/A	Partial	N	Y	N	N	N
Ashchurch	FGW	F	60	Y	N/A	N/A	50	Y	N	N	Y	N	N
Avoncliff	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Avonmouth	FGW	F	6	N	N/A	Free	N/A	Partial	N	N	Y	N	N
Barnstaple	FGW	E	87	Y	40	N/A	N/A	Y	Y	Y	Y	N	N
Bath Spa	FGW	C	359	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Bedminster	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Bedwyn	FGW	F	25	Y	N/A	80	N/A	Partial	N	Y	Y	N	N
Bere Alston	FGW	F	13	Y	N/A	Y	N/A	Y	N	N	N	N	N
Bere Ferrers	FGW	F	9	Y	N/A	Y	N/A	Partial	N	N	Y	N	N
Bicester Town	FGW	F	29	N	N/A	75	N/A	Y	N	Y	Y	N	N

Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Bodmin Parkway	FGW	D	75	Y	N/A	75	N/A	Partial	Y	Y	Y	N	N
Bourne End	FGW	E	61	Y	40	N/A	N/A	Y	N	N	Y	N	N
Bradford-on-Avon	FGW	E	200	Y	N/A	N/A	90	Partial	N	N	Y	N	N
Bridgwater	FGW	E	50	N	N/A	75	N/A	Partial	Y	Y	Y	N	N
Bristol Parkway	FGW	B	1140	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Bristol Temple Meads	FGW	A	446	Y	83	N/A	N/A	Y	Y	Y	Y	N	Y
Bruton	FGW	F	18	Y	N/A	50	N/A	Partial	N	N	Y	N	N
Bramley	FGW	F	N	N	N/A	N/A	N/A	N	N	N	Y	N	N
Bugle	FGW	F	N	N	N/A	N/A	N/A	N	N	N	Y	N	N
Burnham	FGW	E	61	Y	80	N/A	N/A	N	Y	N	Y	N	N
Calstock	FGW	F	22	Y	N/A	N/A	Y	Y	N	N	Y	N	N
Cam & Dursley	FGW	F	120	Y	N/A	N/A	95	Y	N	N	Y	N	N
Camborne	FGW	E	10	Y	N/A	Y	N/A	Y	N	Y	Y	N	N
Carbis Bay	FGW	F	20	N	N/A	75	N/A	Partial	N	N	N	N	N
Castle Bar Park	FGW	E	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Castle Cary	FGW	D	120	Y	90	N/A	N/A	Partial	Y	N	Y	N	N
Causeland	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Chapelton	FGW	F	5	N	N/A	Y	N/A	Partial	N	N	N	N	N
Charlbury	FGW	E	158	Y	90	N/A	N/A	Y	N	N	Y	N	N
Cheltenham Spa	FGW	C	200	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Chetnole	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Chippenham	FGW	C	663	Y	95	N/A	N/A	Partial	Y	Y	Y	N	N
Cholsey	FGW	E	61	Y	80	N/A	N/A	N	N	N	Y	N	N
Clifton Down	FGW	F	40	N	N/A	85	N/A	Y	N	N	N	N	N
Cookham	FGW	E	76	N	N/A	90	N/A	Y	N	N	N	N	N
Combe	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Coombe	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N

Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Copplestone	FGW	F	5	N	N/A	Y	N/A	Partial	N	N	N	N	N
Crediton	FGW	F	70	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Culham	FGW	F	8	Y	N/A	Y	N/A	Partial	N	N	Y	N	N
Dawlish	FGW	D	98	Y	90	N/A	N/A	Partial	Y	N	N	N	N
Dawlish Warren	FGW	F	5	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Devonport	FGW	F	10	Y	N/A	Y	N/A	Y	N	N	N	N	N
Didcot Parkway	FGW	B	1127	Y	85	N/A	N/A	Partial	Y	N	Y	N	N
Digby and Sowton	FGW	F	250	Y	N/A	Y	N/A	Y	N	N	N	N	N
Dilton Marsh	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Dockyard	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Dorchester West	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Drayton Green	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Ealing Broadway	FGW	C	N	N	N/A	N/A	N/A	N	N	Y	N	Y	Y
Eggesford	FGW	F	5	N	N/A	Y	N/A	Y	N	N	N	N	N
Evesham	FGW	E	84	Y	50	N/A	N/A	Y	Y	N	Y	N	N
Exeter Central	FGW	C	70	Y	75	N/A	N/A	Y	N	Y	Y	N	N
Exeter St Davids	FGW	C	399	Y	88	N/A	N/A	Y	Y	Y	Y	N	Y
Exeter St Thomas	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Exmouth	FGW	D	47	Y	N/A	N/A	75	Y	N	N	Y	N	N
Exton	FGW	F	8	Y	N/A	Y	N/A	Partial	N	N	Y	N	N
Falmouth Docks	FGW	F	40	Y	N/A	70	N/A	Y	N	Y	Y	N	N
Falmouth Town	FGW	F	60	N	N/A	N/A	Y	Y	N	Y	N	N	N
Filton Abbey Wood	FGW	F	30	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Finstock	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Freshford	FGW	F	9	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Frome	FGW	D	15	Y	N/A	80	N/A	Y	N	N	Y	N	N
Furze Platt	FGW	E	N	N	N/A	N/A	N/A	Y	N	Y	N	N	N
Gloucester	FGW	C	231	Y	100	N/A	N/A	Partial	Y	Y	Y	N	N
Goring and Streatley	FGW	E	152	Y	80	N/A	N/A	Partial	N	Y	Y	N	N
Greenford	LUL	E	36	N	NCP	N/A	N/A	N	N	Y	Y	Y	N
Gunnislake	FGW	F	30	Y	N/A	Y	N/A	Y	N	N	Y	N	N

Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Hanborough	FGW	F	37	Y	N/A	85	N/A	Y	N	Y	Y	N	N
Hanwell	FGW	E	N	N	N/A	N/A	N/A	N	N	N	Y	N	Y
Hayes and Harlington	FGW	D	122	Y	70	N/A	N/A	N	N	N	Y	N	Y
Hayle	FGW	F	25	N	N/A	70	N/A	Y	N	N	N	N	N
Henley-on-Thames	FGW	E	267	Y	45	N/A	N/A	Y	N	N	Y	N	N
Highbridge and Burnham	FGW	F	20	Y	N/A	N/A	85	Partial	Y	Y	Y	N	N
Honeybourne	FGW	F	26	Y	N/A	70	N/A	Y	N	Y	N	N	N
Hungerford	FGW	F	68	N	N/A	80	N/A	Partial	N	N	Y	N	N
Islip	FGW	F	32	N	N/A	60	N/A	Y	N	N	Y	N	N
Iver	FGW	E	N	N	N/A	N/A	N/A	N	N	N	Y	N	Y
Ivybridge	FGW	F	206	Y	N/A	N/A	75	Y	N	N	N	N	N
Kemble	FGW	D	336	Y	95	N/A	N/A	Y	Y	N	Y	N	N
Keyham	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Keynsham	FGW	F	53	Y	50	N/A	N/A	N	N	N	Y	N	N
Kingham	FGW	E	140	Y	85	N/A	N/A	Partial	N	N	Y	N	N
Kings Nympton	FGW	F	5	Y	N/A	Y	N/A	Y	N	N	N	N	N
Kintbury	FGW	F	12	N	N/A	Y	N/A	Y	N	N	Y	N	N
Langley	FGW	E	65	Y	90	N/A	N/A	Partial	Y	N	Y	N	N
Lapford	FGW	F	2	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Lawrence Hill	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Lelant	FGW	F	10	N	N/A	N/A	Y		N	N	N	N	N
Lelant Saltings	FGW	F	130	Y	N/A	N/A	Y	Y	N	N	N	N	N
Liskeard	FGW	D	80	N	N/A	65	N/A	Partial	N	Y	Y	N	N
London Paddington	NR	A	152	Y	NCP	N/A	N/A	Y	Y	Y	Y	Y	Y
Looe	FGW	F	20	Y	75	N/A	N/A	Y	N	N	Y	N	N
Lostwithiel	FGW	F	20	Y	N/A	Y	N/A	Y	N	N	N	N	N
Luxulyan	FGW	F	10	Y	N/A	Y	N/A	Partial	N	N	Y	N	N
Lympstone Commando	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Lympstone Village	FGW	F	20	Y	N/A	Y	N/A	Y	N	N	Y	N	N

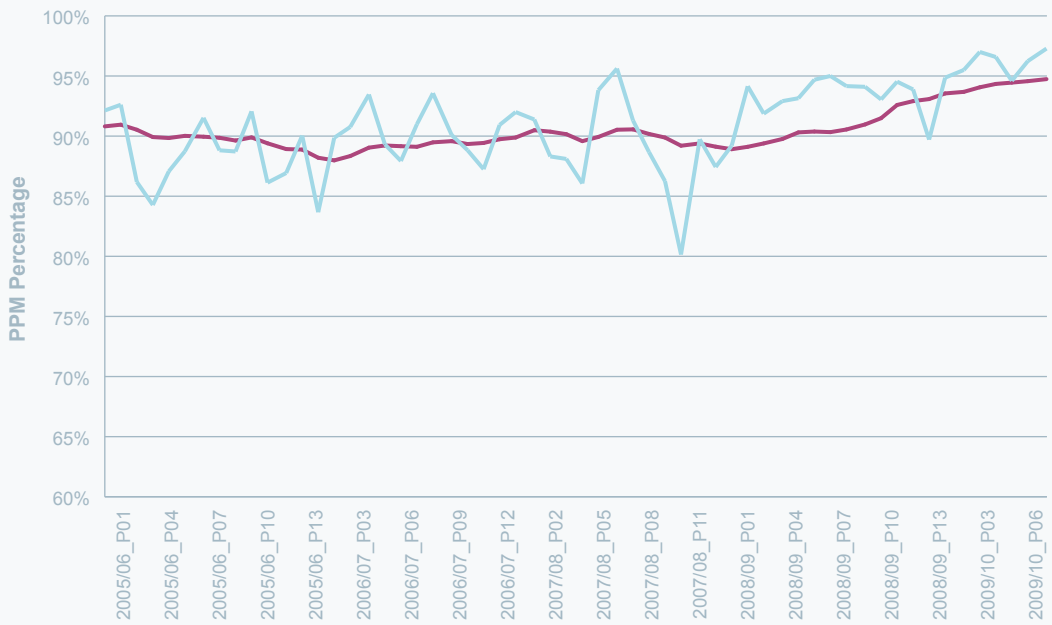
Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Maiden Newton	FGW	F	12	Y	N/A	Y	N/A	Partial	N	N	N	N	N
Maidenhead	FGW	C	389	Y	90	N/A	N/A	Y	Y	Y	Y	N	Y
Marlow	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	Y	N	N
Melksham	FGW	F	10	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Menheniot	FGW	F	25	N	N/A	Y	N/A	Partial	N	N	N	N	N
Midgham	FGW	F	12	Y	Y	N/A	N/A	Partial	N	N	Y	N	N
Montpelier	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Morchard Road	FGW	F	5	N	N/A	Y	N/A	Y	N	N	N	N	N
Moreton-in-Marsh	FGW	E	153	Y	50	N/A	N/A	Partial	N	N	Y	N	N
Mortimer	FGW	E	60	N	90	N/A	N/A	Partial	N	N	Y	N	N
Nailsea and Backwell	FGW	F	105	Y	N/A	N/A	100	N	N	N	Y	N	N
Newbury	FGW	C	240	Y	100	N/A	N/A	Partial	Y	N	Y	N	N
Newbury Racecourse	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Newquay	FGW	F	49	Y	75	N/A	N/A	Y	Y	Y	Y	N	N
Newton Abbot	FGW	C	261	Y	50	N/A	N/A	Y	Y	Y	Y	N	N
Newton St Cyres	FGW	F	5	Y	N/A	Y	N/A	Partial	N	N	N	N	N
Oldfield Park	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Oxford	FGW	B	530	Y	60	N/A	N/A	Y	Y	Y	Y	N	N
Paignton	FGW	C	87	Y	75	N/A	N/A	Y	Y	Y	Y	N	N
Pangbourne	FGW	E	92	Y	80	N/A	N/A	Partial	N	N	Y	N	N
Par	FGW	E	25	Y	N/A	90	N/A	Partial	N	N	N	N	N
Parson Street	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Patchway	FGW	F	15	Y	N/A	Y	N/A	Partial	N	N	N	N	N
Penmere	FGW	F	5	N	N/A	Y	N/A	Y	N	Y	Y	N	N
Penryn	FGW	F	N	N	N/A	Y	N/A	Y	N	Y	Y	N	N
Penzance	FGW	C	129	Y	75	N/A	N/A	Y	Y	Y	Y	N	N
Perranwell	FGW	F	20	Y	N/A	65	N/A	Y	N	N	Y	N	N
Pershore	FGW	F	40	N	N/A	Y	N/A	Y	N	Y	Y	N	N
Pewsey	FGW	D	79	Y	90	N/A	N/A	Partial	N	N	Y	N	N
Pilning	FGW	F	10	Y	N/A	Y	N/A	Partial	N	N	N	N	N
Plymouth	FGW	C	352	Y	80	N/A	N/A	Y	Y	Y	Y	N	N
Polsloe Bridge	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N

Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Portsmouth Arms	FGW	F	5	Y	N/A	Y	N/A	Partial	N	N	N	N	N
Quintrel Downs	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Radley	FGW	F	35	N	N/A	45	N/A	Partial	N	Y	Y	N	N
Reading	FGW	B	1650	Y	60	N/A	N/A	Y	Y	Y	Y	N	Y
Reading West	FGW	E	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Redland	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	Y	N	N
Redruth	FGW	D	40	Y	80	N/A	N/A	Y	Y	Y	Y	N	N
Roche	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Saltash	FGW	F	20	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Sandplace	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Sea Mills	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Severn Beach	FGW	F	N	N	N/A	N/A	N/A	Y	N	Y	Y	N	N
Shiplake	FGW	F	50	Y	N/A	95	N/A	Y	N	N	Y	N	N
Shipton	FGW	F	20	N	Y	N/A	N/A	Partial	N	N	N	N	N
Shirehampton	FGW	F	10	Y	N/A	Y	N/A	Y	N	N	Y	N	N
Slough	FGW	C	626	Y	90	N/A	N/A	Y	Y	N	Y	N	N
South Greenford	FGW	F	N	N	N/A	N/A	N/A	Partial	N	Y	N	N	N
South Ruislip	Chiltern	F	N	N	N/A	N/A	N/A	N	Y	Y	Y	Y	N
Southall	FGW	D	N	N	N/A	N/A	N/A	N	N	Y	N	N	Y
St Andrews Road	FGW	F	8	N	N/A	Y	N/A	N	N	N	Y	N	N
St Austell	FGW	C	157	Y	70	N/A	N/A	Y	Y	N	Y	N	N
St Budeaux Ferry Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Budeaux Victoria Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Columb Road	FGW	F	10	N	N/A	Y	N/A	Y	N	N	N	N	N
St Erth	FGW	E	60	Y	30	N/A	N/A	Partial	N	N	N	N	N
St Germans	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
St Ives	FGW	F	200	Y	N/A	N/A	Y	Y	N	N	N	N	N
St James Park	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Keyne	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Stapleton Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Starcross	FGW	F	N	N	N/A	N/A	N/A	N	N	N	Y	N	N
Stonehouse	FGW	E	25	Y	N/A	90	N/A	Y	N	N	N	N	N

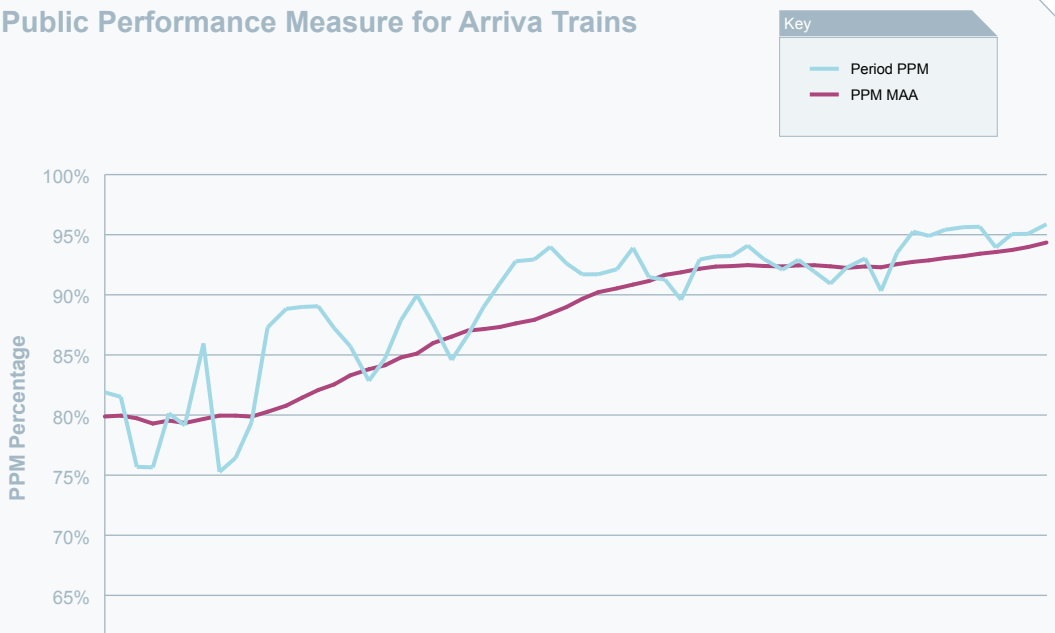
Station	Operator	Category	No of Car Park Spaces	Disabled Car Park Spaces	Car Park Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Charging	LA Owned/ Operated		Taxi	Bus	Cycle	Metro	Airport
Stroud	FGW	D	181	Y	80	N/A	N/A	Y	Y	N	Y	N	N
Swindon	FGW	C	607	Y	90	N/A	N/A	Y	Y	Y	Y	N	N
Taplow	FGW	E	51	Y	40	N/A	N/A	Partial	N	Y	Y	N	N
Taunton	FGW	C	309	Y	95	N/A	N/A	Partial	Y	Y	Y	N	N
Teignmouth	FGW	D	92	Y	75	N/A	N/A	Partial	N	N	Y	N	N
Thatcham	FGW	E	61	Y	60	N/A	N/A	Partial	N	Y	Y	N	N
Theale	FGW	E	219	Y	60	N/A	N/A	N	N	Y	Y	N	N
Thornford	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Tilehurst	FGW	E	111	Y	80	N/A	N/A	N	N	Y	Y	N	N
Tiverton Parkway	FGW	D	193	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Topsham	FGW	F	4	Y	N/A	N/A	Y	Y	N	N	Y	N	N
Torquay	FGW	C	91	Y	75	N/A	N/A	Y	Y	Y	Y	N	N
Torre	FGW	F	5	Y	N/A	Y	N/A	Partial	N	Y	Y	N	N
Totnes	FGW	D	122	Y	100	N/A	N/A	Partial	Y	Y	Y	N	N
Trowbridge	FGW	D	258	Y	100	N/A	N/A	Y	Y	N	Y	N	N
Truro	FGW	C	150	Y	60	N/A	N/A	Y	Y	Y	Y	N	N
Twyford	FGW	D	426	Y	82	N/A	N/A	Partial	Y	N	Y	N	N
Umberleigh	FGW	F	11	Y	N/A	Y	N/A	Y	N	N	N	N	N
Wargrave	FGW	F	30	N	N/A	45	N/A	Y	N	N	Y	N	N
Warminster	FGW	E	98	Y	80	N/A	N/A	Y	N	N	Y	N	N
West Drayton	FGW	E	17	Y	90	N/A	N/A	N	Y	N	Y	N	Y
West Ealing	FGW	E	N	N	N/A	N/A	N/A	N	N	N	N	N	Y
Westbury	FGW	D	240	Y	85	N/A	N/A	Y	Y	Y	Y	N	N
Weston Milton	FGW	F	36	Y	N/A	75	N/A	Y	N	N	Y	N	N
Weston-super-Mare	FGW	C	158	Y	95	N/A	N/A	Y	Y	Y	Y	N	N
Windsor and Eton Central	FGW	D	N	N	N/A	N/A	N/A	Y	N	N	Y	N	N
Worle	FGW	F	180	Y	N/A	90	N/A	Y	N	N	Y	N	N
Yate	FGW	F	120	Y	90	N/A	N/A	Partial	N	N	Y	N	N
Yatton	FGW	E	99	Y	60	N/A	N/A	Y	N	N	Y	N	N
Yeoford	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Yeovil Pen Mill	FGW	E	37	Y	N/A	80	N/A	Partial	N	Y	Y	N	N
Yetminster	FGW	F	7	Y	N/A	75	N/A	Y	N	N	N	N	N

Appendix B – Public and Freight Performance Measures

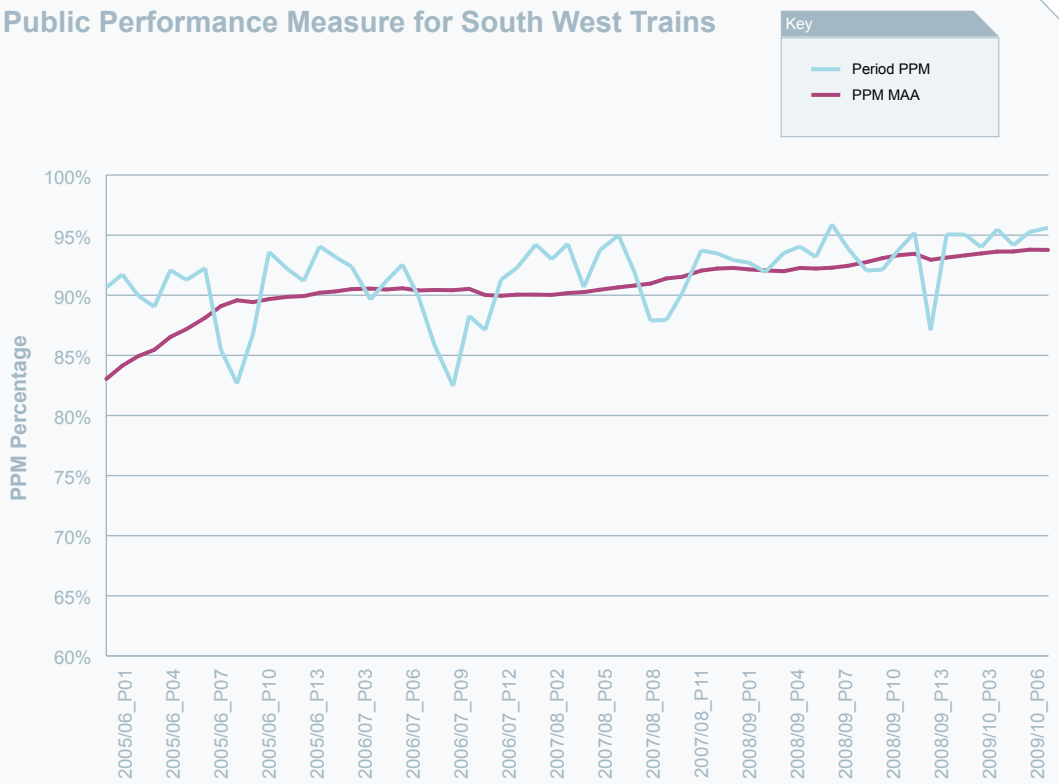
Public Performance Measure for Heathrow Express



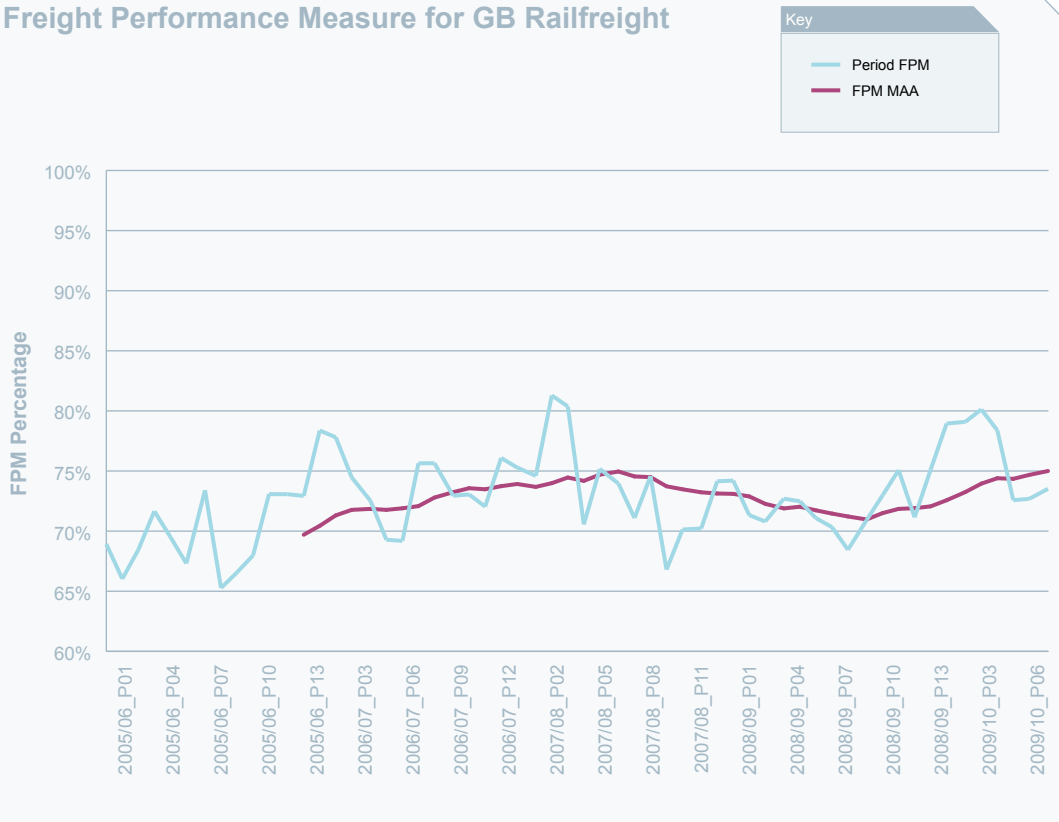
Public Performance Measure for Arriva Trains



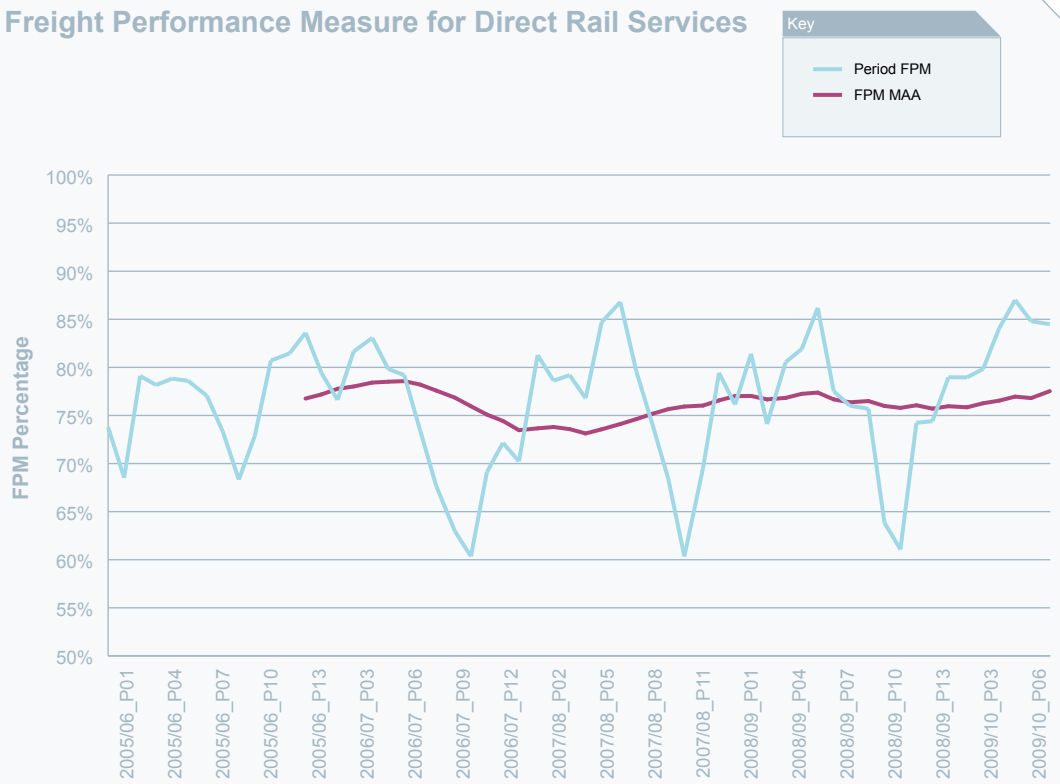
Public Performance Measure for South West Trains



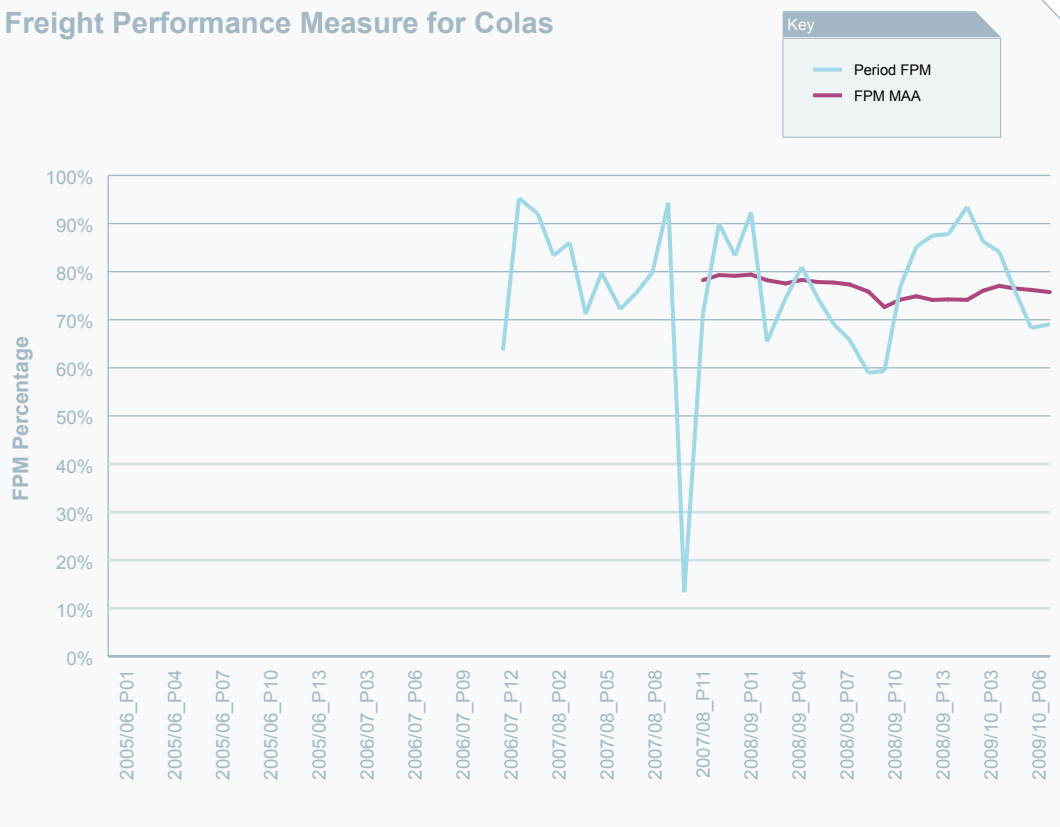
Freight Performance Measure for GB Railfreight

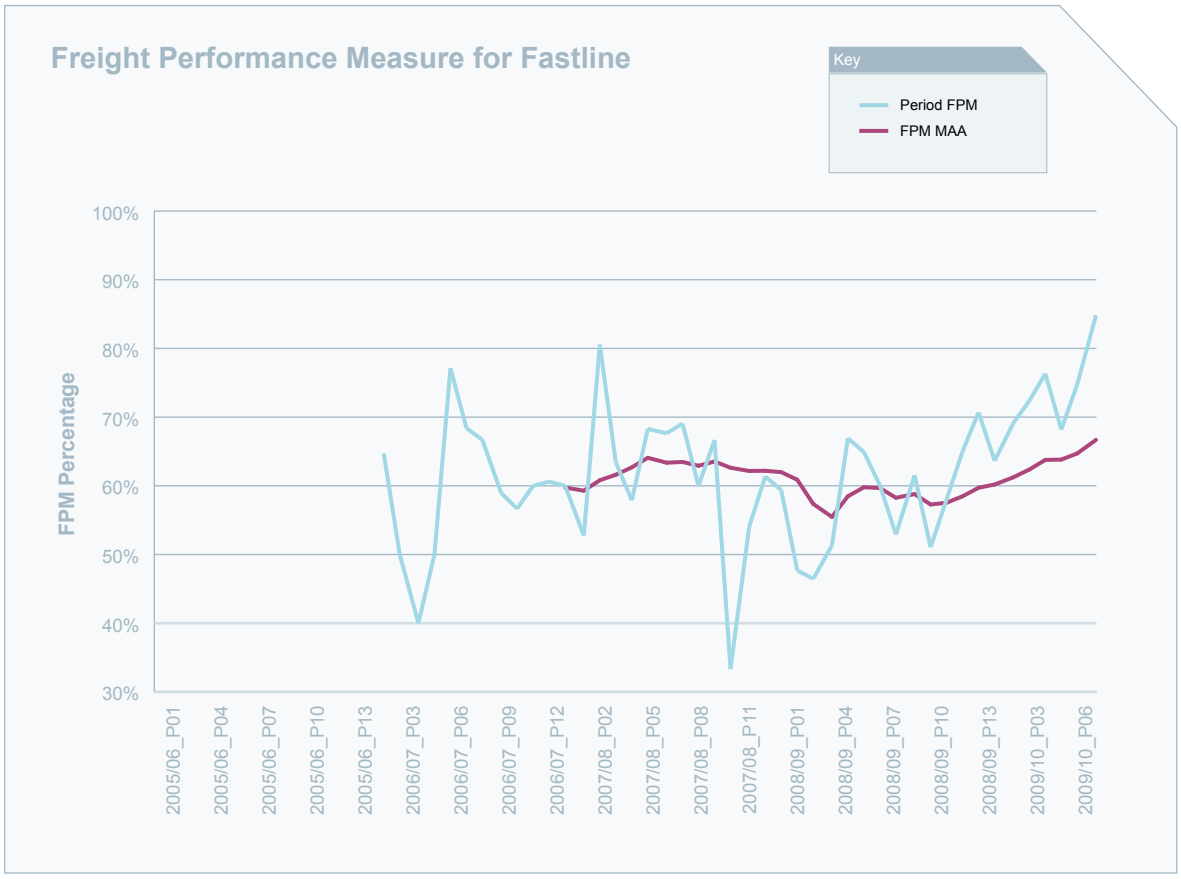


Freight Performance Measure for Direct Rail Services



Freight Performance Measure for Colas




Freight Performance Measure for Fastline
Key
Period FPM
FPM MAA
FPM Percentage
100%
90%
80%
70%
60%
50%
40%
30%
2005/06_P01
2005/06_P04
2005/06_P07
2005/06_P10
2005/06_P13
2006/07_P03
2006/07_P06
2006/07_P09
2006/07_P12
2007/08_P02
2007/08_P05
2007/08_P08
2007/08_P11
2008/09_P01
2008/09_P04
2008/09_P07
2008/09_P10
2008/09_P13
2009/10_P03
2009/10_P06

Appendix C – Reactionary delay minutes – top 15 locations

Passenger

Section	Summary area		Minutes delay	Trains affected	Delay per train affected
Moreton-in-Marsh	GW07	Oxfordshire and North Cotswolds	14,748	1,617	9.12
Plymouth	GW06	Cogload Jn - Penzance	19,008	2,317	8.20
Bristol Temple Meads	GW03	Greater Bristol and Westbury	68,953	8,626	7.99
Gloucester	GW05	Bristol - Birmingham Line	20,469	2,620	7.81
Evesham	GW07	Oxfordshire and North Cotswolds	32,459	4,521	7.18
Bedwyn	GW04	Reading - Cogload Jn	16,811	2,346	7.17
London Paddington	GW01	Paddington - Didcot	184,221	26,046	7.07
Avonmouth	GW03	Greater Bristol and Westbury	8,229	1,166	7.06
Taunton	GW06	Cogload Jn - Penzance	19,111	2,731	7.00
Westbury	GW03	Greater Bristol and Westbury	31,914	4,658	6.85
Oxford	GW07	Oxfordshire and North Cotswolds	81,113	12,180	6.66
Eggesford	GW09	Devon and Cornwall branches	10,634	1,599	6.65
Henley-on-Thames	GW08	Thames Valley branches	7,271	1,101	6.60
Swindon - Challow	GW02	Didcot - Pilning (via Badminton)	7,632	1,162	6.57
Swindon	GW02	Didcot - Pilning (via Badminton)	21,201	3,234	6.56

Freight

Section	Summary area		Minutes delay	Trains affected	Delay per train affected
Newport Docks	GW10	Wales	48,997	519	94.41
Westerleigh Murco	GW05	Bristol - Birmingham Line	16,551	194	85.31
Portbury Coal Terminal EWS	GW03	Greater Bristol and Westbury	34,718	464	74.82
Theale Murco	GW04	Reading - Cogload Jn	7,009	104	67.39
Hayes & H'Ton Tarmac Sdgs	GW01	Paddington - Didcot	9,247	139	66.53
Theale Foster Yeoman	GW04	Reading - Cogload Jn	16,094	244	65.96
Didcot Power Station EWS	GW02	Didcot - Pilning (via Badminton)	54,647	912	59.92
Avonmouth Ntl Pwr Silo 1	GW03	Greater Bristol and Westbury	13,602	263	51.72
Llanwern Exchange Sdgs	GW10	Wales	36,557	718	50.92
East Usk Jn. N. Y.	GW10	Wales	10,379	228	45.52
Wentloog (Freightliner)	GW10	Wales	15,825	356	44.45
Alexandra Dock Jn. T.C.	GW10	Wales	19,322	460	42.00
Acton T.C.	GW01	Paddington - Didcot	75,474	1,825	41.36
Wootton Bassett F.Y.	GW03	Greater Bristol and Westbury	4,339	107	40.55
Merehead Quarry	GW04	Reading - Cogload Jn	22,080	552	40.00

6.9.3 Option 3 – Grade separation Didcot East

60-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	114
Operating Cost	0
Revenue	-4
Other Government Impacts	1
Total costs	**111**
Benefits (Present Value)	
Rail users' benefits	4
Non-users' benefits	2
Total Quantified Benefits	**6**
NPV	**-105**
Quantified BCR	**0.1**

6.9.3 Option 5 – Didcot North Jn

	£ million (2002 PV)	
60-year appraisal	**Low CAPEX cost scenario and with potential renewal savings**	**High CAPEX cost scenario and without renewal savings**
Costs (Present Value)		
Investment Cost	0.8	4
Operating Cost	0	0
Revenue	-1	-1
Other Government Impacts	0.2	0.2
Total costs	**-0.1**	**3.2**
Benefits (Present Value)		
Rail users' benefits	0.8	0.8
Non-users' benefits	0.3	0.3
Total Quantified Benefits	**1.2**	**1.2**
NPV	**1.3**	**-2.0**
Quantified BCR	**Financially Positive**	**0.4**

6.9.9 Option 1a – Extension of down goods loop from Platform 2 at Bristol Parkway to the Down Filton line

60-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	10
Operating Cost	0
Revenue	-2
Other Government Impacts	0
Total costs	**8**
Benefits (Present Value)	
Rail users' benefits	2
Non-users' benefits	0
Total Quantified Benefits	**2**
NPV	**-6**
Quantified BCR	**0.3**

6.9.9 Option 2a – Keynsham Up and Down loops

60-year appraisal	£ million (2002 PV)
Costs (Present Value)	
Investment Cost	12
Operating Cost	0
Revenue	-0.1
Other Government Impacts	0
Total costs	**12**
Benefits (Present Value)	
Rail users' benefits	0.1
Non-users' benefits	0
Total Quantified Benefits	**0.1**
NPV	**-12**
Quantified BCR	**0.0**

6.9.10.6 – Half hourly Avonmouth to Bristol Temple Meads service	
30-year appraisal	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0.0
Operating Cost	17.8
Revenue	-1.8
Other Government Impacts	0.4
Total costs	**16.4**
Benefits (Present Value)	
Rail users' benefits	8.9
Non-users' benefits	0.7
Total Quantified Benefits	**9.6**
NPV	**-6.7**
Quantified BCR	**0.6**

6.9.10.6 – Hourly Severn Beach to Bristol Temple Meads service	
30-year appraisal	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0.0
Operating Cost	18.1
Revenue	-2.2
Other Government Impacts	0.5
Total costs	**16.4**
Benefits (Present Value)	
Rail users' benefits	12.6
Non-users' benefits	1.0
Total Quantified Benefits	**13.6**
NPV	**-2.8**
Quantified BCR	**0.8**

6.9.10.8 – Bristol Temple Meads to Gloucester via Severn Tunnel service	
30-year appraisal	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0
Operating Cost	21.1
Revenue	-3.8
Other Government Impacts	0.9
Total costs	**18.2**
Benefits (Present Value)	
Rail users' benefits	10
Non-users' benefits	1.3
Total Quantified Benefits	**11.4**
NPV	**-6.8**
Quantified BCR	**0.6**

6.9.12 – Additional hourly service between Exeter St Davids and Axminster	
30-year appraisal (without capital expenditure)	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0
Operating Cost	22.1
Revenue	-4.7
Other Government Impacts	1.1
Total costs	**18.4**
Benefits (Present Value)	
Rail users' benefits	13.5
Non-users' benefits	1.6
Total Quantified Benefits	**15.1**
NPV	**-3.4**
Quantified BCR	**0.8**

6.9.12 – One and two-hourly extensions of Paignton to St James Park service to Axminster

	£ million (2002 PV)	
60-year appraisal	**One-hourly***	**Two-hourly**
Costs (Present Value)		
Investment Cost	0	0
Operating Cost	42	25
Revenue	-12	-6
Other Government Impacts	3	1
Total costs	**33**	**21**
Benefits (Present Value)		
Rail users' benefits	47	22
Non-users' benefits	7	3
Total Quantified Benefits	**54**	**26**
NPV	**21**	**4.7**
Quantified BCR	**1.6**	**1.2**

**does not include capital cost of required infrastructure*

6.9.12 – Long distance extensions
a) Extend Manchester – Bristol Temple Meads services to Exeter St Davids and/or Plymouth

	£million (2002 PV)		
30-year appraisal	**Extension to Exeter**	**Mix of extension to Exeter and Plymouth**	**Extension to Plymouth**
Costs (Present Value)			
Investment Cost	0	0	0
Operating Cost	37.5	47.1	79.6
Revenue	-10.2	-14.4	-20.3
Other Government Impacts	2.0	2.9	4.2
Total costs	**29.3**	**35.6**	**63.6**
Benefits (Present Value)			
Rail users' benefits	26.5	36.6	52.3
Non-users' benefits	3.9	5.8	8.6
Total Quantified Benefits	**30.4**	**42.3**	**60.9**
NPV	**1.1**	**6.7**	**-2.7**
Quantified BCR	**1.0**	**1.2**	**0.9**

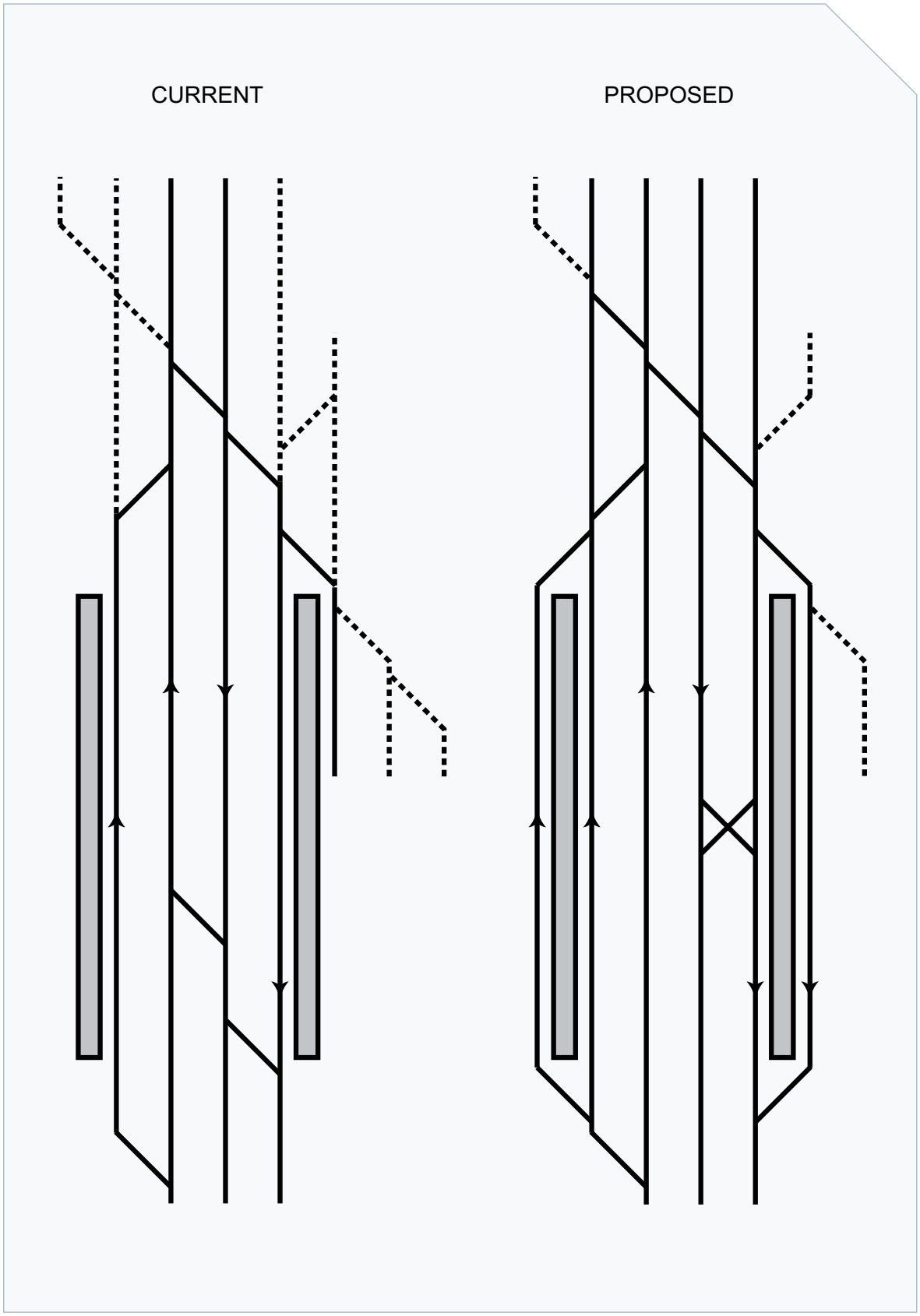
6.9.12 – Long distance extensions
b) Extend Cardiff – Taunton services to Exeter St Davids and/or Plymouth

	£million (2002 PV)		
30-year appraisal	**Hourly extension to Exeter**	**Hourly extension to Plymouth**	**Two-hourly extension to Plymouth**
Costs (Present Value)			
Investment Cost	0	0	0
Operating Cost	25.1	54	28.7
Revenue	-3.2	-7.3	-4.7
Other Government Impacts	0.7	1.6	1.1
Total costs	**22.6**	**48.3**	**25**
Benefits (Present Value)			
Rail users' benefits	10.9	24.3	15.7
Non-users' benefits	1.8	4.6	2.9
Total Quantified Benefits	**12.7**	**28.9**	**18.6**
NPV	**-9.9**	**-19.4**	**-6.4**
Quantified BCR	**0.6**	**0.6**	**0.7**

6.9.15.1 – Additional local stopping services to Newquay on weekend

30-year appraisal	**£ million (2002 PV)**
Costs (Present Value)	
Investment Cost	0.0
Operating Cost	0.3
Revenue	-0.1
Other Government Impacts	0.0
Total costs	**0.1**
Benefits (Present Value)	
Rail users' benefits	0.2
Non-users' benefits	0.0
Total Quantified Benefits	**0.2**
NPV	**0.1**
Quantified BCR	**1.1**

Appendix E – Oxford station – theoretical layout



Appendix F – Interurban Route Sections

These figures are indicative of the overall maximum levels of capital expenditure that could be spent if all passengers benefit from the journey time improvement over the described sections.

Route Section	Benefits calculated between:	Infrastructure cost which could be supported for each minute of journey time saving – BCR of 2
Paddington – Reading	Paddington – Acton, Main Line only	£129m
Reading – Swindon	Swindon – Didcot	£54m
Reading – Oxford	Oxford – Radley	£30m
Reading – Taunton (Westbury)	Reading West – Theale	£24m
Swindon – Bristol Temple Meads	Swindon – Chippenham	£23m
Bristol Parkway – Newport	Pilning – Patchway	£22m
Swindon – Bristol Parkway	Swindon – Bristol Parkway	£21m
Taunton – Exeter	Taunton – Tiverton Parkway	£18m
Bristol Temple Meads – Taunton	Nailsea & Blackwell – Yatton	£15m
Cheltenham – Bristol Parkway	Yate and Cam & Dursley	£13m
Reading – Basingstoke	Reading West – Mortimer	£12m
Westbury – Taunton	Castle Cary – Taunton	£12m
Bristol Temple Meads – Taunton	Bridgwater – Highbridge & Burnham	£11m
Exeter – Plymouth	Totnes – Ivybridge	£9m
Bristol Temple Meads – Westbury	Avoncliff – Freshford	£7m
Plymouth – Penzance	St Germans – Menheniot	£6m
Cardiff Central – Birmingham New Street	Cardiff Central – Newport	£6m
Swindon – Cheltenham	Swindon – Kemble	£5m
Oxford – Worcester	Oxford – Hanborough	£5m
Westbury – Salisbury	Dilton Marsh – Warminster	£4m
Exmouth – Exeter	Polsloe Bridge – St Jame's Park	£3.6m
Gloucester to Severn Tunnel Jn	Gloucester – Severn Tunnel	£2.4m
Barnstaple – Exeter	Exeter St Davids – Newton St Cyres	£1.1m
Castle Cary – Dorchester	Castle Cary – Yeovil Pen Mill	£1m
Par – Newquay	Newquay – Qunitrel Downs	£0.3m
Westbury – Chippenham	Melksham – Trowbridge	£0.1m

Appendix G – Stakeholder Aspirations

New Stations	Reopened Stations	Line Reinstatment/Conversion
Avon Meads	Ashley Hill	Aller Triangle/Aller Chord
Devizes (Parkway)	Ashton Gate	Avonmouth to Filton (via Henbury)
Eton Wick	Brent	Barnstaple to Bideford
Exeter Business Park	Bristol Road	Bere Alston to Tavistock
Gloucester (Barnwood)	Bodmin Town	Bourne End to High Wycombe
Gloucester (South)	Chalvey	Bradford North Curve
Lockleaze	Charfield	Dualling of Glyn Valley
Monkerton	Churchdown	Exeter – Okehampton – Tavistock – Plymouth
Newcourt	Corsham	Frome to Radstock
Newbridge	Chipping Sodbury	Highbridge Loop
Oxpens	Cullompton	Patchway to St Andrews Road
Perivale	Fowey	Minehead Branch to Taunton
Portway Park & Ride	Hallen	Newquay to Truro (St Denis Link)
St Werburghs	Henbury	Radstock to Swindon
White Horse Business Park (Trowbridge)	Horfield	Stratford to Honeybourne (The Honeybourne Line)
	Kingkerswell	Tavistock to Plymouth
	Langport	Thornbury to Yate
	Marlborough	
	Minehead	
	North Filton	
	Norton Jn (Parkway)	
	Old Oak Common	
	Padstow	
	Park Royal	
	Pill	
	Plympton	
	Portishead	
	Somerton	
	Staverton	
	Stonehouse (Bristol Rd)	
	Wadebridge	
	Wantage/Grove	
	Wellington	
	Wickwar	
	Winterbourne	
	Wootton Bassett	

Appendix G – Stakeholder Aspirations continued

Service Proposals
Reading – Didcot – Swindon (stopping)
Oxford – Didcot – Swindon (stopping)
Local Oxford service – Wantage/Grove via Milton Park – Didcot – Appleford – Culham – Radley
Kennington – Oxford (possibly Bicester)
Bristol – Swindon – Oxford
Weston-super-Mare to Portishead via Bristol Temple Meads – Filton Abbey Wood – Bristol Parkway – Avounmouth – Bristol Temple Meads
Plymouth – Liskeard (stopping)

Glossary

Term	Meaning
ATOC	Association of Train Operating Companies
BCR	Benefit Cost Ratio
Capacity (of rolling stock)	Capacity is deemed to be the number of standard class seats and standing spaces available on a train.
Capacity (of infrastructure)	The capacity of a given piece of railway infrastructure is an assessment of the maximum number or mix of trains which could operate over it. This is quantified more formally through a Capacity Utilisation Index
Capacity (of stations)	The pedestrian capacity of a station is an assessment of the maximum number of passengers it can acceptably handle, given the station layout at the site concerned
Connectivity	The ability to travel between two stations or conurbations within an acceptable journey time or frequency options compared to other modes of transport
Control Period 4 (CP4)	The five year period between 2009 and 2014
Control Period 5 (CP5)	The five year period between 2014 and 2019
CUI	Capacity Utilisation Index
DaSTS	Delivering a Sustainable Transport System
DfT	Department for Transport
DOO	Driver-Only Operation, i.e. trains which operate without carrying a guard
Down	Where referred to as a direction i.e. Down direction, Down peak, Down line, Down train, this generally refers to the direction that leads away from London
Dwell time	The time a train is stationary at a station
ERTMS	European Rail Traffic Management System. A future railway signalling system, with equipment located in the driver's cab, rather than at the lineside
FOC	Freight Operating Company
FPM	Freight Performance Measure, expressed as a percentage of trains running on time compared to those scheduled to run
Gap	Where the network does not meet the specification or demand required of it, now or in the future
GRIP	Guide to Railway Investment Projects – Network Rail's process for project management of schemes through development and implementation
Headway	The minimum interval possible between trains on a particular section of track
HLOS	High Level Output Specification – the DfT's High Level Output Specification, which has specified to Network Rail the outputs that need to be delivered within a Control Period.
HST	High Speed Train
Intermodal Trains	Freight trains which convey traffic which could be conveyed by road, rail or sea (eg. containerised traffic)
IEP	Intercity Express Programme, the name given to the project to replace the existing High Speed Train fleet
JPIP	Joint Performance Improvement Plans
Junction margin	The minimum interval possible between trains operating over the same junction in conflicting directions

Term	Meaning
LDHS	Long Distance High Speed
LENNON	An industry database recording ticket sales: Latest Earnings Networked Nationally Over Night
Load Factor (relative to seats)	Load factor (relative to seats) is calculated as the passenger demand divided by the number of standard class seats, expressed as a percentage.
Load Factor (relative to total capacity)	Total capacity includes both standard class seats and standing allowance. For intercity rolling stock, total capacity has been estimated at a ratio of 1.2 times the number of standard class seats as per HLOS. For the commuter rolling stock, it has generally been calculated on the basis of the total number of passengers that can be accommodated, allowing 0.45 square metre of space per person. When this information is not available for some of the commuter rolling stocks, total capacity has been estimated at a ratio of 1.4 times the number of standard class seats. Load factor (relative to total capacity) is calculated as the passenger demand divided by total capacity as defined above, expressed as a percentage.
Loading Gauge	The loading gauge is the profile for a particular route within which all vehicles or loads must remain to ensure that sufficient clearance is available at all structures
MOIRA	Industry standard demand forecasting model
NPV	Net Present Value
Option	The options as identified in this document are aimed at addressing the highlighted gaps
ORR	Office of Rail Regulation
PDFH	Passenger Demand Forecasting Handbook. An industry document that summarises the effects of service quality, fares and external factors on rail demand
Perturbation	Describes disruption to the planned train service pattern
PIXC	Passengers in excess of Capacity – This only applies to weekday commuter trains arriving in London between 07:00 and 09:59 and those departing between 16:00 and 18:59. The PIXC measure for a Train Operating Company (TOC) as a whole is derived from the number of passengers travelling in excess of capacity on all services divided by the total number of people travelling, expressed as a percentage. PIXC counts are carried out in autumn each year, either by means of a manual count on a typical weekday, or (increasingly commonly) by the calculation of average loads derived from automatic passenger counting equipment fitted on trains The DfT has set limits on the level of acceptable PIXC at 4.5 percent on one peak (morning or afternoon) and three percent across both peaks. The DfT monitors the level of PIXC across peaks (both individually and combined)
Possession	Where part of the infrastructure is closed to services to carry out maintenance, renewal or enhancement works
PPM	Public Performance Measure, expressed as a percentage of trains running on time compared to those scheduled to run
PV	Present Value
Railsys	A simulation modelling tool utilising proposed infrastructure with service provisions used to measure performance/reliability benefits
RES	Regional Economic Strategy
RIFF	Rail Industry Forecasting Framework
RPA	Regional Planning Assessment

Term	Meaning
Route Availability (RA)	Is the system which determines which types of locomotive and rolling stock can travel over any particular route. The main criteria for establishing RA usually concerns the strength of underline bridges in relation to axle loads and speed, although certain routes have abnormal clearance problems (eg. very tight tunnels). A locomotive of RA8 is not permitted on a route of RA6 for example
RSS	Regional Spatial Strategy
RUS	Route Utilisation Strategy
S&C	Switch and Crossings
SDO	Selective Door Opening – a means of ensuring that only selected doors open when a train is stopped at a station, leaving closed any doors which overhang short platforms. Not all rolling stock is fitted with this facility; those types of rolling stock which are so fitted vary in the permutations of doors which can be kept closed in this way
Seven Day Railway	Network Rail initiative implementing techniques which will minimise the impact on passengers and freight of engineering work for maintenance, renewal and enhancements
SMG	Stakeholder Management Group
TEE	Transport Economic Efficiency
TfL	Transport for London
TEMPRO	Trip End Model Presentation Program. Software application used by the DfT to provide detailed analysis of trip end, journey mileage, car ownership and population/workforce planning data throughout the country
TOC	Train Operating Company
tph	trains per hour
Train path	A slot in a timetable for running an individual train
TWA	Transport and Works Act
Up	Where referred to as a direction i.e. Up direction, Up peak, Up line, Up train, this is generally but not always refers to the direction that leads towards London
W10	The loading gauge which enables 9ft 6in containers to be conveyed on conventional wagons
WCML	West Coast Main Line
WSG	Wider Stakeholder Group
WTT	Working Timetable

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