Delivering a better railway for a better Britain
Network Specification 2016
Western
Network Specification: Western

Incorporates Strategic Routes:
- J: London and West
- K: West of England
- L: Wales (part) and
- M: West Midlands & Chilterns (part)

This Network Specification describes the Western Route in its geographical context, outlining train service provision to meet current and future markets, and traffic flows for passenger and freight businesses. The specification outlines and identifies capability improvements set out in relevant Route Utilisation Strategies (RUS) to meet future growth for the medium to long term. This is further enhanced with the conditional outputs from the Market Studies and the outputs from the Western Route Study.

Each Network Specification draws upon the supporting evidence and recommendations from a geographical RUS, and second generation RUSs which have been completed, for each part of the national rail network. These provide the strategic direction, initially for a 10-year period within the overall context of the next 30 years. This specification also notes the demand projections and the conditional outputs articulated in the Market Studies for passenger and freight, published in Autumn 2013 and the Western Route Study published in August 2015 as part of the Long Term Planning Process (LTPP).

The Network RUS incorporates a number of national workstreams, and consists of:
- Scenarios and Long Distance Forecasts: published in June 2009. The document considers how demand for long distance rail services, both passenger and freight, might be impacted by four alternative future scenarios
- Electrification Strategy: published in October 2009. The document sets out a strategy for further electrification of the network. This strategy is being revised to reflect the electrification schemes that are progressing or are committed, and will consider the options for additional electrification over the next 30 years. The revised Network RUS: Electrification Strategy Draft for Consultation is due to be published in 2015
- Freight: The Freight RUS was established in 2007 and a number of its recommendations to develop the Strategic Freight Network (SFN) have been implemented. The refresh of the Freight RUS will look at the future capability requirements of the network to accommodate freight growth
- Stations: published in September 2011, this strategy considered the pedestrian capacity of stations on the network. It sets out a process for considering congestion at stations and proactively reviewing congestion across the network. For the Western Route, the RUS identified Bristol Temple Meads and Bristol Parkway as stations which require the continued development of proposals and capacity interventions for the volume of predicted rail passenger demand, particularly when linked to the Intercity Express Programme (IEP) and wider economic developments. Further station capacity assessments have been undertaken as part of the Western Route Study identifying key stations which may require interventions in Control Period 6 (CP6, 2019 – 2024) or beyond
- Passenger Rolling Stock: published in September 2011. This strategy explores the potential for greater efficiency in the purchase of new rolling stock to replace the existing fleet and accommodate growth in demand. The RUS identified the potential for significant economies of scale through procuring a smaller, standardised range of stock types targeted at specific market sectors
- Passenger Rolling Stock Depots Planning Guidance: published in December 2011. The document was produced as best practice guidance particularly focusing on the depot/network interface
- Alternative Solutions: published in July 2013. The document considers a number of alternative solutions to accommodate the future demand for rail passengers on some parts of the network more cost effectively, including non-rail options
- ‘Improving Connectivity’: was published for consultation by Network Rail in December 2014. It puts forward proposals for an alternative approach to planning the network to improve passenger connectivity, using East Anglia as a case study
- Interoperability: the Department for Transport (DfT) has requested Network Rail leads a cross-industry review of Interoperability on Great Britain’s rail network. The outcome of this review is expected to be the publication of the Network RUS: Interoperability. The aim is to establish this RUS in sufficient time to inform the next Initial Industry Plan (IIP) in September 2016.

The Route Studies provide choices for funders, and are a key part of...
In line with its licence obligation to establish and maintain RUSs, Network Rail has considered how this can most effectively be carried forward now that the original RUS programme is complete. In agreement with the Office of Road and Rail (ORR), a new LTPP has been established, taking into account changing industry context and looking ahead 30 years. Four Market Studies, covering Long Distance, Regional Urban and London and South East (L&SE) Passenger markets and the Freight market, have been established. These look at the strategic goals of the transport sector as a whole and those circumstances where rail can contribute to those goals, before forecasting future passenger and freight demand over the next 30 years.

The studies articulate a series of conditional outputs to meet the strategic goals and accommodate forecast demand. The conditional outputs are aspired levels of service in terms of, for example, frequency, journey time and/or passenger capacity on key flows in the sector. The conditional outputs reflect stakeholder views of how rail can support delivery of their strategic goals in light of opportunities created by planned investments.

The aim of the Market Studies is to provide demand forecasts and conditional outputs that are consistent across the Route Studies. Conditional outputs are aspirations for the future rather than recommended investment decisions. The Market Studies inform a series of Route Studies disaggregated typically by Network Rail’s devolved Routes. The Route Studies seek to accommodate the conditional outputs from the Market Studies onto the Network, firstly by making best use of existing capacity, and secondly through infrastructure intervention (where there is an affordable and value for money business case for doing so).

The Western Route Study was published as a Draft for Consultation in October 2014, work has continued with the final strategy published in August 2015.

Airport policy for the UK has recently been reviewed by the Airports Commission, chaired by Sir Howard Davies. Initial findings from this review were published in 2013 with final findings published in July 2015. In particular, it considers the various options for expanding airport capacity in order to maintain the UK’s position as Europe’s most important aviation hub. The shortlisted options are expansion of either Heathrow or Gatwick Airports. Network Rail has been working with the Airports Commission to enable options for expanding UK aviation capacity to be informed by the opportunities and constraints of viable rail access links.

The integration of each of these strategies is key to the development of each route as between them they cover the needs and requirements of both passengers and freight going forwards.

The National Operating Strategy covers the management and control of rail services on the network. The strategy will integrate traffic management and control systems to improve performance and potentially improve the Public Performance Measure by two per cent. It will result in cost savings by moving from over 800 signal boxes to 14 railway operating centres over a timescale of around 30 years. Network Rail plans that over 80 per cent of the network will be run by the new centres by 2029, with most of that delivered in Control Periods 5 and 6 (2014 – 2024). Network Rail has been working with the industry to develop the proposals, and is in discussion with senior industry leaders to develop the plan further.

For the Western Route, the Operating Strategy will integrate the signalling renewals programme across the route (Worcester, Gloucester, Westbury, Exeter, and Plymouth to Penzance) with the introduction of European Traffic Control System (ETCS) and European Rail Traffic Management System (ERTMS) where possible. The integration of these programmes with the National Operating Strategy, transferring signalling control to the Thames Valley Signalling Control Centre at Didcot (which will become the Western Railway Operating Centre) will be key.

This document refers to Strategic Route Sections (SRS), which cover specific sections of the route. These are covered in detail in the Route Specification, which is published as an appendix to this Network Specification. This describes in greater detail the current and future requirements of each SRS to inform both internal and external stakeholders of our future strategy.
The scope of the Western Route is extensive and diverse, the focal element being the Great Western Main Line which runs from London to Bristol, through the south west to Penzance. This creates main line links between London and the South West and to Wales. Extending from this are radial routes to Oxford, the Cotswolds, Birmingham and the South Coast. Branch lines into the London suburbs, to the Devon and Cornish coast and dedicated freight lines complete the mix of routes. The scope area of the Western Route is adjoined by London North Western, Anglia, Wessex and Wales Routes.

The Western Route can be divided into a number of segments, the key characteristics of which are described in the following sections:

**London to Bristol and South Wales Main Line**

The core of the Great Western Main Line (GWML) is the high speed section from London Paddington through the Thames Valley, Swindon and Bristol Parkway and on to the Severn Tunnel (for Wales). Designated as part of the Trans-European Network, this key element of the east to west route provides fast interurban links between the English and Welsh capital cities. The route diverges at Wootton Bassett Junction, to the west of Swindon, towards Chippenham and Bath, and also at Bristol Parkway towards Bristol Temple Meads.

The GWML is also a key freight corridor for traffic from the south west (specifically Bristol) and south Wales to London, and from Bristol Parkway on to the north at Westerleigh Junction. There are also a number of freight terminals between London Paddington and West Drayton that handle a variety of traffic, along with the Greenford loop providing access for freight to and from the Chilterns.

The GWML forms part of the national Strategic Freight Network (SFN), and is the second busiest freight corridor for freight into London.

**Thames Valley branches**

Five short Thames Valley branch lines feed the GWML section of the route between London Paddington and Reading, from Greenford, Colnbrook, Windsor & Eton Central, Marlow and Henley-on-Thames.

**Reading – Oxford – Banbury corridor**

This corridor forms a key part of the London Paddington outer suburban network and plays a crucial role in the long-distance network which links the south coast via Basingstoke, Reading and Oxford with the Midlands, Greater Manchester, East Midlands, Yorkshire, the North East and Scotland.

The corridor is also part of the nationally-significant SFN for container traffic between the port of Southhampton and the Midlands, the North West and Scotland via the West Coast Main Line (WCML). Automotive flows are also prevalent on this corridor.

**North Cotswolds (Oxford – Worcester & Hereford)**

The North Cotswold Line runs northwest from Oxford through Moreton-in-Marsh towards Worcester providing through connectivity from Worcester and Hereford to London Paddington. Between Hereford and Worcester the route also carries outer suburban services between Hereford, Worcester and Birmingham. The border for the Western Route with London North Western Route is to the south of Hartlebury/Bromsgrove.

**South Cotswolds Line (Swindon – Cheltenham)**

The Stroud Valley section of the route diverges from the GWML at Swindon for Gloucester and Cheltenham via Kemble, Stroud and Stonehouse, and connecting with the West Midlands and the north at Gloucester and Cheltenham. The section between Swindon and Gloucester forms part of the South Wales diversionary route for both passenger and freight services when the Severn Tunnel is closed.

**South West and Wales to the West Midlands**

This corridor plays a central role in the long distance network, linking the South West region (through Bristol) and South Wales (on the South Wales Main Line) via Gloucester/Cheltenham with the Midlands, Manchester, the East Midlands, Yorkshire, the North East and Scotland. Equally this part of the route – between Westerleigh Junction and Barnt Green – is a component of the wider national freight network which links the North with South Wales and the South West, mainly for long distance metals, coal and, potentially in the future, biomass flows. The border of the Western Route with the Wales Route is to the east of Chepstow, and at Pilning, east of the Severn Tunnel.

**Greater Bristol - regional and local network**

Centred on Bristol Temple Meads station the Greater Bristol rail network includes a mixture of main, regional and local branch lines providing connectivity opportunities across the West of England region and beyond. The network includes lines to Avonmouth and
Route Context

Severn Beach, South Wales, Gloucester, Weston-super-Mare, Taunton, Bath and Westbury.

Reading to Penzance

This main line route diverges from the GWML at Reading towards the South West through Newbury and Westbury on to Taunton, where it converges with the main line route from Bristol and north thereof. The route continues across the southwestern peninsula, connecting significant towns and the cities of Exeter, Plymouth and Truro with London and the South East of England. The route also provides access to the Mendip quarries to the west of Westbury, which generate significant volumes of aggregate traffic.

Devon - regional and local network

The key centres of Exeter and Plymouth are on the main line network, providing direct connectivity to Bristol, London and beyond through the cross-country network and Long Distance High Speed (LDHS) trains. Two local rail networks exist in Devon centred on the cities of Exeter and Plymouth. Local services around Exeter are arranged to ensure through cross-Exeter links between Barnstaple line on the north coast, through the two stations in Exeter (St Davids and Central) to Exmouth, and from Exmouth to Paignton on the south coast. A single line from Crediton provides a connection on to the privately owned Dartmoor Railway. From Newton Abbot there is a single track connection on to the Heathfield branch, which has been used for handling timber traffic loaded at Teigngrace. Exeter is also connected to London Waterloo via Honiton and Axminster, providing an alternative route to London. The Plymouth local network includes the branch line to Gunnislake and stations into Cornwall.

Cornwall - regional and local network

The South West Main Line between Plymouth and Penzance connects a number of significant towns and cities, including the city of Truro. Branch lines such as Liskeard – Looe, Par – Newquay, Truro – Falmouth and St Erth – St Ives connect key holiday and tourist resorts, and education and employment centres, to the main line network. A number of freight only lines exist with Fowey Harbour and the Parkandillack branches serving the china clay market.
Within the Western Route, the main markets for rail passengers are identified as long, medium and short distance commuting into London, Reading, Bristol and Exeter; interurban travel between main centres such as Bristol, Exeter and Plymouth towards London and the Thames Valley, the Midlands, the north east and Scotland; inter-regional and interurban travel to the south west; the coast, the Cotswolds, to Wales and the North; leisure, holiday and tourism; access to airports and the social dimension of local branch lines and rural locations.

Passenger services which operate over the route can be categorised into the following three groups:

**Long distance services**
Interurban services are divided between London Paddington and South Wales and between London Paddington and the Greater Bristol area via Bath; to Oxford and the Cotswold Line, and (less frequently) to Cheltenham via the Stroud Valley and a broadly-hourly London Paddington to Plymouth/Penzance service. These services share the intensively used main lines between London Paddington and Reading operating as eight-car train formations running at up to 125mph and cater for a significant long-distance London commuter market, predominantly running non-stop between London Paddington and Reading. Additional services to the coastal resorts in Cornwall are provided on summer Saturdays for leisure and holiday demand with a nightly (Saturdays excepted) sleeper service operating between London Paddington and Penzance serving the principal Cornish stations.

The Great Western RUS (March 2010) predicts rail passenger demand on the LDHS services into London Paddington to increase by 44 per cent between 2008 and 2019 in the peak and 51 per cent for all day services. This includes the anticipated impact of electrification and the new Super Express Trains (SETs).

Forecasts developed as part of the LTPP in the Long Distance Market Study (October 2013) for 2023 and 2043 anticipate growth into London Paddington as, up to 29 per cent for main line services between 2012 and 2023 and 99 per cent between 2012 and 2043.

Long-distance interurban services operate between the south coast (via Reading), main centres in the South West (via Bristol) and the Midlands, Yorkshire, the North East and Scotland, providing journey opportunities for business travel, access to airports, leisure and tourism. Centred on Birmingham, service patterns provide a half-hourly service between the major locations across the cross-country network.

The Network RUS: Scenarios and Long Distance Forecasts (June 2009) predicts rail passenger demand for cross-country travel to increase by 36 per cent between Bristol and Birmingham by 2016 and by 63 per cent by 2026. Extending to 2043, the Long Distance Market Study (October 2013) predicts growth of up to 97 per cent on this corridor.

**Inter-regional services**
Inter-regional services operate across the route and provide semi-fast (limited stop) services between South Wales, the west of England, the Greater Bristol conurbation and Bath, through west Wiltshire and Salisbury to the south coast, and through south Somerset for Dorset.

There are limited-stop services between the East Midlands and Birmingham New Street and Cardiff via Cheltenham and Gloucester (omitting Worcester). These are complemented by stopping services between Cheltenham and Swindon and between Great Malvern and Bristol via Worcester, calling at intermediate stations such as Ashchurch, and Cam & Dursley. The latter also form part of the Greater Bristol network. Frequencies between Cheltenham Spa and Gloucester are further augmented by the Cardiff stopping services.

Supplementary stopping services add to the local cross-Bristol network between Cheltenham/Gloucester (via Yate) and Westbury/Southampton/Weymouth; between Cardiff and Taunton, and between Bristol Parkway and Weston-super-Mare. Hourly semi-fast services between Cardiff and Portsmouth via Bristol and Bath, add to the cross-Bristol network.

Approximately one train every two hours operates between Westbury and Swindon. There are currently a limited number of services between London Waterloo and Bristol Temple Meads (only) via Salisbury.

An hourly service between London Waterloo and Exeter St Davids (via the Wessex route) contributes to the service provision for the south west.

The Great Western RUS (March 2010) predicts continued growth for inter-regional services with peak rail passenger demand predicted to grow by 41 per cent between 2008 and 2019, equivalent to an annual growth rate of 3.2 per cent. Off-peak demand is predicted to grow by 37 per cent which is principally assumed to be for leisure purposes. The Regional Urban Market Study (October 2013) predicts up to 111 per cent growth into Bristol between 2012 and 2043.
Suburban, commuter and local services

Thames Valley suburban and commuter operations, generally using the relief lines, can be sub-divided into those catering for the inner suburban markets to the east of Taplow and outer suburban services to Maidenhead, Didcot, Oxford and Newbury. This also includes branch line services for Greenford, Windsor & Eton Central, Bourne End and Marlow, and Henley-on-Thames, as well as services between Reading and Basingstoke. Regular Heathrow Express non-stop services and Heathrow Connect stopping services from London Paddington serve London Heathrow Airport Central Terminal Area (CTA)(Terminals 1, 2 & 3) and Terminal 5, with a connecting shuttle from the CTA to Terminal 4.

In the Thames Valley, suburban services run at up to 90mph, serving the large number of stations within Greater London and Berkshire. The exception is airport services which run on the main lines at 100mph between London Paddington and Heathrow Airport Junction.

The Great Western RUS (March 2010) predicts that between 2008 and 2019, rail passenger demand for the short to medium distance commuter market to London Paddington will increase by 21 per cent in the peak and by 25 per cent all day. These forecasts predominantly represent demand from stations to the east of Reading such as Maidenhead, Slough and West Drayton. This demand will be met by a significant change in the suburban service structure through the introduction of the high-capacity 9-car Crossrail service from May 2018.

The Long Distance Market Study (October 2013) and the London and South East Market Study (October 2013) anticipate growth in demand for relief line services into London Paddington to increase by up to 198 per cent between 2012 and 2023 and 298 per cent between 2012 and 2043.

The Greenford to London Paddington service will be truncated to terminate at West Ealing in the new bay platform. This is driven by the introduction of Crossrail.

Further west, the main markets for rail are identified as medium and short distance commuting, leisure and holiday traffic to the main centres such as Bristol, Taunton, Exeter and Plymouth, providing local journey opportunities as well as feeding into main line services from rural locations on local branches. In the Exeter district the pairing of Barnstaple journeys with Exmouth, and Exmouth with Paignton, is co-ordinated with the journeys via Honiton which – taken together – form the basis of a cross-Exeter local network through Exeter Central with further local journeys westwards beyond Exeter to Plymouth.

A number of branches enable many of the larger coastal resorts on the south and north coasts of Devon and Cornwall to be served by rail, and holiday traffic is a significant element of the overall passenger market. The most intensively used Devon and Cornwall branches to Exmouth, Falmouth and St Ives have half-hourly frequencies whilst the other west of England branches have hourly or less frequent services. The Paignton and Newquay branches have an element of through working of long distance services, increased on a seasonal basis. Additional Newton Abbot to Paignton services operate to provide a two trains per hour structure.

The level of demand can be significantly greater for the coastal resorts during the summer months; the Western Route Study has undertaken analysis for such routes to determine trends in peak summer patronage and the implications for future capacity.
Key freight markets and traffic flows

The rail industry’s established freight forecasts were published in the Freight Market Study in 2013. The Market Study is part of the Long Term Planning Process with forecasts developed in collaboration with freight operators and stakeholders.

The Freight Market Study (October 2013) base year is 2011/12 with forecasts developed for 2023, 2033 and 2043, which in summary show:

- substantial growth in intermodal freight from ports and, in the longer term, between domestic intermodal terminals (many of which do not currently exist but are expected to be developed in future)
- a decline in coal traffic over the long term, partly offset by a growth in biomass as coal’s share of the UK’s power generation mix reduces; and
- modest growth in other commodities, in particular aggregates for the construction industry.

The Freight Market Study (October 2013) forecasts freight growth unconstrained by rail capacity and the extent of future new terminal developments. The unconstrained forecasts form the freight conditional outputs which are then assessed in the Route Studies to present choices for funders for Control Period 6 and beyond.

Recent demand analysis for the Network RUS: Freight has highlighted that the market for the movement of construction materials by rail has changed since the establishment of the Freight Market Study (October 2013). Revised forecasts for this commodity have been agreed by the industry and will be presented in the revised Network RUS: Freight Draft for Consultation which is due to be published at the end of 2015.

The anticipated effect is to increase rail’s assumed future market share and thus the number of construction material trains.

Significant volumes of freight are carried over the Western Route, with an estimated 21 million tonnes transported per annum. The GWML is the second busiest freight corridor into London after the West Coast Main Line (WCML). For the GWML, the Freight Market Study (October 2013) predicts around 60 train paths per day to be required in each direction between Reading and London by 2043.

Across the route there are around 45 freight terminals handling over 12 different commodities. The major commodities transported are: aggregates, coal, containers, steel and automotive. In addition to these flows, other freight traffic traverses the area to destinations in South Wales and to the North of England and Scotland. 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.

Aggregates for the construction industry mainly originate in the Mendips and account for much of the freight traffic between the West Country and London with key terminals at Acton, Brentford, Hayes, West Drayton, Thorney Mill, Colnbrook, and others to the south and east of London.

The busiest part of the network for freight is between Reading and Acton. Aggregates traffic also flows southwards from Westbury to reach various southern destinations via Salisbury. The route between the south coast Port of Southampton and the WCML 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. This has seen a significant increase following the completion of the gauge enhancement scheme enabling 9ft 6in containers to use the route. Rail’s market share at Southampton has since increased to 36 per cent with forecast growth to 2030 requiring up to 50 freight paths per day.

Automotive manufacturing is centred at Oxford Cowley (BMW) and Swindon South Marston (Honda). Train loads of export cars run to Purfleet Docks and Southampton. Increasing volumes of export cars from Halewood for shipment at Southampton are transported across the route. The automotive import market is mainly based on the Port of Bristol’s Portbury terminal, with a rail terminal at Swindon Hawksworth handling steel for car manufacture.

Petroleum traffic generates up to five trains per week crossing the route from Milford Haven to either Westerleigh or Theale. There are also daily planned oil trains from Lindsey Oil Refinery to Westerleigh, and to Colnbrook. There are other, less regular movements.

Daily train loads of containerised waste run between Brentford and (currently) Scunthorpe.

Most freight traffic in the West of England is generated around Bristol, at the major logistics complex at Avonmouth and the Royal
Portbury Dock. The terminal at South Liberty Lane, Bristol handles up to six container trains per week from Tilbury, Isle of Grain (Medway) or Felixstowe. There are biomass trains from Royal Portbury Dock to the North.

The development by the Bristol Port Company to construct a new container terminal at Avonmouth will introduce further freight traffic across the area.

The Freight Market Study predicts around 30 freight paths will be required per day in 2043 across the Bristol area.

Network Rail is working with SITA to develop an ‘energy from waste’ power station on the Severn Beach branch at the former ICI Severnside site.

In the far South West, china clay traffic from a range of loading points around St Austell is carried locally within Cornwall for export via the port of Fowey, as well as over longer distances outside the route. Further, aggregate traffic is carried from Burngullow to East London.

Timber supply from Exeter Riverside to Chirk has recently increased.

The Freight Market Study predicts around 10 freight paths will be required per day in 2043 in the South West.

Network Rail infrastructure traffic operates across the route, mainly serviced from the Westbury Local Distribution Centre (LDC). The routes around Acton and Greenford are also key in delivering heavy engineering trains on to the London Underground network via Neasden or Aylesbury.
This section outlines the investment in the Western Route during Control Period 4 (CP4). The schemes were primarily funded by Government through a variety of funding streams such as: the CP4 High Level Output Specification (HLOS), the Transport Innovation Fund, or station improvement programmes, while others were Third Party funded.

- **Swindon to Kemble Redoubling**: the scheme redoubled a 12-mile section of single line between Swindon and Kemble to improve capacity and performance on the South Cotswold route. The scheme was completed in August 2014.
- **Westerleigh Junction - Barnt Green Linespeed Improvement**: the scheme raised linespeeds allowing a reduction in journey times of up to three minutes and has improved reliability 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 also delivers significant performance improvements as well as providing an increase in both passenger and freight capacity. The scheme was funded through the CP4 HLOS and implemented during 2015.
- **Reading station area redevelopment**: redevelopment of the station area and its approaches to deliver capacity, capability and performance improvements. The scheme was funded through the CP4 HLOS and completed during 2015.

**National Stations Improvement Programme (NSIP)**: station improvements completed in CP4 include: Southall, Hayes & Harlington, Slough, Maidenhead, Twyford, Theale, Hungerford, Didcot Parkway, Oxford, Swindon, Chippenham, Bath Spa, Bristol Parkway, Gloucester, Exeter St Davids, Exeter Central, Newton Abbot, Plymouth, Truro and Penzance.

**Strategic Freight Network Gauge Enhancements**: The transport initiative funded scheme constructed a W10 gauge cleared route from Southampton to the West Coast Main Line via Basingstoke, Reading, Didcot and Leamington Spa, to enable the movement of 9ft 6in containers on standard height wagons. The scheme was completed in early 2011.
This section outlines the investment envisaged for the Western Route in Control Period 5 (CP5). Some of these have a firm commitment to funding and delivery with their development and implementation spanning CP4, CP5 and Control Period 6 (CP6), whilst others form the basis of Third Party schemes bidding for funding. Further details can be found in the Network Rail Control Period 5 Enhancement Delivery Plan.

The High Level Output Specification (HLOS) (published in July 2012) for Control Period 5 (CP5) defines the railway the Government wishes to see by 2019 and includes committed schemes, illustrative option schemes and ring-fenced funding opportunities. The Government’s strategy for CP5 is built around four priorities –

- A rolling programme of electrification through the creation of an ‘Electric Spine’
- Increasing capacity and accelerating journey times between key cities; investing in faster trains (i.e. The Intercity Express Programme) and route improvements
- Facilitating commuter travel into major urban areas, helping to expand the effective labour market, and helping people to access a wider range of jobs
- Improving railway links to major ports and airports – a new rail link to give western access to Heathrow Airport.

The anticipated schemes are discussed further, in turn:

**Crossrail**

A Third Party funded cross-London service between Reading and Heathrow in the west and Abbey Wood and Shenfield in the east. This delivers 4 trains per hour (tph) to Heathrow, 2tph to Maidenhead, 2tph to Reading and at peak times 2tph to West Drayton. Construction works will be ongoing until 2018 when the initial service becomes operational. Full service operation will commence in December 2019.

**Great Western Main Line Electrification**

In March 2011, the Government confirmed its commitment to electrification of the GWML for the following routes: London Paddington to Cardiff Central (via Bristol Parkway), Reading to Newbury, Didcot to Oxford, Swindon to Bristol Temple Meads, Bristol Temple Meads to Bristol Parkway and Filton Abbey Wood towards the boundary with the Wales Route (Severn Tunnel).

In July 2012, as part of the HLOS, Government announced its commitment to further extend the GWML electrification programme to include Swansea, the Thames Valley branch lines, Acton Yard to Acton Wells and additional elements as part of the Electric Spine.

The electrified routes facilitate the progressive introduction of electric passenger train services on main line, regional and suburban services, and selective electric haulage of freight services.

**Electric Spine**

The aim for the rolling programme of electrification is to create an ‘Electric Spine’ for a high capacity passenger and freight electric corridor running from the south coast through Basingstoke, Reading, Oxford, Leamington Spa, Coventry and Nuneaton to the West Midlands and the North West; and via the East West Rail link from Oxford to Milton Keynes for the WCML to the North and Scotland, and to Bedford for the Midland Main Line to the East Midlands and South Yorkshire. High level development work is underway.

Further areas of infill electrification are being evaluated to meet longer-term aspirations following the completion of the main line scheme for connections to the cross-London key routes, and access to key freight terminals.

**Great Western Main Line gauge enhancement**

To complement the electrification of the GWML network, development works are underway to assess the scope of works required to allow W10 gauge operations for Hi-cube containers to be conveyed on conventional wagons between South Wales, the Bristol ports and Acton Yard for onwards connections to the cross-London gauge cleared routes. Enhanced gauge clearance is being delivered in part by GWML electrification, where common delivery efficiencies can be made. By connecting with the Southampton to West Coast cleared route at Didcot and Reading a wider W10 gauge cleared freight network would be achieved.

**Intercity Express Programme**

The Intercity Express Programme (IEP) provides a new generation of trains, known as Super Express Trains (SET), catering for longer distance travel on interurban and outer suburban routes, replacing the majority of the current High Speed Train (HST) fleet.

The Great Western SET fleet will be delivered from 2015 onwards for testing and commissioning and comprises 9-car Class 801/0 electric
trains for operations on the electrified routes and Class 800/1 5-car bi-mode trains, capable of operating as a 10-car formation to meet peak demand. Bi-mode trains can operate over non-electrified parts of the network, providing through connectivity between electrified and non-electrified routes. The enhanced capabilities and qualities of the new rolling stock will benefit passengers across the whole route through improved end-to-end journey times and on-train environment.

The trains are anticipated to be deployed on LDHS services between London Paddington and South Wales, Bristol and the north and south Cotswolds. With the combination of the new train service specifications and the implementation of electrification, journey times on long distance services could be reduced by up to 17 minutes between Bristol and London and 14 minutes between Cardiff and London. A number of linespeed improvement schemes will also be reviewed to further maximise the benefits SET will bring.

In order to deliver the increased service frequency and accommodate longer trains, infrastructure improvements are required, such as track layout reconfiguration, additional lines, platform extensions, station enhancements and associated signalling adjustments. Development work is underway which includes platform reconfiguration at London Paddington station, constructing a fourth platform at Bristol Parkway and associated station improvements and additional infrastructure around Bristol and at Henwick near Worcester.

The introduction of SETs on an increased service level will provide a significant increase in capacity which will make a major contribution towards meeting the increasing passenger demand and predicted growth for rail travel over the next 30 years.

**Southampton to West Coast Main Line capacity improvements**

In addition to the gauge clearance and train lengthening schemes completed in CP4, growth in the deep sea container market requires an increase in capacity on the route between Southampton and the WCML.

**East West Rail (incorporating Evergreen III)**

The East West Rail initiative is a Third Party proposal to introduce direct passenger services from Oxford and Aylesbury to Bletchley and Milton Keynes Central by 2018. A committed scheme within the July 2012 HLOS, the primary objective of East West Rail’s electrified two track railway is to improve east – west connectivity, providing a local transport link to support growth and development. It provides a means of easing traffic congestion problems in Oxford, Bletchley and Milton Keynes. As part of the ‘Electric Spine’ strategy, options are being assessed for direct passenger services between Reading/Oxford and Milton Keynes Central via Bletchley, long distance services between the south coast and the North of England and regular long distance freight services.

Evergreen III Phase 1 forms part of Chiltern Railways’ franchise commitment to upgrade the Chiltern Main Line to Birmingham. Phase 2 provides a new half-hourly London Marylebone to Oxford service through the construction of a new south-to-west chord at Bicester connecting 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, called Oxford Parkway. Phase 2 has been combined with East West Rail Phase 1 to enable more efficient and cost-effective delivery.

**Oxford Corridor Capacity Improvements**

The Oxford corridor provides the key strategic link for passenger and freight traffic between the south coast and the WCML and the North, in addition to acting as a branch of the east – west GWML for outer Thames Valley and Cotswold Line traffic. A large proportion of passenger train arrivals at Oxford from the south terminate there, and turn back for Reading and London Paddington. The Oxford corridor also forms part of the national Strategic Freight Network.

To facilitate predicted growth in passenger and freight traffic through Oxford a package of schemes were identified in the Great Western RUS, to increase capacity and route availability, as well as to introduce higher linespeeds bringing journey time benefits.

With the proposed introduction of East West Rail and the extension of Chiltern Railways’ Marylebone services to Oxford, the infrastructure requirements at Oxford have been revised. Coupled with the City and County Council’s aspirations for wider city redevelopment, the opportunity to maximise the investment
around the Oxford station area has been jointly reviewed with a City
and Station Masterplan.

The schemes under development include:

- Bi-directional signalling between Didcot and Tackley to enable a
  more efficient maintenance regime and create additional train
  paths specifically for overnight freight trains and outer suburban
  services. These improvements to route availability fully support
  the principles of Network Access by enabling maintenance work
  to be undertaken whilst running an operational railway, and will
  bring substantial benefits to train operators as well as achieving
  internal cost efficiencies
- Additional platform capacity
- Linespeed improvements on the Up and Down passenger loops,
  achieved through a four-track section between Oxford and
  Wolvercot Junction to segregate freight and passenger traffic.

The jointly-funded Station Masterplan has identified development
potential for the station area and wider surrounds to create a more
fitting station building, facilities and environment for the city.
Combined with an improved transport interchange and aligned
with the local council’s highway proposals, the area could be
significantly transformed. The Masterplan concluded early 2015
and identified outputs which are subject to funding for further
development and implementation.

Greater Bristol Programme Capacity Improvements

To reduce journey times, increase capacity and service frequency in
and around Bristol, a programme of improvements is being
developed following their recommendation in the Great Western
RUS, to provide the infrastructure necessary to deliver the proposed
SET service level of four trains per hour between Bristol and London
Paddington, and reduce journey times from the South West into
Bristol and northwards onto Birmingham. The programme includes:

- Additional infrastructure between Dr Days Junction and Filton
  Abbey Wood
- Station and platform capacity improvements at Bristol Temple
  Meads station for both passenger and train services
- Incremental enhancements to planned junction renewals into /
  out of the station area.

A Station Masterplan for Bristol Temple Meads and the surrounding
area has been developed by Network Rail working in partnership
with the West of England Local Enterprise Partnership (LEP), Bristol
City Council, the Homes & Community Association, First Great
Western and English Heritage.

The masterplan study identifies two concept options to transform
the station area, both options propose improvements to the station
area whilst also aligning and providing linkages to the Temple
Quarter Enterprise Zone, the surrounding area and into the city. As
part of the proposals a new interchange facility and new station
entrance to the north of the station is identified, in addition to an
eastern entrance to link the proposed Arena site and former Post
Office site, with associated public realm to enhance the setting of
the station.

The progression of the outputs from the masterplan study is subject
to funding for further development and implementation.

Resignalling Programme

A major signalling renewal programme is planned for the Bristol,
Swindon and Oxford areas in advance of electrification of the
GWML. The signalling renewal will provide for the introduction of
ETCS ensuring compatibility between the systems. The proposed
introduction will supersede the existing signalling system and
eventually replace the need for conventional signalling.

The signalling renewal between Totnes and Penzance has been
approved by the industry for acceleration from CP6, with a view to
early implementation in late CP5 subject to value for money
business case and availability of funding. This would provide the
infrastructure capability to operate two passenger trains per hour
between Plymouth and Penzance. The scheme is currently being
developed and Network Rail continues to work with Cornwall
Council to achieve the successful delivery of this.

Rolling Stock Deployment

Following electrification of the GWML, the opportunity exists to
redeploy rolling stock in order to maximise the usage of electric
rolling stock and provide additional capacity. It is proposed to replace the Class 165/166 Diesel Multiple Units (DMUs) with Electric Multiple Units (EMUs) in the Thames Valley area. It is anticipated that the Class 165/166 stock will be cascaded to the West Country to support growth and provide capacity to cater for increasing demand. Route clearance for EMUs in the Thames Valley and DMUs in the west is included in the HLOS (July 2012) as an ‘illustrative option’. Development works are underway to confirm infrastructure works necessary to facilitate the redeployment of rolling stock.

**Depots and Stabling**

Development work to examine depot and rolling stock stabling requirements to support the introduction, and redeployment, of rolling stock is currently being undertaken by the rail industry and may lead to further requirements to support the rolling stock changes anticipated in CP5. This also considers the ability to operate and facilitate Empty Coaching Stock movements to stabling and maintenance locations across the route, in particular during peak periods between London Paddington and Reading where there are a number of significant changes to depot facilities with Crossrail, IEP and High Speed 2 (HS2). Locations being considered include West Ealing, Langley, Worcester, Didcot, Oxford and Exeter.

As part of the Cornwall Rail Improvement Package, a major upgrade to the Sleeper service rolling stock will be completed and enhancements made to the train maintenance depot in Penzance. The depot will have engineering facilities upgraded as well as an increase in capacity to enable the maintenance of the Sleeper service to transfer from Old Oak Common London to Penzance.

**Station Improvements**

Funding is available in CPS for the National Stations Improvement Programme (NSIP), Access for All (AFA) and Station Commercial Project Facility (SCPF). Network Rail and First Great Western, in conjunction with local authorities, are assessing priority stations.

NSIP has received £103m of funding nationally for CP5 to develop and improve stations across the rail network. The key objectives are to deliver schemes to improve the experience of the travelling public by facilitating investment and further efficiencies. The initiative also intends to optimise opportunities for leveraging in Third Party funding. For Western, there are currently 28 stations progressing through the development stage. Many of the improvements have been combined with those provided through the AFA scheme.

The Railways for All strategy (published by the Government in March 2006) describes how AFA funding will be used to improve the accessibility of stations. Feasibility studies have been undertaken to identify how access can be improved at selected stations. This process included engagement with key stakeholders to ensure that the most appropriate solution is delivered within the objectives of the AFA funding. The programme for stations within Western Route include: Chippenham, Cheltenham, Weston-super-Mare, Totnes, Torquay, Theale and Burnham.

The SCPF was developed by the DfT in partnership with Network Rail, the Association of Train Operating Companies and the ORR and is now in its second tranche. It provides a £60 million national fund for station improvements that reduces the public subsidy for rail by generating a financial return. FGW are looking to place bids at 17 stations across the route, with the schemes if successful to be completed by the end of CPS.

**St Erth Station Developments**

In collaboration with Cornwall Council and First Great Western, Network Rail are reviewing opportunities for station developments at St Erth which include a new park and ride facility, a new transport interchange, improved accessibility and enhanced station capacity to accommodate the growth in rail passengers specifically to St Ives.

**Devon Metro**

Devon County Council is developing a Devon Metro proposal to provide a cross-Exeter network of half-hourly and hourly clockface services on the Barnstaple to Exmouth and Paignton to Honiton axes with lengthened rolling stock and new infrastructure to facilitate. The proposal also includes a number of new stations at Newcourt (between Digby & Sowton and Topsham on the Exmouth line), Marsh Barton (between Exeter St Thomas and Starcross on the main line) and Edginswell (on the Torbay line). With the provision of
a further passing loop on the South West Main Line a half-hourly service could operate to Axminster. The new station at Newcourt opened in June 2015.

**Level Crossing improvements**

As part of the ongoing view to improve network capability and safety, proposals for the Level Crossing Improvement Fund have been sought. National funding has been allocated, with the route securing funding towards level crossing closures, to seek safety improvement through the elimination, control or mitigation of risk at level crossings.

Three open level crossings on the Newquay branch have been upgraded, improving safety. Where possible, subject to appropriate risk assessments, linespeed opportunities may be achievable in conjunction with safety improvements. This has been realised already at Sea Mills on the Severn Beach Line.

In other areas use of appropriate technology and innovation to deliver safety improvements is being assessed.

**Western Flood Resilience Programme**

Following the extensive disruption to train services from extreme weather in November and December 2012, Network Rail undertook a review of infrastructure resilience to geo-environmental hazards across the Western Route. The study reviewed the root causes of failure and the disruption due to each event and concluded that effective reduction of extreme weather disruption would require co-ordinated infrastructure interventions at many sites.

A range of flood resilience improvement measures were identified including:

- Enhanced drainage to the top of cutting slopes, diverting Third Party inflows
- Elevated structures to raise signalling equipment
- Track lifting in flood plains
- Track drainage enhancements where flows are carried along the railway.

The study identified flooding resilience works at nine locations and a further project to install river-level monitoring equipment. The total programme of interventions was costed at over £44m, to be delivered in prioritised stages between 2014 and 2017. In February 2014, Government authorised funding for the Western Flood Resilience Programme.

**Exeter St Davids to Newton Abbot Geo-Environmental Study**

Following extensive storm damage to the railway between Exeter and Newton Abbot, current coastal defences along this stretch of railway are vulnerable to further damage and consequent disruption. Network Rail has commissioned a study to look at options to increase the geo-environmental resilience of this route section. The study commenced in November 2014 with an expected 18 month duration.
This section outlines the proposed investment envisaged for the Western Route in Control Period 6. Some of these have a firm commitment to funding and delivery with their development and implementation spanning CP5 to CP6, whilst others form the basis of rail industry and Third Party schemes bidding for funding.

**MetroWest**

The West of England Partnerships’ proposal for a local network designated as ‘MetroWest’ provides enhanced, half-hourly clockface services on the Yate – Bristol Temple Meads – Weston-super-Mare and Cardiff – Bristol Temple Meads – Bath Spa – Westbury corridors, with lengthened rolling stock and new infrastructure to facilitate. Phase 1 of MetroWest would provide half-hourly train services between Bristol Temple Meads and Severn Beach, Bristol Temple Meads and Portishead (peak only) and between Bristol Temple Meads and Bath Spa. This would achieve a half-hourly cross-Bristol service frequency and requires infrastructure works to reinstate passenger services on the Portishead branch line. The anticipated start date for this service structure is May 2019.

Phase 2 aims to provide an hourly service on the Avonmouth freight line, upgraded to passenger status, serving new stations at North Filton and Henbury, and enhanced frequency between Weston-super-Mare and Yate. The anticipated start date for these services is December 2021. New stations are also proposed along Filton Bank, at Saltford, Ashton Gate and Corsham.

With the electrification of the GWML to Bristol, and potential extensions to the west, opportunities arise for local and regional rail services to be operated with electric trains. Electrification could bring additional value to the MetroWest scheme, and might justify a review of the possibilities. This could identify the additional elements of infill that would be required to enable a fully-electrified, cross-Bristol network of services.

**Western Rail Link to Heathrow**

There is growing demand, particularly from the business community who currently account for a third of the passenger numbers using Heathrow Airport, for improved rail access from the west. Network Rail has developed options to deliver this in partnership with Heathrow Airport Limited (HAL) and the Thames Valley Berkshire Local Enterprise Partnership (LEP).

Funding for the development of a direct western link into Heathrow Airport from the GWML was identified in the CPS HLOS (July 2012). Options have been developed identifying the most suitable corridor east of Langley to link the two and deliver a typical four trains per hour service between Heathrow Terminal 5 and Reading. Implementation is proposed for CP6.

**Bere Alston and Tavistock**

The reinstatement of infrastructure between Tavistock and Bere Alston would enable the Tamar Valley line to offer passenger services between Plymouth and Tavistock. The scheme is in development with Devon County Council, and subject to funding, could be implemented in CP6.

**Further Potential Schemes Identified by the Route Study**

The Western Route Study has been undertaken as part of the Long Term Planning Process, looking at the medium to long term strategy for the railway. Options have been identified to accommodate growth in passenger and freight demand, and increases in the number of trains which might be operated to deliver improved passenger connectivity through an indicative train service specification for the year 2043.

Schemes have been prioritised for Control Period 6 (CP6) where there is a driver to do so, using the agreed prioritisation criteria:

- To accommodate passenger and freight demand in CP6
- To deliver enhanced connectivity to High Speed 2 Phase 1
- To deliver identified funder priorities for CP6
- Schemes which reduce whole-industry costs where there is a renewal due which presents an opportunity to deliver an enhancement at reduced Whole Life Cost.

Taking these criteria into account, the following choices have been presented as proposed priorities for CP6. Further development will be required to refine requirements, to consider and refine options and costs, and to confirm the affordability and value for money represented.

Subject to the above, the Route Study has identified the following themes:

- Additional capacity would be required to accommodate peak passenger demand into the key centres of London, Bristol and
There are choices to improve connectivity during CP6 as a result of renewals anticipated on the approach to London Paddington station, at Bristol East Junction, and in the Worcester and Gloucester areas. Acceleration of resignalling to CP5 would allow early delivery of connectivity improvements in Cornwall.

- Electrification of the Birmingham – Bristol route is a stated funder priority. As part of this provision, requirements for future growth will be considered further.

Early development work is underway to develop options on the priority corridors of:
- London Paddington – Reading
- Reading – Didcot – Oxford
- Didcot – Swindon
- Exeter – Castle Cary via Yeovil.

In addition, a line of route study has commenced to review the corridor from Southampton to the West Midlands and the West Coast to assess the interventions required to deliver freight and passenger growth in CP6 and beyond, and to prioritise schemes across the respective Route Study areas (Wessex, Western, West Midlands & Chilterns).

This work will inform the next planning cycle for industry funding for CP6 which commences with the Initial Industry Plan (IIP) for CP6 anticipated to be published in September 2016.
This section describes the longer-term strategy envisaged for the Western Route. Many of the initiatives are based on evidence from the Route Utilisation Strategies, the Western Route Study and from involvement with the Local Enterprise Partnerships and Local Authorities. The strategy is also shaped by Government policies and transport objectives. Most of the proposals are uncommitted and are yet to have identified or achieved a firm funding stream.

Shorter journey times between key centres

Electrification of the GWML and the introduction of the SET on long-distance, high-speed services on the route will contribute to greatly improved journey times, increased capacity and service frequency.

The main passenger market on the GWML is between London and Bristol and to a lesser extent Cardiff, with evidence suggesting there is business demand for shorter journey times between the key centres.

By exploiting the potential speed capability of the SET above 125mph, further journey time reductions might be achieved following the introduction of in-cab signalling. A review of linespeed opportunities on the main lines between London Paddington and Bristol Parkway has identified the requirements for 140mph capability. Opportunities for linespeed improvements between London Paddington and Bristol Parkway will be assessed in line with future infrastructure interventions to accommodate predicted growth and, where possible, aligned with the rolling programme of electrification and signalling enhancements.

Additional opportunities to reduce overall journey times may also exist as part of capacity interventions such as those presented below. For example, higher speeds could be achieved by additional infrastructure to improve segregation of high-speed passenger and other, slower-moving, traffic.

Journey Time Improvement Programme

The Western Route Journey Time Improvement (JTI) Programme is reviewing opportunities to reduce journey times either via a change in calling patterns, rolling stock and/or linespeed improvements. The Western Route has been assessed on a corridor basis and opportunities for each corridor identified for potential journey time benefits. This has been undertaken using a combination of different early development methods, depending on context. Typically these include:

- Route Runner: an Excel spreadsheet tool which calculates journey times based on rolling stock performance characteristics and calling patterns and identifies the target line speed increases and the potential benefits available
- Third Way Analysis: Desktop review of track geometry to identify the scale of intervention required (or possible) to achieve line speed increases
- Timetable Analysis: Analysis of the benefits which can be realised within the timetable structure or the improvements possible through changes in calling patterns.

The outputs of the programme will be assessed for implementation and funding streams in CP5, CP6 and the longer term and where possible aligned with renewals or other enhancements. Current corridors under review include the Cornish Main Line, branch lines around Devon and Cornwall and the route between Reading and Exeter via Newbury and Westbury. Further areas include Bristol to Birmingham and the North and South Cotswolds.

In collaboration with CrossCountry Trains, Network Rail is developing a package of schemes that could significantly improve journey times on the core cross-country corridor between Plymouth and Birmingham and on to the North and Scotland. By improving linespeeds at key sections across the route between Plymouth, Taunton and Bristol Temple Meads, Bristol Temple Meads and Bristol Parkway, and Westerleigh Junction and Barnt Green, journey times might be significantly reduced.

Improved capacity on key corridors

Accommodating peak demand through rolling stock solutions

The Western Route Study has examined opportunities to accommodate forecast demand using train lengthening as a means to provide additional on-train capacity, as an alternative to new or modified infrastructure. This builds on the emerging strategy to redeploy rolling stock following the introduction of new vehicles for the major programmes such as Thameslink, Crossrail and IEP.

The electrification of the GWML during CP5 provides the opportunity for the introduction of electric trains on outer suburban services between Oxford/Newbury and London Paddington to provide a significant increase in seating capacity.

During CP5, it is expected that demand will be accommodated...
through the introduction of frequent, high-capacity, high-performance EMU trains into the Thames Valley to meet forecast increases in demand by maximising the use of available line capacity. During CP6 further lengthening of services to Newbury and Oxford would be required.

On longer-distance services, it is expected that demand will be accommodated through the additional capacity provided by the longer, more frequent SET service structure during CP5. In the longer term, it is likely that additional peak capacity during CP6 will be required; this could be accommodated through additional trains from Swindon, thus relieving capacity on the longer distance trains from Bristol, South Wales and the South Cotswolds. Alternative solutions might include lengthening of SETs, increasing the number of seats provided, and/or additional calls in long distance services.

Train lengthening would require infrastructure alterations in some locations, e.g. platform lengthening or changes to signalling.

**Alternative solutions to efficiently deliver passenger demand**

As part of the Network RUS, a strategy has been developed which presents alternative solutions to carrying the future demand for rail passengers more cost effectively. The scope of the strategy includes a study which assesses the potential use of tram-train and light rail type rolling stock, discontinuous electrification and energy storage as potential solutions to reduce the costs to Community Rail and peripheral routes. This is particularly relevant for journeys on the local networks in Devon and Cornwall where business justifications for heavy rail interventions can be difficult. The study was established in July 2013.

**Improved connectivity**

**High Speed Two (HS2)**

The proposed HS2 high-speed line would run from London Euston via a new station at Old Oak Common in west London to Birmingham, and on to Manchester and Leeds. This would have a major impact on travel patterns on the Western Route. The proposed Old Oak Common complex includes a new eight-platform station on the GWML and potentially offers greater connectivity opportunities to the WCML via a proposed link line, the West and North London Lines and to Crossrail for central London and London Heathrow Airport. HS2 Phase 1 is anticipated to be operational by 2026.

**Improving connectivity through further infrastructure interventions**

To improve connectivity (as well as to accommodate peak demand, see above) into London, additional train services will be required. These additional train services would further challenge the capacity of the mainly four track layout, and further infrastructure interventions such as grade separated junctions and additional tracks may be required on the approach to London Paddington.

The significant benefits achieved through the provision of a station at Old Oak Common on the HS2 route will alter requirements for the London Paddington to Old Oak Common corridor. The infrastructure for this corridor is being reviewed in line with these altered requirements, renewal plans for CP6, and the changes already planned to support Crossrail and IEP, to identify options for meeting the changing context whilst taking account of growth forecast.

With future resignalling (either through conventional renewals or in-cab signalling) proposed for the GWML, opportunities exist to improve headways where existing headways currently constrain capacity and provide operational constraints.

Studies are underway to determine whether there is a case for further infrastructure interventions, taking forward the outputs presented in the Western Route Study.

**Local and regional networks and branch lines**

In conjunction with the benefits delivered by long-distance, high-speed services, it is important that local networks are developed to improve journey opportunities for employment and leisure activities, and improve connectivity into longer distance higher speed services.

Working with Third Parties, Network Rail will evaluate the demand for local stations on certain regional routes and cross-city networks, such as Bristol and Exeter, and the additional infrastructure required to deliver them. Train lengthening will also be required to accommodate forecast demand.
Plymouth and Cornwall

Revisions to branch line operations will continue to be reviewed for improved connectivity, service frequency and journey times in line with other developments that may be taking place, specifically with the Community Rail Partnerships and council-funded schemes.

Following catastrophic destruction of the Dawlish Sea Wall due to abnormal weather conditions in early February 2014, Network Rail undertook an appraisal of options for a more sustainable rail route to support the restored Dawlish coastal route in maintaining connectivity for the south west peninsula in the event that the Dawlish coastal route is not available. Loss of the route without a viable alternative has severe implications for both local and national economies, and mobility and connectivity across the region. The West of Exeter Route Reliance Study was published in July 2014 and provides a number of options for the provision of improved connectivity across Devon.

Digital Railway

The Digital Railway is a rail industry-wide programme designed to benefit Great Britain’s economy by accelerating the digital enablement of the railway.

The scope of the Digital Railway vision is to be defined during CP5. The business case framework will be aligned to the LTPP and supported by the Department of Transport. The real challenge facing the industry is to reach consensus on the elements of the vision that can be accelerated, to build a plan for how this can be realised, and to build the business case for Government to invest in achieving that vision. This will need to consider the operational processes and people related changes as well as technological acceleration.

The Digital Railway programme is setting out to build the industry business case to accelerate the digital enablement in several key areas of the railway, namely:

- **Train operation** – transforming the rolling stock landscape, tariffs, journey sale and settlement, and potentially even the franchise operating model. This is the ‘Digital Train Operator’
- **Capacity allocation** – long-term network planning through to sale of access to capacity in real-time. This is the ‘Digital System Operator’
- **Passenger** – simplifying journeys, from planning, purchase to on-the-day travel. This is the ‘Digital Passenger’
- **Infrastructure** – digital assets, digital workforce and digital operations, shown in this picture as the ‘Digital Asset Manager’
- **Stations and Interchanges** – retail and transport hubs with key interconnects to other modes of transport including driverless electric cars. This is the ‘Digital Station’.

In most areas, work to develop technical capability is already underway. The programme will seek to determine what is required to align and accelerate different initiatives to bring them into a single roadmap underwritten by the whole industry. The output of the programme will be a business case to Government, presented through the IIP in September 2016.

European Rail Traffic Management System

European Rail Traffic Management System (ERTMS) is an in-cab signalling and train control system which combines ETCS and Global System for Mobile communications – Railways (GSM-R). The key characteristics of ERTMS are that it ensures trains operate within safe limits and speeds at all times, and in-cab signalling provides safe movement authority directly and continuously to the driver through the driver’s desk display.

The introduction of the system will be a key enabler in the development of the future railway. It will underpin enhancements to railway operations beginning in CP6. ERTMS will become the long-term standard for resignalling schemes and aligned with proposals for the Digital Railway.

Southern Rail Access to Heathrow

London Heathrow Airport is currently directly served by the London Underground and heavy rail services which currently include fast airport services and local stopping services. Committed schemes like Crossrail will significantly improve connectivity and journey times to locations across London and the South East.

It has long been recognised, however, that a significant proportion...
of Heathrow Airport demand comes from the South where passengers are likely to access the airport by road, which is partly due to the non-competitive journey times available by rail. Improved rail links from the South are therefore seen as important in improving connectivity, journey time and overall passenger experience whilst creating modal shift away from car travel.

The study is being carried out by Network Rail, who will deliver its findings to the DfT during 2015.

**Expanding the electrified railway**

In the July 2012 HLOS, the DfT indicated that it wished the industry to develop a ‘rolling programme’ of electrification to provide capability for electric traction on a significant proportion of the national rail network. Expansion of the electrified network would reduce rail industry costs and cut carbon emissions through the creation of electrified routes to link the core centres of population and economic activity. Electrification could also provide additional benefits including gauge clearance for large containers and better journey times for passenger and freight trains.

Network Rail, on behalf of the rail industry, will publish a ‘refreshed’ Route Utilisation Strategy for Electrification, to outline potential priorities for future electrification following completion of the programme currently underway. The strategy will prioritise routes for further development based primarily on the density of diesel-operated traffic that could be converted to electric operation through the provision of electrification. It will also consider options that may be worthy of further investigation in light of other factors. These include, for example, whether an option would allow more efficient usage of the existing electrified network by reducing diesel running on electrified sections of the route; providing a diversionary route; identifying synergies with rolling stock replacement; or other enhancement schemes. For the routes selected for further development cost estimates will be produced and full business case appraisals conducted in a manner consistent with funders’ guidelines.

The RUS will examine in detail the passenger electrification options most likely to offer the highest value for money following the completion of the current portfolio of schemes. The business cases will be based on current understanding of the services that would be required to meet CP5 growth projections. Over the timescale of the RUS, the strength of the case for further electrification will continue to evolve as the industry progresses through a rolling programme that adapts to technological developments and changes in demand. Similarly the inclusion of other factors (for example the wider economic benefits considered by the Northern Electrification Task Force) could suggest a different prioritisation than that presented in the RUS.
Western Capability maps

Linespeed

- 0-35 mph
- 40-75 mph
- 80-105 mph
- 110-125 mph
Western
Capability maps

Route availability

Network Rail - Network Specification: Western

March 2016

NEWBURY
READING
OXFORD
DIDCOT PARKWAY
SWINDON
GLOUCESTER
WORCESTER FOREGATE STREET
BRISTOL TEMPLE MEADS
EXETER ST DAVIDS
PLYMOUTH
PENZANCE
TRURO
LONDON PADDINGTON
 Plymouth

RA 1-6
RA 7-9
RA 10
Western Capability maps

Gauge

- W6
- W7
- W8
- W9
- W10
- W10 but not W9

Stations:
- NEWBURY
- READING
- LONDON Paddington
- GLoucester
- Bristol Temple Meads
- SWindon
- Didcot Parkway
- Exeter St Davids
- Plymouth
- Worcester Foregate Street
- Truro
- Penzance
- Plymouth
Western Capability maps

Current Electrification
Western Capability maps

Future Electrification (2019)
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<td>K.12</td>
<td>Falmouth Docks branch</td>
</tr>
<tr>
<td>K.13</td>
<td>Newquay branch</td>
</tr>
<tr>
<td>K.14</td>
<td>Gunnislake branch</td>
</tr>
<tr>
<td>K.15</td>
<td>Swindon – Bristol Temple Meads (via Bath)</td>
</tr>
<tr>
<td>K.16</td>
<td>Bristol – Birmingham Line</td>
</tr>
<tr>
<td>K.17</td>
<td>Weston-super-Mare Loop</td>
</tr>
<tr>
<td>K.18</td>
<td>Severn Beach branch</td>
</tr>
<tr>
<td>K.98</td>
<td>Freight trunk routes</td>
</tr>
<tr>
<td>K.99</td>
<td>Other freight lines</td>
</tr>
</tbody>
</table>

## Interface with other Routes

**London North Western Route**

<table>
<thead>
<tr>
<th>Strategic Route Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.15</td>
<td>Bicester Town Branch</td>
</tr>
<tr>
<td>M.09</td>
<td>Barnt Green – Stoke Works Junction</td>
</tr>
<tr>
<td>M.11</td>
<td>Oxford – Coventry South</td>
</tr>
<tr>
<td>M.15</td>
<td>Stourbridge Junction – Hereford</td>
</tr>
</tbody>
</table>

**Wales**

<table>
<thead>
<tr>
<th>Strategic Route Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.02</td>
<td>Gloucester – Border (nr Chepstow)</td>
</tr>
</tbody>
</table>

**Wessex**

<table>
<thead>
<tr>
<th>Strategic Route Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.09</td>
<td>Reading – Basingstoke</td>
</tr>
<tr>
<td>K.05</td>
<td>Castle Cary – Dorchester</td>
</tr>
</tbody>
</table>