

*Delivering a better railway
for a better Britain
Network Specification 2018
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 consists of:

- Scenarios and Long Distance Forecasts - 2009
- Electrification - 2009
- Stations - 2011
- Passenger Rolling Stock - 2011
- Passenger Rolling Stock Depots Planning Guidance - 2011
- Alternative Solutions for Delivering Passenger Demand Efficiently - June 2013

In 2012, in line with its licence obligation to establish and maintain RUSs, Network Rail, in agreement with the Office of Rail Regulation (ORR), introduced a Long Term Planning Process (LTPP) which takes into account the changing industry context and looking ahead between 10 and 30 years. In November 2013, the LTPP produced four Market Studies:

- Long Distance
- Regional Urban
- London & South East, and
- Freight

The Route Studies provide choices for funders, and are a key part of the evidence base for enhancement planning beyond 2019.

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 up to 2043.

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 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 in August 2015.

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.

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 Southampton and the Midlands, the North West and Scotland via the West Coast Main Line (WCML). Automotive flows are also prevalent on this corridor.

Flows run from the North West, Midlands and Oxford to Southampton and Purfleet for export. A degree of defence traffic and construction materials traffic also exists.

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 Bart 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

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

Reading to Penzance

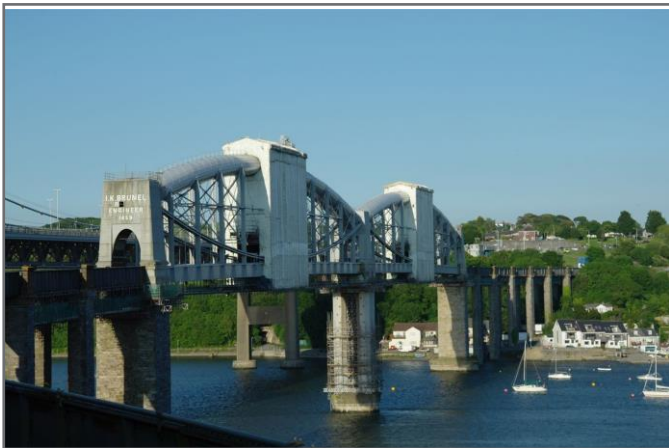
This main line route diverges from the GWML at Reading towards the South West through Newbury and Westbury on to Taunton, where it converges with the main line route from Bristol and north thereof. The route continues across the south-western peninsula, connecting significant towns and the cities of 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, but is temporarily out of use. 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.



The Royal Albert Bridge connecting Devon and Cornwall

Key passenger markets and traffic flows

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 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.

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 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 Regional Urban Market Study (October 2013) predicts up to 111 per cent growth into Bristol between 2012 and 2043.



Passengers at Windsor & Eton Central station

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 local 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.

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). A Freight Market Study was published in April 207 to draw together the strategic freight recommendations from individual route studies and takes account of earlier published forecasts, with recent market developments

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



Freight terminal at South Liberty Lane, Bristol.

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.

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.

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.

Infrastructure investment in Control Period 5 (2014 – 2019)

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 three priorities –

- 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 and 2tph to Reading in the off-peak and 4tph in the peak. Construction works will be ongoing until 2018 when the initial service becomes operational. Full service operation will commence in December 2019.

Great Western Route Modernisation Programme

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.

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 IET 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:

- An additional platform at Bristol Parkway
- Additional infrastructure between Dr Days Junction and Filton Abbey Wood

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. The Class 165/166 Diesel Multiple Units (DMUs) will be replaced with Electric Multiple Units (EMUs) in the Thames Valley area, with the Class 165/166 stock cascaded to the West Country to support growth and provide capacity to cater for increasing demand.

Depots and Stabling

The depot and stabling requirements to support the introduction and redeployment, of rolling stock considers the ability to operate and facilitate Empty Coaching Stock movements to stabling and maintenance locations across the route. Particular attention has been given to 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). Schemes taken forward include; West Ealing and Maidenhead stabling facilities and North Pole, Stoke Gifford and Exeter depots.



Visualisation of an Intercity Express Train

South West Rail Resilience Programme

The line of route through the South West, particularly the open coast section between Dawlish Warren and Teignmouth, has a long history of failures. In 2014 the sea wall at Dawlish failed and track was left hanging following extensive washout and the cliffs between Parsons Tunnel and Teignmouth dramatically slipped onto the railway line. Both required extensive emergency remediation works that saw the railway line closed for 8 weeks following the storm at a cost of £50 million.

The railway line is the only rail link to the South West and provides essential connectivity to Exeter, Bristol and London as well as links to local coastal communities and following the 2014 storms it was clear that the business needed to take a long term holistic approach to dealing with the resilience of the line in order for it to be sustainable for future generations. A study was completed and recommended a programme of interventions along the route.

The current development phase has focussed on three key areas deemed highest risk. These are:

- Design a new sea wall at Dawlish
- Cliff stabilisation and rock fall shelters at tunnel portals
- Develop options between Parsons Tunnel and Teignmouth: both of which will be subject to Transport and General Works Act Order (TWAO)

Traffic Management

A 1-year trial of the Luminata Traffic Management System is running from June 2018 – June 2019. This will manage and monitor the flow of trains, identifying conflicts, allowing plans to be changed, and so will more effectively reduce delays and the impact to passengers.

The system takes into account the different types of trains and services operating across the network, forecasting their forward journey and highlighting any potential conflicts or delay. When disruption occurs, traffic management enables real-time re-planning to happen quickly so that train services can get back to normal as fast as possible, minimising delays.

St Erth Station Developments

In collaboration with Cornwall Council and Great Western Railway, Network Rail are progressing 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, due for completion in 2019.

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 includes a number of new stations at Newcourt (between Digby & Sowton and Topsham on the Exmouth line), opened in June 2015, 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.

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.

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



Newcourt station

Station Improvements

Funding is available in CP5 for the National Stations Improvement Programme (NSIP), Access for All (AfA) and Station Commercial Project Facility (SCPF). Network Rail and Great Western Railway, 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.

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. Stations on Western Route to be upgraded during the remainder of CP5 include: Burnham, Totnes, Torquay, whilst improvements at Cheltenham, Weston-super-Mare and Theale have been deferred to CP6.

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. Great Western Railway are looking to place bids at 17 stations across the route, with the schemes if successful to be completed by the end of CP5.

Proposed Infrastructure investment – Future Enhancements Pipeline

This section outlines the proposed requirements envisaged for the Western Route that will inform the Future Enhancements Pipeline, which will secure funding through the Investment Decision Framework. Some of these have a firm commitment to funding and delivery with their development and implementation spanning multiple Control Periods, whilst others form the basis of rail industry and Third-Party schemes bidding for funding.

Future Enhancements Planning

From 2019/20 onwards, the Government has set out a new approach to the funding of rail enhancements, creating a rolling programme of investment focused on the delivery of programme outcomes rather than individual interventions, replacing the previous fixed control period approach to funding enhancements. Funding for enhancements will be released on a three-stage business case process under the Investment Decision Framework implemented between Network Rail and DfT: decision to develop; decision to design; decision to deliver. This programme of investment will be published as the Rail Network Enhancements Pipeline (RNEP)

The schemes that are proposed for the RNEP for Western Route are categorised as follows;

- Hendy Review Deferral (2015) – As part of Sir Peter Hendy's review into Network Rail's Enhancements Portfolio in 2015, the delivery of certain schemes was deferred beyond 2019.
- Additional Deferrals (2016) – Network Rail's Enhancements Portfolio was further reviewed in November 2016 and the decision to defer further schemes beyond 2019 was taken by Government.
- New Choices for Funders – the Western Route Study (2015) was undertaken as part of the Long Term Planning Process, looking at the long and medium-term strategy for the railway. Options have been identified as choices for funders 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.
- Other – Schemes that have been identified to either maximise the benefits of the schemes above or to provide capacity and resilience over and above that provided by the schemes above, in order to respond to anticipated requirements.

As part of the Future Enhancement Planning process, the portfolio of schemes have been prioritised and grouped into eight programmes which focus on delivering outputs and outcomes for customers:

- London Paddington to Reading Capacity Improvement Programme
- Greater Bristol Area Programme
- Oxfordshire Corridor Improvement Programme
- Economic Growth to the South West Peninsula Programme
- South West Rail Resilience Programme
- Western Route Resilience Programme
- Western Route Passenger Accessibility Programme
- London Heathrow Airport Connectivity Programme

These eight programmes are envisaged to deliver increase capacity, capability, connectivity and resilience on the Western Route, including:

- Additional capacity to accommodate peak passenger demand into the key centres of London, Heathrow Airport, Oxford, Bristol and Exeter.
- Improved connectivity as a result of renewals anticipated on the approach to London Paddington station, at Bristol East Junction, and in the Worcester and Gloucester areas.
- Enhanced resilience between Exeter and Newton Abbot.
- Enabling economic growth to the South West Peninsula through targeted investment to increase capacity and resilience on the Peninsula.
- Enhanced resilience and continuity of services during periods of adverse weather conditions, through investments including minimising the impact of power and distribution failures on the operations of the mainline.

- Improving the accessible system for passengers on Western Route through platform extensions and improved accessibility into and through stations.
- Improved connectivity into Heathrow Airport through the provision of a Western Rail Link to Heathrow.

In addition to and alongside the schemes included in the Future Enhancements Planning process, there are also Nationally Significant Infrastructure Projects and third-party funded schemes in development for delivery post-2019, subject to funding. These are as follows:

Nationally Significant Infrastructure Projects

Western Rail Link to Heathrow

Funding for the development of a direct western link into Heathrow Airport from the GWML was identified in the CP5 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, with a currently anticipated entry into service date of 2027.

Third-Party led

HS2 and Old Oak Common

The 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 will 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 and the proposed Old Oak Common complex are anticipated to be operational by 2026.

MetroWest

The West of England Combined Authority (WECA) scheme for a local network designated as 'MetroWest' provides enhanced, half-hourly clockface services on the Yate – Bristol Temple Meads – Weston-super-Mare and Bristol Temple Meads – Bath Spa 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, with hourly services between Portishead and Bristol Temple Meads 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 2021.

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 July 2021. New stations are also proposed along Filton Bank, at Ashton Gate and Corsham.

East West Rail

The East West Rail project seeks to introduce direct passenger services from Oxford and Aylesbury to Bletchley and Milton Keynes Central by 2024. A committed scheme within the July 2012 HLOS, the primary objective of East West Rail's 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. Options are being assessed for direct passenger services between Reading/Oxford and Milton Keynes Central via Bletchley and regular long distance freight services.

This section describes the longer-term strategy envisaged for the Western Route. Many of the initiatives are based on evidence from the Western Route Study and from involvement with local stakeholders. 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. Where applicable, these will evolve to input into the Future Enhancements Pipeline.

The railway system drives economic growth. It transports people to and from work, education and social activities and it carries goods to markets, connecting businesses. Many parts of the network are at or approaching capacity at certain times of the day. Over the longer term we expect this demand for rail to continue to grow, so capacity is a valuable commodity. Getting the best use of track, train and station capacity today, and expanding the capacity of the system in an affordable and value for money way is a key challenge for the whole industry. Growing our capacity is paramount to supporting growth in jobs, housing and economic growth.

Capacity is at the heart of everything we do; our activities span the breadth of railway planning in terms of time horizons - what the railway could look like in 30 years and the full spectrum of system opportunities to deliver more capacity including better timetables, longer and more trains, new technology and, where necessary, new infrastructure. This strategy considers such requirements within a 30-year context currently up to 2043.

Passenger growth continues to outstrip forecast growth across the route with the railway being a significant driver of economic growth. In order to keep pace with this level of growth we will explore new ways of funding and delivering capacity enhancements on the railway, working with local communities to align and present joint strategies for how rail can deliver such growth and improvements in capacity, capability and connectivity. Priority areas for capacity improvements, and forecast growth, continue to be into key centres such as London and Reading and also Bristol, Oxford and Exeter.

Our future plan provides the services and support to build on CP5 investment and the benefits this can bring whilst reviewing opportunities to deliver more new services, greater capacity with improved journey times and connectivity through prioritisation of requirements from 2019 and beyond.

We will work with Government, funders and stakeholders to develop longer term strategies for the network utilising our new approach to long term planning 'Continuous Modular Strategic Plans', and provide advice to funders on investment priorities through development of a future enhancement pipeline. This pipeline will present recommended interventions as choices to

funders on a short (5 years), medium (10 years) and long term (30 year) basis which could address key capacity challenges of the system. The plans will also feed refranchising, capacity allocation and access rights

To meet the capacity challenge, infrastructure and technology interventions such as Digital Railway are under development to enhance the capacity and performance of the Western route. Opportunities to attract parties new to the rail industry to contribute funding to this portfolio of investment options will be actively explored.

Shorter journey times between key centres

Electrification of the GWML and the introduction of the IETs on long-distance, high-speed services and EMUs on more local, commuting 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 IETs 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 digital interventions to accommodate predicted growth and provide faster journeys.

Additional opportunities to reduce overall journey times may also exist as part of capacity interventions such as those presented below, or when aligned with planned renewals. 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 considers opportunities to reduce journey times via a change in calling patterns, rolling stock and/or linespeed improvements, where possible aligned with future renewals.

The Western Route has assessed on a corridor basis, opportunities 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 the longer term and where possible aligned with renewals or other enhancements. Corridors reviewed 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 lines.

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 additional train services which may require 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 for the introduction of electric trains on outer suburban services between Didcot/Newbury and London Paddington to provide a significant increase in seating capacity.

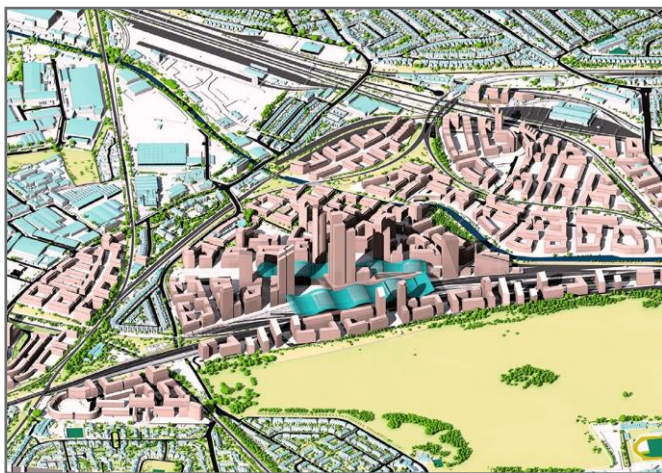
During CP5, it is expected that demand will be accommodated through the introduction of frequent, high-capacity, high-performance EMU trains into the Thames Valley to meet forecast increases in demand by maximising the use of available line capacity. During CP6 further lengthening of services to Newbury 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 IET service structure. In the longer term, it is likely that additional peak capacity will be required during CP6; this could be accommodated through additional trains from Swindon to London, thus relieving capacity on the longer distance trains from Bristol, South Wales and the South Cotswolds. Alternative solutions might include 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.



HS2 proposed Old Oak Common design. Image courtesy of HS2 Ltd.

Improving capacity through timetabling and innovations

To enable the benefits of capacity improvements to be realised in the timetable, Network Rail fulfils an important role as System Operator by working with the industry to achieve robust, deliverable timetables which can deliver those benefits. Integration of service changes in long-distance services between London, Bristol, South Wales and the South West, the addition of the full Elizabeth Line services alongside the potential introduction of additional third-party funded local service initiatives, such as MetroWest and Brentford, will be the initial focus for the route's strategy. This will be followed by the integration of East West Rail, Western Rail Link to Heathrow and HS2 at Old Oak Common (subject to funding).

The System Operator plans the railway cohesively as a network considering the wider socio-economic impacts of investment decisions, and allocating access through a network-wide timetabling process. The ongoing changes to the timetable, with the implementation of programmes such as Crossrail, bind routes together more than ever. The full introduction of Elizabeth line services from Reading to Shenfield will drive huge increases in capacity, connectivity and journey time improvements with 24 trains per hour.

After that HS2 will follow, reinforcing the 'network' nature of the railway. As the network gets busier enabling the delivery of additional capacity will require collaborative and innovative ways of allocating capacity on the network. Increasingly we will need to make more judgements on the trade-off between more trains, better journey times and system performance, as well as local needs. We are embedding a customer-focussed approach to major timetable change events through Event Steering Groups which maintains focus on the benefits sought by funders.

The System Operator Strategic Business Plan proposes a number of initiatives to deliver capacity and timetabling improvements predominantly stemming from better end-to-end planning. The strategy draws upon the System Operator operating model and incorporates identification of timetable impacts much sooner in the strategic planning and early development process. This will be supported by a proposed new organisational structure within Capacity Planning to provide resource to better assist with the development of future timetables, fulfil timetable activities and achievement of benefit realisation.

Whole System Modelling provides the toolset to support that process by improving the quality of information available at each decision point and providing a forward view of configuration states, assumptions and whole system dependencies. These decisions can be used to inform future franchise specifications and future enhancement interventions. The aim of which is to prevent such decisions being made too late in the process, as can happen now, in the timetable production phase.

We have also introduced a dedicated capacity analysis team seeking to identify capacity opportunities within the timetable ("Capacity Hunters").

Improved connectivity

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.

There are significant benefits to be achieved through the provision of a station at Old Oak Common however this 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 IET, to identify options for meeting the changing context whilst taking account of forecast growth.

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.

Most recently, work has been assessing opportunities between Exeter and Barnstaple jointly with Great Western Railways. The main output which seems most achievable is to raise the linespeed between Umberleigh and Chapelton.

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 being defined. 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.

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. Improve 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.



Signalling workstation

Strategic Route Section Index

J.01	London Paddington – Heathrow Airport Junction
J.02	Heathrow Airport Junction – Reading
J.03	Reading – Didcot
J.04	Didcot – Network Rail Border with Wales Route (nr Pilning)
J.05	Reading – Newbury
J.06	Newbury – Cogload Junction
J.07	Didcot – Oxford
J.08	Greenford Lines
J.10	Swindon – Standish Junction
J.11	Cotswolds Line
J.12	Henley-on-Thames branch
J.13	Marlow branch
J.14	Windsor & Eton branch
J.16	Heathrow Airport
J.98	Freight trunk routes
J.99	Other freight lines

K.01	Bristol Temple Meads – Exeter St Davids
K.02	Exeter St Davids – Plymouth
K.03	Plymouth – Penzance
K.04	Salisbury – Bathampton / Tlingley Junction
K.06	Exeter – Exmouth Junction
K.07	Paignton branch
K.08	Barnstaple branch
K.09	St Ives branch
K.10	Looe branch
K.11	Exmouth branch
K.12	Falmouth Docks branch
K.13	Newquay branch
K.14	Gunnislake branch
K.15	Swindon – Bristol Temple Meads (via Bath)
K.16	Bristol – Birmingham Line
K.17	Weston-super-Mare Loop
K.18	Severn Beach branch
K.98	Freight trunk routes
K.99	Other freight lines

Interface with other Routes

London North Western Route

J.15	Bicester Town Branch
M.09	Barnt Green – Stoke Works Junction
M.11	Oxford – Coventry South
M.15	Stourbridge Junction – Hereford

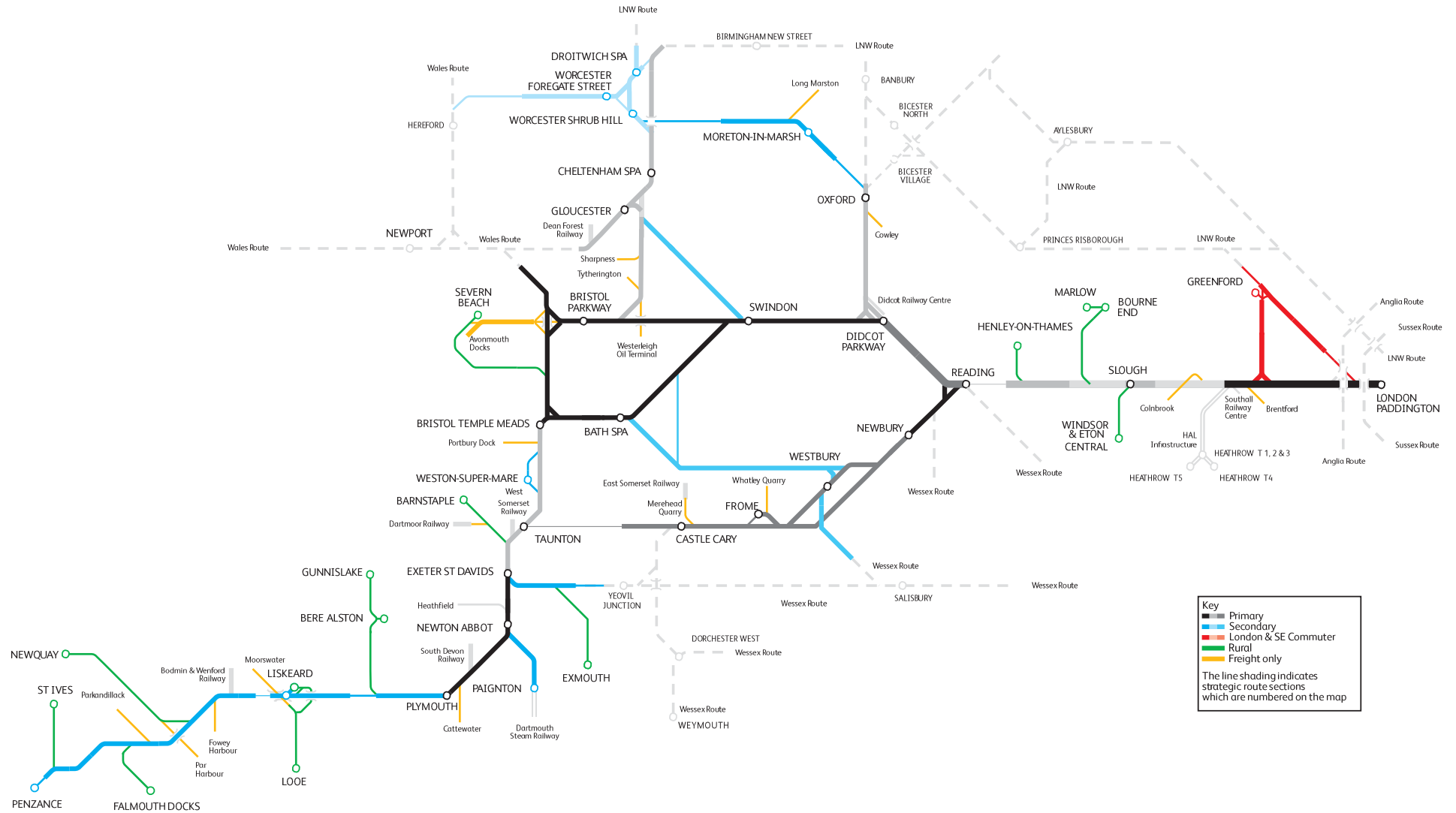
Wales

L.02	Gloucester – Border (nr Chepstow)
------	-----------------------------------

Wessex

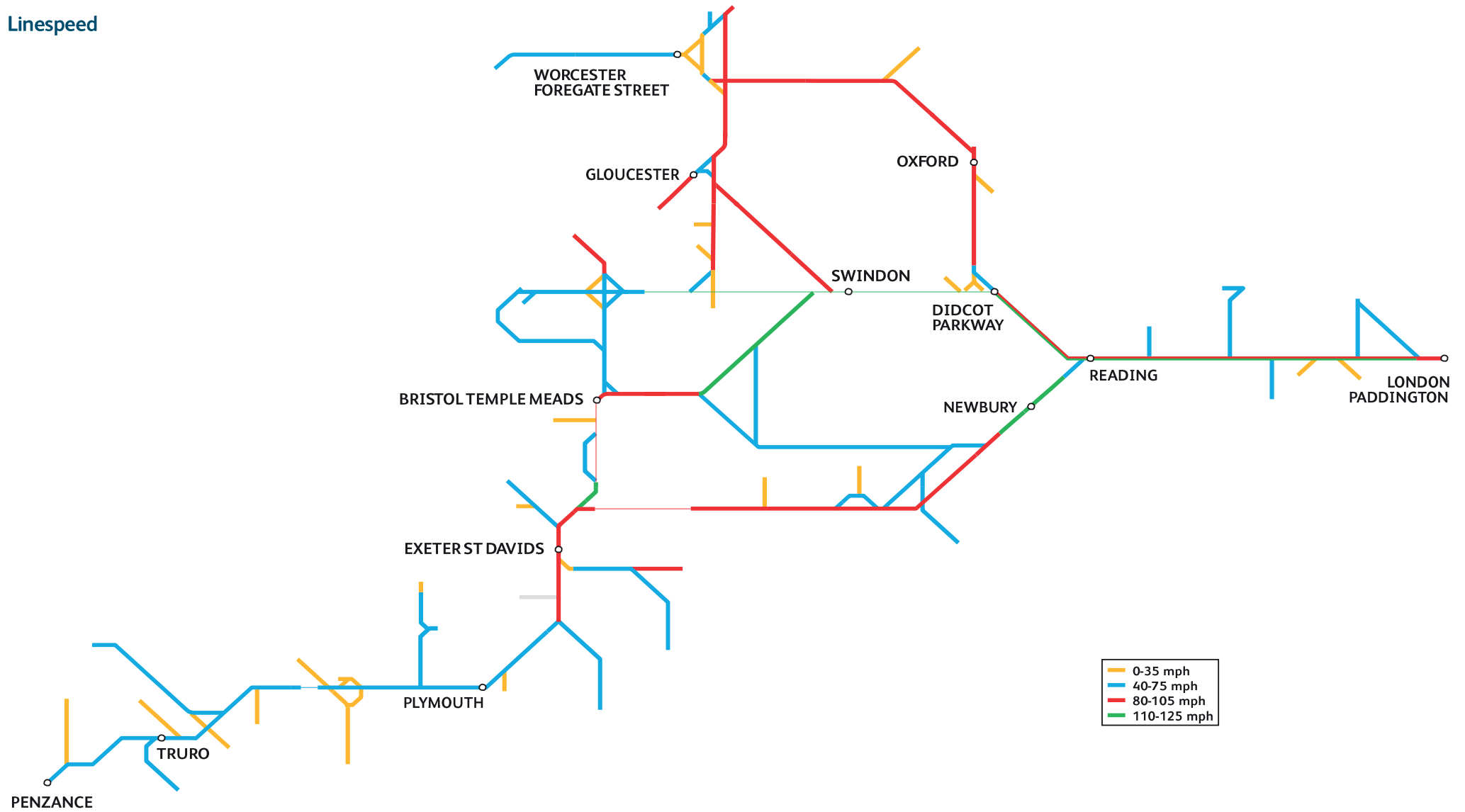
J.09	Reading – Basingstoke
K.05	Castle Cary – Dorchester

Western Route map



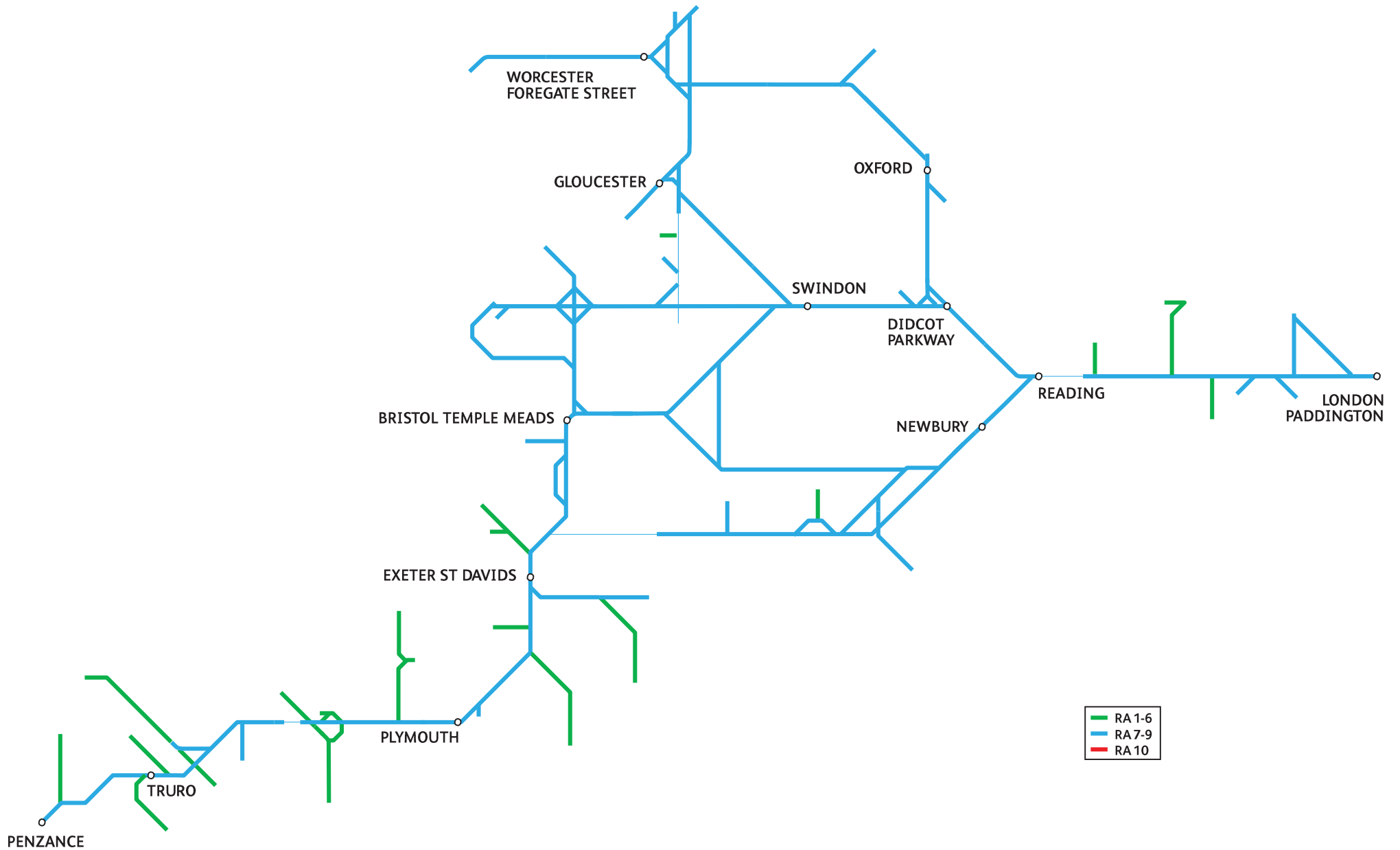
Western Capability maps

Linespeed



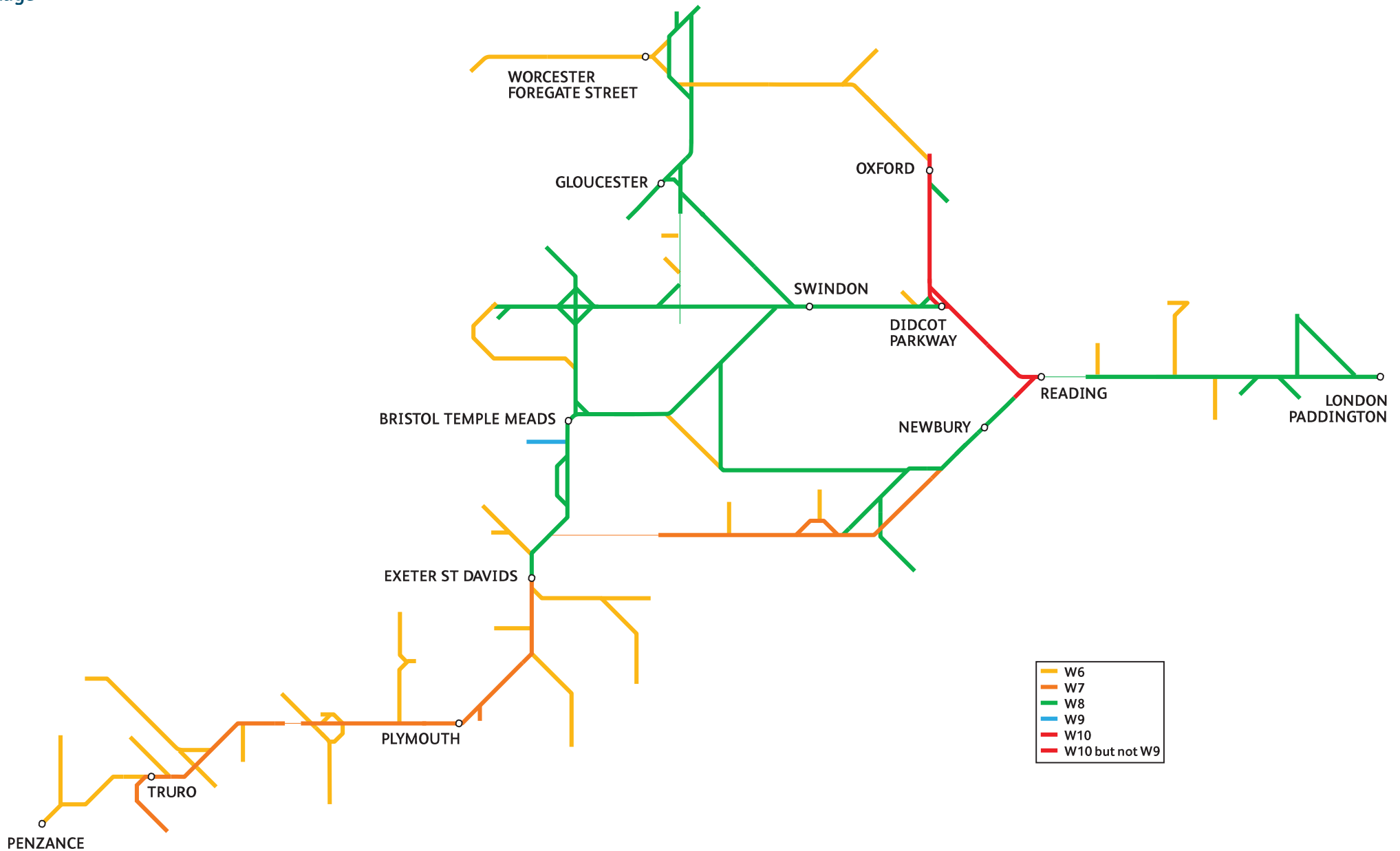
Western Capability maps

Route availability



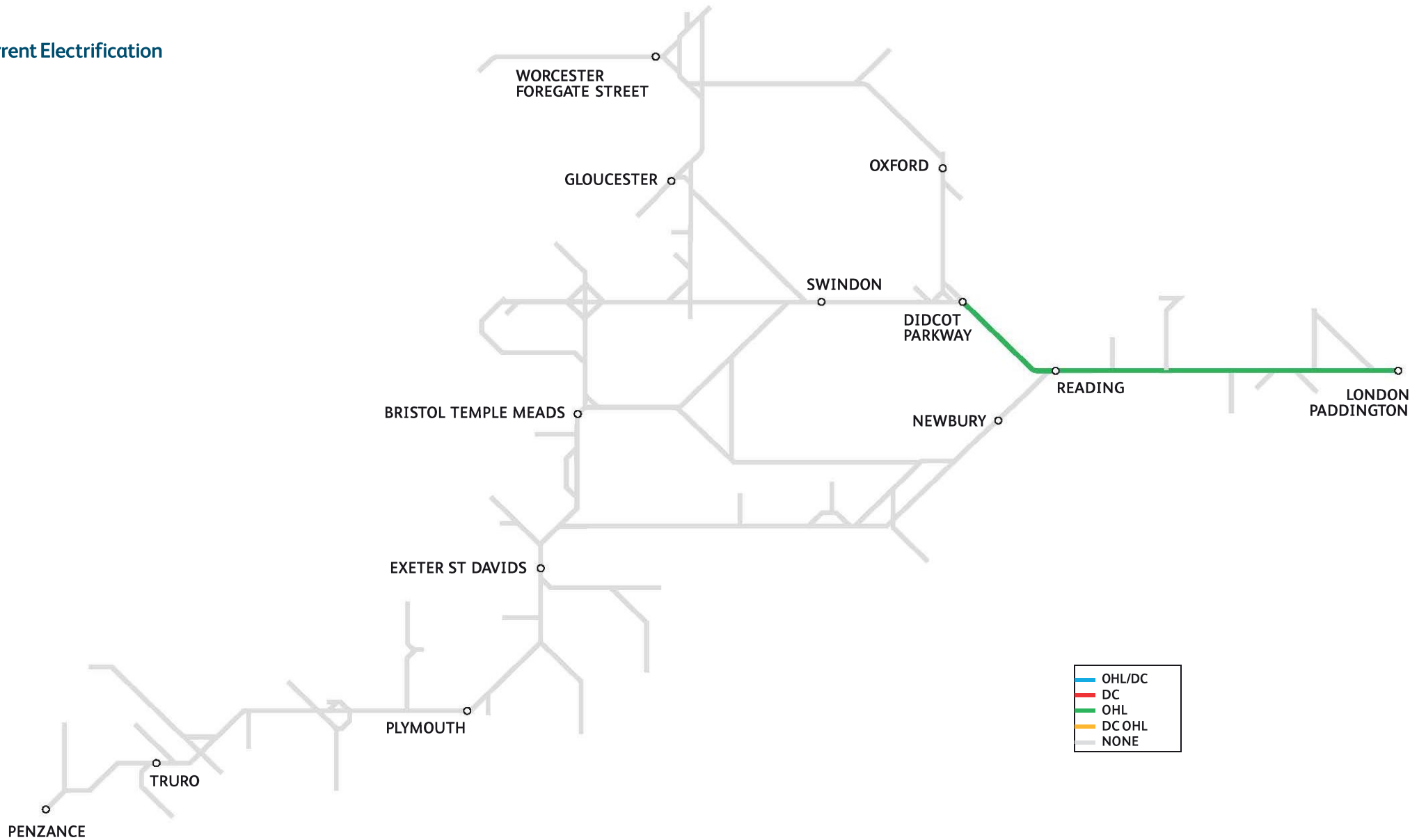
Western Capability maps

Gauge



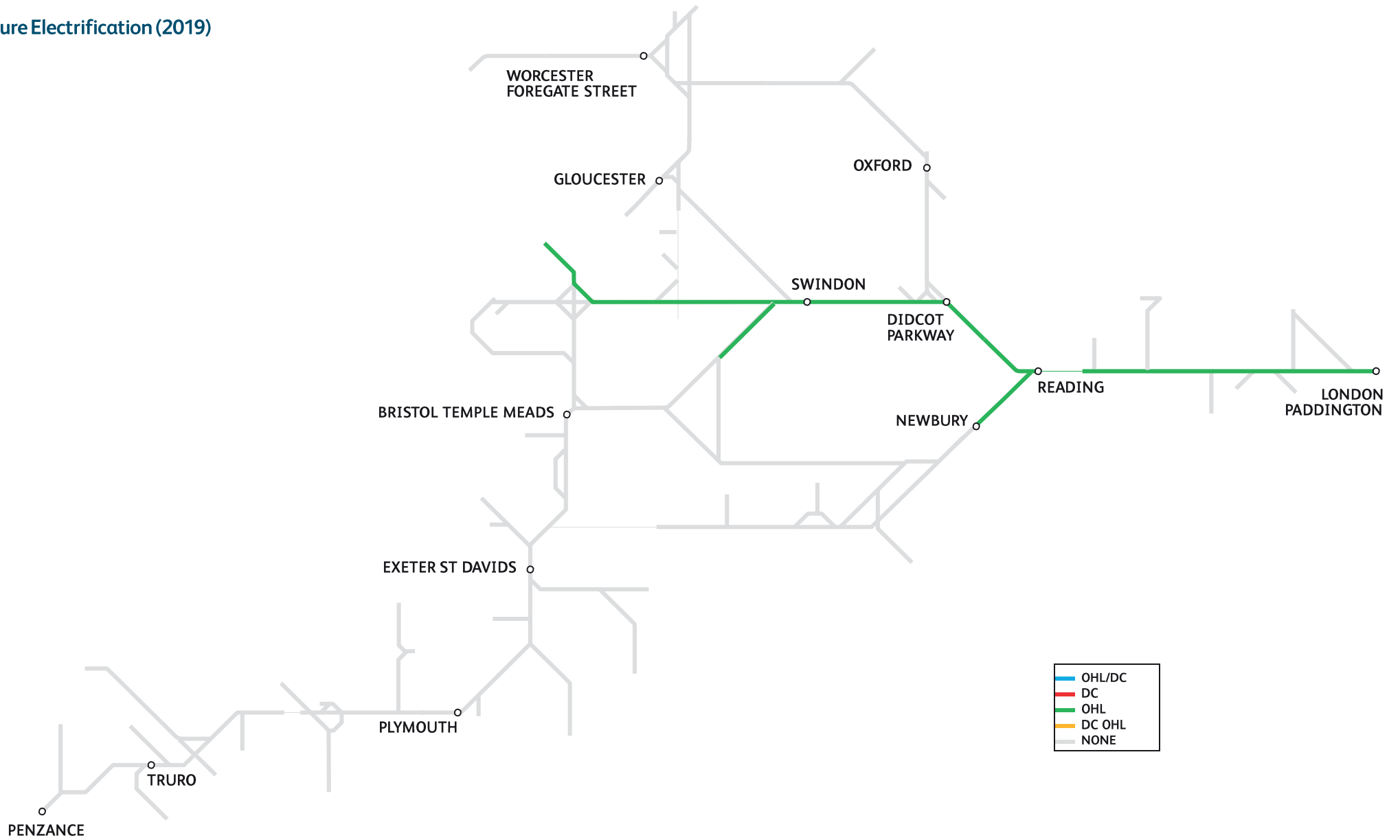
Western Capability maps

Current Electrification



Western Capability maps

Future Electrification (2019)



Network Rail Limited

1 Eversholt Street
London NW1 2DN

Tel: 020 7557 8000

www.networkrail.co.uk