

*Delivering a better railway  
for a better Britain  
Network Specification 2016  
Anglia*



# Network Specification: Anglia

March 2016

Network Rail – Network Specification: Anglia 02

## Incorporates Strategic Routes:

*D - East Anglia*

*E - North London Lines*

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This Network Specification describes the Anglia route in its geographical context and provides a summary of the available rail infrastructure for passenger and freight operators. It identifies the key markets for passenger and freight services by Strategic Route Section (SRS). The SRSs cover specific sections of the route and are published as appendices to this document. They describe in greater detail the current and future requirements of each SRS to inform both internal and external stakeholders of the future strategy on the Route.

Each Network Specification draws upon the supporting evidence and recommendations from the Route Utilisation Strategy (RUS) process, which informed the Control Period 5 (CP5) strategy through to 2019, as well as emerging findings from the newly established Long Term Planning Process (LTPP), which provides strategic direction for a 10-year period within the overall context of the next 30 years.

There are a number of Network RUS and other supporting documents; these comprise:

- Cross London RUS – established in October 2006 detailing a high-level rail industry strategy to 2019 covering the North London Line, Gospel Oak to Barking Line and the West London Line.
- Greater Anglia RUS – established in February 2008 detailing a high-level rail industry strategy to 2021 covering the routes out of London Liverpool Street and London Fenchurch Street, the cross country routes and rural branch lines in East Anglia.
- London and South East RUS (second generation) – published in July 2011 which focuses on the London end of the route and reviews the longer term requirements, particularly of London Liverpool Street to beyond 2030.
- 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 and sets out a strategy for further electrification of the network. This strategy is being refreshed and the revised draft Electrification RUS is due to be published for consultation in 2016.

- Stations – published in September 2011, the RUS considers the pedestrian capacity of stations on the network; this workstream is now being subsumed by the LTPP.
- Passenger Rolling Stock – published in September 2011. The RUS takes a long term view of future passenger rolling stock and infrastructure to establish whether there may be potential to plan the railway more efficiently.
- Passenger Rolling Stock Depots Planning Guidance – published in December 2011. The document presents best practice guidance, particularly focusing on the depot/network interface.
- Alternative Solutions for Delivering Passenger Demand Efficiently – published in July 2013. This RUS developed a strategy which presents a number of alternative solutions to carrying the future demand for rail passengers on some parts of the network more cost effectively.

The Network Specifications also note the demand projections and service level conditional outputs articulated in the Market Studies to meet the strategic goals of the sector identified in the LTPP. These studies were published in Autumn 2013 and cover the following markets:

- Long Distance Passenger
- Regional Urban Passenger
- London and South East Passenger
- Freight.

The market studies inform a series of route studies, disaggregated nationally in most cases by Network Rail's devolved routes. The Anglia Route Study, which was published in March 2016, has developed demand forecasts and conditional outputs for flows wholly within the Anglia Route and seeks to accommodate these, together with the cross-boundary conditional outputs from the market studies, onto the network. This is done firstly by making best use of existing capacity, and secondly through infrastructure interventions where there is an affordable and value for money case for doing so. The Route Study presents options to address demand and growth forecasts and provides choices for funders which will inform the industry's ongoing discussions with funders concerning the future outputs, investment choices and funding requirements



for the railway in the medium and longer term. The findings of the recent review of the CP5 Enhancements Delivery Programme by Sir Peter Hendy, which assessed the deliverability and affordability of committed projects leading to the revision of the development and delivery of certain schemes to more realistic parameters within CP6, have also been considered in the wider context of future funding and investment requirements.

The National Operating Strategy, which is a new way of managing, controlling and operating rail services on the network, has been included as well. The strategy will integrate traffic management and control systems to improve performance and potentially improve the Public Performance Measure (PPM) by two per cent. It will result in cost savings by moving from over 800 signal boxes to 14 rail operating centres over a timescale of around 30 years. Over 80 per cent of the network is planned to be run by the new centres by 2029, with most of this delivered in CP5 & CP6 (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.

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.

### Route context

The scope of the Anglia Route is wide ranging and diverse, comprising five key corridors: the Great Eastern Main Line (GEML), the Cross country corridor via Ely, the West Anglia Main Line (WAML), Essex Thameside and the Orbital Routes, which include the North London Line (NLL) and Gospel Oak to Barking (GOB) line.

The Anglia Route is a significant generator for freight, particularly along the Cross country corridor via Ely and Orbital Routes, with many freight facilities located around the Route including the Port of Felixstowe, which is the largest container port in the UK, and the Thames Gateway Port.

#### Great Eastern Main Line (GEML)

The GEML is a 114 mile electrified route between London Liverpool Street and Norwich. The route is intensively used by a mixture of long distance, outer and inner suburban services on the four-track section between London Liverpool Street and Shenfield. From

Shenfield the two-track electrified line continues to Norwich carrying fast-growing long distance services and linking key feeder routes from the Essex branches onto the GEML:

- the two-track electrified route from Southend Victoria and single track Southminster-Wickford branch, connecting at Shenfield
- the single track electrified Braintree branch connecting at Witham
- the single track non-electrified Sudbury branch connecting at Marks Tey
- the two-track electrified Clacton and Colchester Town and single track electrified Walton-on-the-Naze to Thorpe-le-Soken branches, connecting at Colchester
- and the two-track electrified Harwich Town branch connecting at Manningree.

The Southend Victoria branch includes Southend Airport station, which links to the rapidly developing Southend Airport providing flights to various European destinations. Harwich International station on the Harwich Town branch has ferry links from the adjacent Port of Parkeston Quay to the Netherlands.

The mainly single and two-track non-electrified regional lines of the Anglia Route play a critical role in linking communities to the major conurbations of Ipswich and Norwich as well as the coastal resorts of Lowestoft, Great Yarmouth, Cromer and Sheringham. Onward connections at Ipswich and Norwich give these regional communities and centres links to London, the Midlands and the North of England.

#### Cross country corridor via Ely

The Cross country corridor via Ely crisscrosses the Anglia Route providing significant east to west regional, inter-regional and main line links between East Anglia and the Midlands and North of England. In particular, services run from: Felixstowe and Ipswich to Peterborough via Ely; Ipswich to Cambridge via Newmarket; Norwich to Cambridge via Ely; and Cambridge to Peterborough via Ely.

This corridor of mainly non-electrified single and two-track lines also supports a nationally important freight route, providing an



alternative route for the Strategic Freight Network (SFN) for port freight traffic to the East Coast Main Line (ECML) and West Coast Main Line (WCML), away from the congested GEML to Stratford, where it needs to cross through North London via the NLL.

### West Anglia Main Line (WAML)

The WAML is a 98 mile electrified route between London Liverpool Street and Kings Lynn. Initially there are four tracks between Bethnal Green and Hackney Downs followed by the two tracks along the Lea Valley and onwards to Ely. The route carries busy commuter traffic from Cambridge into London Liverpool Street and serves the busy London Stansted Airport, which diverges from the WAML after Stansted Mountfitchet, with four limited stop services per hour to London Liverpool Street. From Stansted Airport, Cambridge and Ely there are connections to Ipswich, Norwich, Peterborough, the Midlands and the North of England.

The London end of the route is fed by the West Anglia two-track electrified suburban branches from: Enfield Town and Cheshunt at Hackney Downs; Chingford at Clapton; and Herford East at Broxbourne. At Cambridge station a parallel two-track electrified route connects to the ECML and London King's Cross via Royston and Hitchin. From Hertford and Enfield there are separate parallel routes that feed into the ECML and London King's Cross.

### Orbital Routes - North London Line (NLL) and Gospel Oak to Barking (GOB)

The NLL is a vital part of London's transport infrastructure and a major link between key arterial routes to and from the capital. The core of the NLL is the two-track electrified route between Stratford and Richmond that carries London Overground's intensive stopping passenger service. Between Gunnersbury and Richmond the London Overground services share the tracks with London Underground's District Line services.

The GOB line connects to the core NLL at Gospel Oak; this two-track currently non-electrified line connects communities in the east of London to North London.

The Orbital Routes are also nationally important for freight services around London from both Felixstowe and the Thameside ports, as well as other commodities such as aggregates. The GOB route also acts as a diversionary route for freight from the Thameside route to

the WCML, West and South West England without impacting on the critical congested GEML between Forest Gate Junction and Stratford.

### Essex Thameside

The two-track electrified Essex Thameside route runs from London Fenchurch Street to Shoeburyness, with a two-track electrified loop line between Barking and Pitsea via Tilbury and a single electrified line between Upminster and Grays. These lines carry a mixture of commuter and leisure traffic along with substantial freight movements.

The route also links to the single track non-electrified branch line to Thames Haven where the London Gateway Port is located.

### Key passenger markets and traffic flows

The Anglia Route covers a large area with densely populated areas at its southern end, regional hubs at its centre and sparsely populated rural communities in the north. The main markets are commuter travel to London, in particular to the city and the Docklands, and leisure travel, especially to Stansted Airport and the coastal resorts of Sheringham, Cromer, Great Yarmouth, Lowestoft, Felixstowe, Walton-on-the-Naze, Clacton-on-Sea and Southend-on-Sea. The main lines extend all the way down into the Docklands and the eastern approaches to the city. The railway tends to be the first choice for commuters especially on the suburban network, which experiences strong patronage in the peak.

The regional hubs of Cambridge, Ipswich and Norwich serve large and growing business markets as well as feeding commuters into London. There is also a market for shoppers including the Lakeside Shopping Centre at Chafford Hundred station and the Westfield Stratford City shopping centre at Stratford. The route also caters for the growing international markets with stations at Stansted and Southend airports and at Harwich International to connect into ferries from Harwich International Port.

### Passenger services

The passenger services which cover the Anglia Route are operated by Abellio Greater Anglia (GA), Govia Thameslink Railway (GTR), East Midlands Trains, CrossCountry, c2c, TFL Rail and London Overground Rail Operations Limited (LOROL).

The passenger services can generally be broken down into five distinct groups:

- Main Line services – operated by GA, these are the long distance loco hauled London to Norwich services, which provide both business and leisure opportunities throughout the route as well as a growing commuter market into London and between the regional hubs.
- Outer Suburban services – operated by GA, GTR and c2c, these cover the WAML and GEML, as well as a number of branch lines that feed into them and the Thameside routes. Using electric multiple units (EMUs) they provide part of the intensive growing commuter network into London as well as serving the off peak leisure and business markets. These routes include Braintree, Cambridge, Stansted Airport, Colchester, Ipswich and Harwich as well as the coastal resorts of Southend, Clacton and Walton-on-the-Naze.
- Inner Suburban services – operated by GA, TfL Rail, LOROL and c2c using EMUs, these provide intensive peak operations throughout inner London, Essex and Hertfordshire in the mornings and evenings as well as connecting businesses and shoppers.
- Interurban (cross-country) services – operated by GA, East Midlands Trains and CrossCounty using diesel multiple units (DMUs), provide services for the business community and leisure market from Stansted Airport, Cambridge, Ipswich and Norwich to the Midlands and North of England.
- Regional services – operated by GA using DMUs on most of the Suffolk and Norfolk branch lines connecting local communities to the regional conurbations and linking into long distance and commuter services into London.

It is worth noting that within CP5, the Anglia Route will experience two franchise and one concession renewals, all of which will deliver new rolling stock as well as additional capacity on the route. The Essex Thameside franchise was awarded to National Express (c2c) in June 2014, who will run these services for 15 years to 2029. The East Anglia Franchise renewal is currently underway, with the successful bidder due to be announced in June 2016; the new franchise will commence in October 2016. The London Overground

concession is also due to be renewed in November 2016; the new contract award will be awarded in July 2016.

### London Interchanges

Although the majority of the current demand is for travel into London Liverpool Street, on the West Anglia, GOB and Essex Thameside routes a significant number of passengers interchange with the London Underground (LU) at Seven Sisters, Blackhorse Road, Tottenham Hale and Walthamstow Central. At Seven Sisters and Blackhorse Road especially, there is limited station capacity, which causes overcrowding and suppresses demand.

On the Great Eastern route passengers interchange at Stratford with onward journeys via the LU, Docklands Light Railway (DLR) and LOROL services. On the Thameside route passengers interchange at Barking, West Ham and Limehouse.

The main LU interchanges on the NLL are Stratford, Willesden Junction, Highbury & Islington and West Hampstead.

Commuter services on the suburban lines into London Liverpool Street from Shenfield are due to be transformed by the opening of Crossrail in 2018. Crossrail will introduce nine-car services over two tracks of the four-track section between Shenfield and Stratford before the core service descends into the north eastern portal of the central tunnel section near Pudding Mill Lane. There will also be a residual peak hours service into London Liverpool Street from Gidea Park. As well as providing much needed additional capacity on the GEML route, Crossrail will also be an attractor of increased demand to London.

### Outer suburban, long distance and regional services

Away from London, the hourly passenger service between Norwich and Cambridge has seen demand between these major regional transport hubs increase. In addition, there is healthy growth on the interurban services from the region to the West Midlands and the North West.

The M11 corridor has been targeted by the Government as an area key to the unlocking and accommodation of future housing growth in the South East. Cambridge is a location of national importance in knowledge-based industries and a key tourist destination, making it an attractor of a considerable volume of rail trips as well as having



high numbers of resident London commuters. Elsewhere, growth at the regional centres of Chelmsford, Colchester, Ipswich and Norwich are fuelling peak commuter demand for travel to London.

There is potential for new development around Southend Airport proposed developments in the Lea Valley and at Chesterton and Cambridge will bring increased demand for rail travel not only to London, but also between the regional centres of Cambridge, Norwich and Ipswich. There are also proposed housing and business developments in the Thames Gateway.

### Key freight markets and traffic flows

The Anglia route provides two important arteries for long distance freight flows from the east and south coast ports of Felixstowe, Harwich and Thames Gateway: across London via the congested GEML and across the cross country route to Peterborough via Bury St Edmunds, Ely and March. These arteries also see varying volumes of freight to local terminals and yards, including:

- Aggregates & cement (Bow, Broxbourne, Lea Interchange, Kennett, Marks Tey, Harlow Mill, Chesterton Junction, Chelmsford, Purfleet, West Thurrock, Brandon, Barnham, Eccles Road, Ely and Ipswich Griffin Wharf)
- sand (Middleton Towers); general merchandise (Ely, Ripple Lane);
- gas distillate (North Walsham)
- deep sea container traffic (Felixstowe and Ipswich Griffin Wharf)
- domestic, short sea and deep sea intermodal traffic (Tilbury, Barking and Purfleet)
- and scrap metal (Snailwell); and seed potato traffic (Eccles Road).

There is a major Network Rail national logistics unit depot based at Whitemoor, between Ely and Peterborough, which feeds track components, ballast and other materials around the network. Also recently opened at Whitemoor is a new national track materials recycling centre.

There are also some LU infrastructure services to Barking and Gunnersbury.

### Freight services

Freight services on the Anglia route are primarily diesel hauled with

some electrically hauled services on the southern end of the GEML. DB Schenker, Freightliner Ltd, Freightliner Heavy Haul Ltd, Direct Rail Services (DRS) and GBRF operate the main freight services.

The deep sea container market continues to dominate the freight scene on the Anglia Route. There has been significant development at the Port of Felixstowe and plans are proposed for a new port at Bathside Bay on the Harwich Branch. Port traffic demand is forecast to grow significantly in the next 10 and 30 years, potentially with a further surger resulting from further development of the deep sea London Gateway Port at Thames Haven on the Thameside route.

Apart from being the key intermodal market for deep sea containers, aggregates are the most significant bulk commodity and in terms of volume growth has been the most successful bulk rail business over the last 5–10 years. Demand is set to see steady growth across the WAML, GEML, Tilbury Loop and around North London due to major construction initiatives, including the provision of additional housing in the London Gateway and the East of England, the growth of the City and Docklands. The High Speed 1 interchange sidings at Ripple Lane for freight services to and from the Channel Tunnel are now operational and the first European gauge freight vehicles have recently transferred from the exchange sidings into the adjacent distribution sidings on the national network; indeed, further enhancements may be advisable.

The rail industry's accepted freight forecasts were published in the Freight Market Study in 2013 and established by the Office of Rail and Road (ORR). Using the year 2011–12 as a baseline, the study forecasts growth to 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 forms a smaller part of the UK's power generation mix
- modest growth in other commodities, in particular aggregates for the construction industry.

The Freight Market Study forecast freight growth is unconstrained by rail capacity and the extent of future new terminal



developments. The unconstrained forecasts form the conditional outputs which assessed in the Route Studies to present choices for funders for CP6 and beyond.

### Proposed infrastructure investment in Control Period 5 (2014 – 2019)

There are a number of identified schemes which Network Rail is developing for delivery in CP5 and CP6 to enhance services in the Anglia Route.

The West Anglia Capacity scheme (Stratford to Angel Road) will enable an increase in the number of trains and station stops along the West Anglia route between Stratford and Angel Road, due for completion in December 2018.

The remodelling of Bow Junction, to allow trains from the Great Eastern Main Line to make use of the Electric Lines beyond the Crossrail tunnel portal at Stratford, is currently under development, for delivery in CP6 subject to funding.

Development work has commenced on an option to examine lengthening services between Kings Lynn and Cambridge from 4-car to 8-car during the peak hours in order to address the existing capacity shortfall. Network Rail is examining options for early implementation, potentially within CP5.

On the Orbital Routes, the electrification of the Gospel Oak to Barking line is currently underway, due for completion in late 2017, which will allow an electrified diversionary route across London for Thameside freight, as well as providing capacity relief between Forest Gate Junction and Stratford on the Great Eastern route. The electrification will enable the two-car DMUs that operate the current passenger services to be replaced by four-car EMUs, allowing a homogenised fleet for all North London, East London and Gospel Oak to Barking line services as well as providing significant additional passenger carrying capacity. Platform extensions to accommodate the longer trains are linked with the electrification scheme, to be delivered by TfL.

There are two new stations currently in delivery: Cambridge North, situated between Cambridge and Waterbeach stations on the WAML and due to be opened in May 2017; and Lea Bridge, situated north of Stratford and planned for opening in May 2016.

Traction power modelling is taking place to model train service changes for CP5 and the future. This will highlight works at a number of feeder stations across the Anglia route which will need to be agreed with the electricity supplier. The Crossrail Programme is planning to install an Auto-Transformer system that will feed all four lines between Liverpool Street and Shenfield and will include provision for future additional and lengthened services highlighted in the London & South East RUS beyond CP5.

Potential works being assessed for further development include partial doubling of the Felixstowe branch line, doubling the track between Ely and Soham, Ely area improvements including level crossings and the doubling of Haughley Junction.

### Strategy beyond Control Period 5

The work undertaken in the Anglia Route Study identifies key challenges that the rail industry will face in the long term, and through analysis and optioneering, the most appropriate methods to resolve these issues have been determined. A key element of this work is to understand the issues that cross the Route Study and RUS boundaries.

Further information on the options detailed below are included in the Anglia Route Study. The options seek to address both passenger and freight requirements; it is worth noting that they are currently neither committed nor funded.

#### Great Eastern Main Line (GEML)

Long-term solutions to meet forecast demand in CP6 and beyond will require significant investment in infrastructure across the route, such as additional platforms at London Liverpool Street, a passing loop north Witham, doubling of Trowse Swing Bridge, improvements at Haughley Junction and signalling headway reductions between Chelmsford and London Liverpool Street.

#### Cross country corridor via Ely

Significant infrastructure change would be required to fully accommodate the forecast freight growth and improved passenger service in CP6 and beyond (primarily linked to cross-boundary services and improved connectivity), such as further doubling of the Felixstowe Branch, improved signalling headways on the Bury St Edmunds Line, Ely area improvements including level crossings and



headway reductions and doubling of single line sections between Ely and Soham.

#### West Anglia Main Line (WAML)

Significant housing growth above that forecast as part of the Market Studies could take place along the West Anglia corridor. In part this could be contingent on greater investment in the network to provide better train services, particularly in connection to Crossrail 2. Options have been developed as an investment choice to allow an increase in services from the West Anglia route to Stratford, which would require four-tracking<sup>1</sup>, alongside an additional platform at Stratford and a third track between Stratford and Ruckholt Road, or platform extensions along the WAML, although these would not be conducive to the unlocking of growth advocated during consultation on the draft Anglia Route Study. Four-tracking requirements would be in line with the Crossrail 2 proposals, and it is therefore recommended that any further development activity is linked to Crossrail 2 development so that there is no, or limited, abortive infrastructure work or cost.

#### Orbital Routes - NLL and GOB

One of the key challenges for both the NLL and GOB line is continuing to support growth for both passenger and freight services whilst maintaining performance. Any increase in services will require headway improvements, regulation points and additional platforms at Gospel Oak or Barking in the longer term.

The extension of the Gospel Oak to Barking line to Barking Riverside is also currently in development; new services are expected to run in 2020.

#### Essex Thameside

A programme of platform lengthening work was completed in CP4 to enable the operation of 12-car services on this route. Anticipated passenger growth in CP6 and beyond can therefore be met through further train lengthening of services to 12 carriages, although improved signalling headways will be required to achieve any increase in service frequency on this route.

<sup>1</sup> Assumed to be the same extent of four-tracking as required for the Crossrail 2 proposals

For freight, there is adequate capacity to meet the predicted growth in pathing demand. However, there are opportunities to improve the robustness of these freight paths through the further development of Ripple Lane West Yard (Nodal Yard) whilst infrastructure is being delivered at Barking Riverside.

#### Electrification strategy

There is currently an electrification programme being delivered in Great Britain which includes the Great Western and Midland Main Lines together with a number of local 'infill' schemes. Expansion of the electrified network will bring many benefits, including faster journey times for passenger and freight trains. Where journey time savings are sufficiently significant (and sufficient capacity is available) there is the potential to run additional services on electrified routes. The simpler design of electric trains means greater reliability, lower maintenance costs and a requirement for fewer spare vehicles. Operators also benefit from lower lease costs for electric trains, and lower variable track access charges given the reduced weight of electric vehicles and consequent reduction in track wear and tear. Average carbon dioxide emissions per vehicle mile are less for electric trains compared to those that use diesel, which can improve station air quality for both passengers and staff.

On behalf of the rail industry, Network Rail will be publishing a 'refreshed' Network RUS for Electrification Draft for Consultation to outline the priorities for future electrification in spring 2016. The strategy will prioritise routes for further development based primarily on the density of diesel-operated traffic which could be converted to electric operation through the provision of electrification. The RUS also considers options which do not perform as well in terms of the conversion ratio, but may be worthy of further investigation in light of other factors, for example whether an option would allow more efficient usage of the existing electrified network by reducing diesel traffic on the existing electrified network or by providing a diversionary route; or where there are synergies with rolling stock replacement, or other enhancement schemes.

The Electrification Strategy identifies a 'Midlands to Anglia' package of options for potential further development comprising:

- Norwich to Ely



- Felixstowe to Whitacre Junction via Nuneaton including Chippenham Junction to Cambridge

In addition, electrification of the Dudding Hill Line in North London has been identified as being significant by freight operators for their businesses.

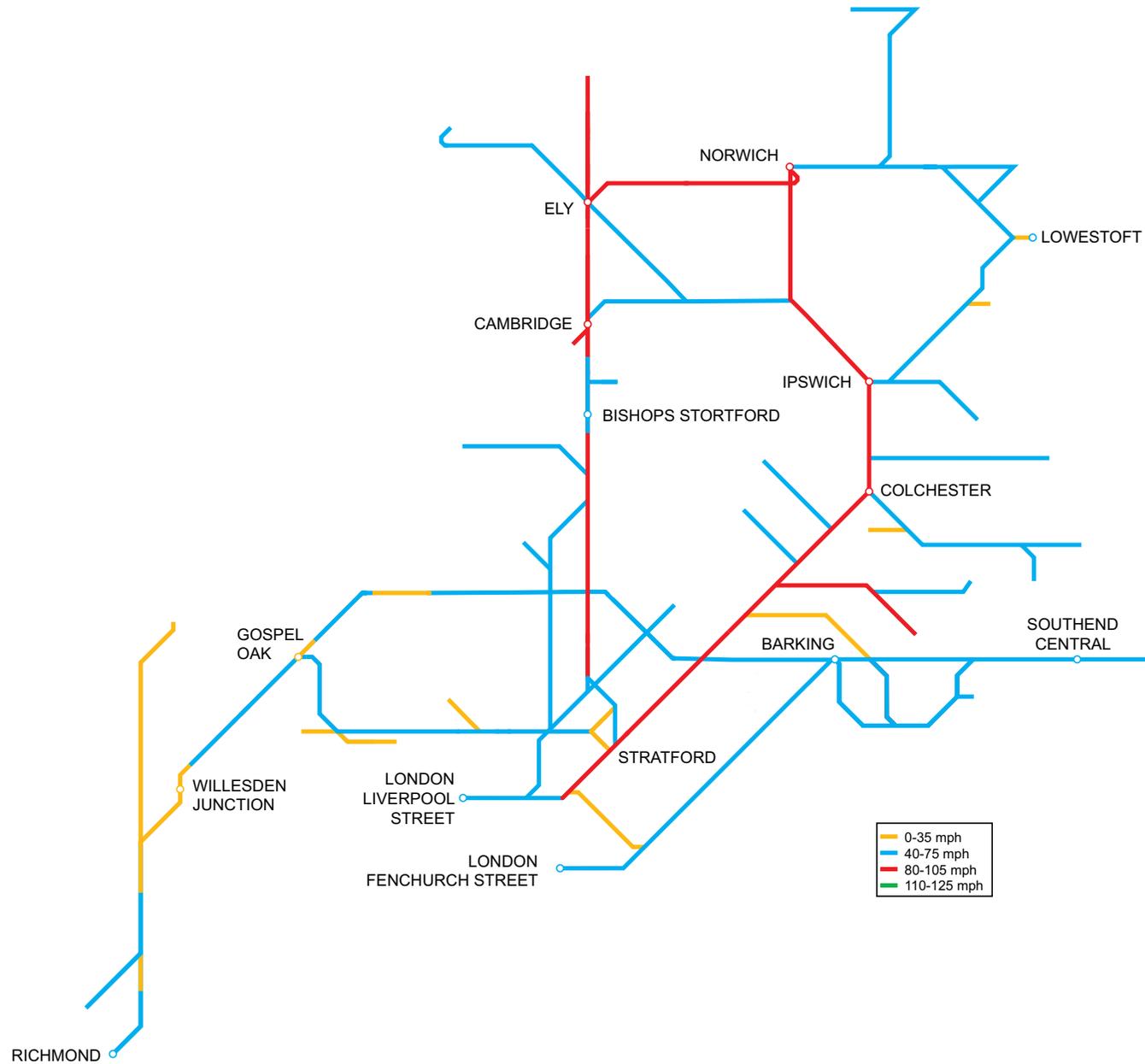
Freight operators may not be able to effectively utilise any additional electrification without the ability to access terminals they serve. This might involve electrifying all or part of a terminal, modifying the terminal layout to enable the use of electric traction, or facilities for bi-mode locomotives to change to/from diesel and electric power. Given that many terminals are privately owned, joint development with terminal owners and freight operators of options for electrifying terminal connections would be beneficial to enable greater usage of electric traction. This also includes any terminals, sidings and maintenance facilities that are required by freight operators to transfer an existing service from diesel to electric traction.

The selection of routes for further development includes all options currently expected to have the strongest business cases from a national perspective. Other schemes are being developed in conjunction with regional bodies, and as demand and service patterns continue to evolve in the longer term electrification may present an appropriate solution for other routes. For routes for which it is unlikely that a case can be made for conventional electrification, there could be an opportunity for alternative solutions to be considered in place of diesel traction, for example battery train operation.

# Anglia

## Capability maps

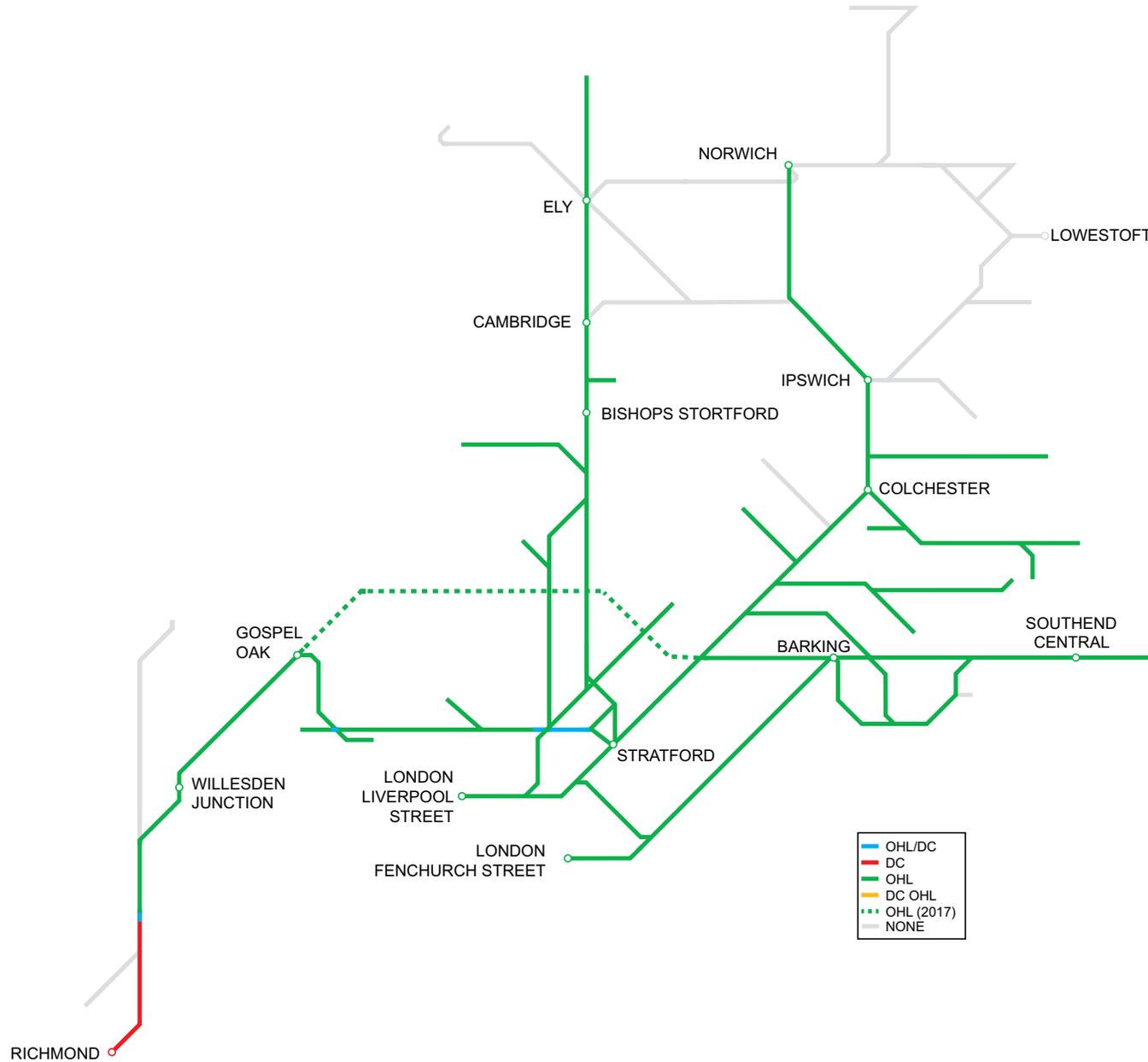
### Linespeed



# Anglia

## Capability maps

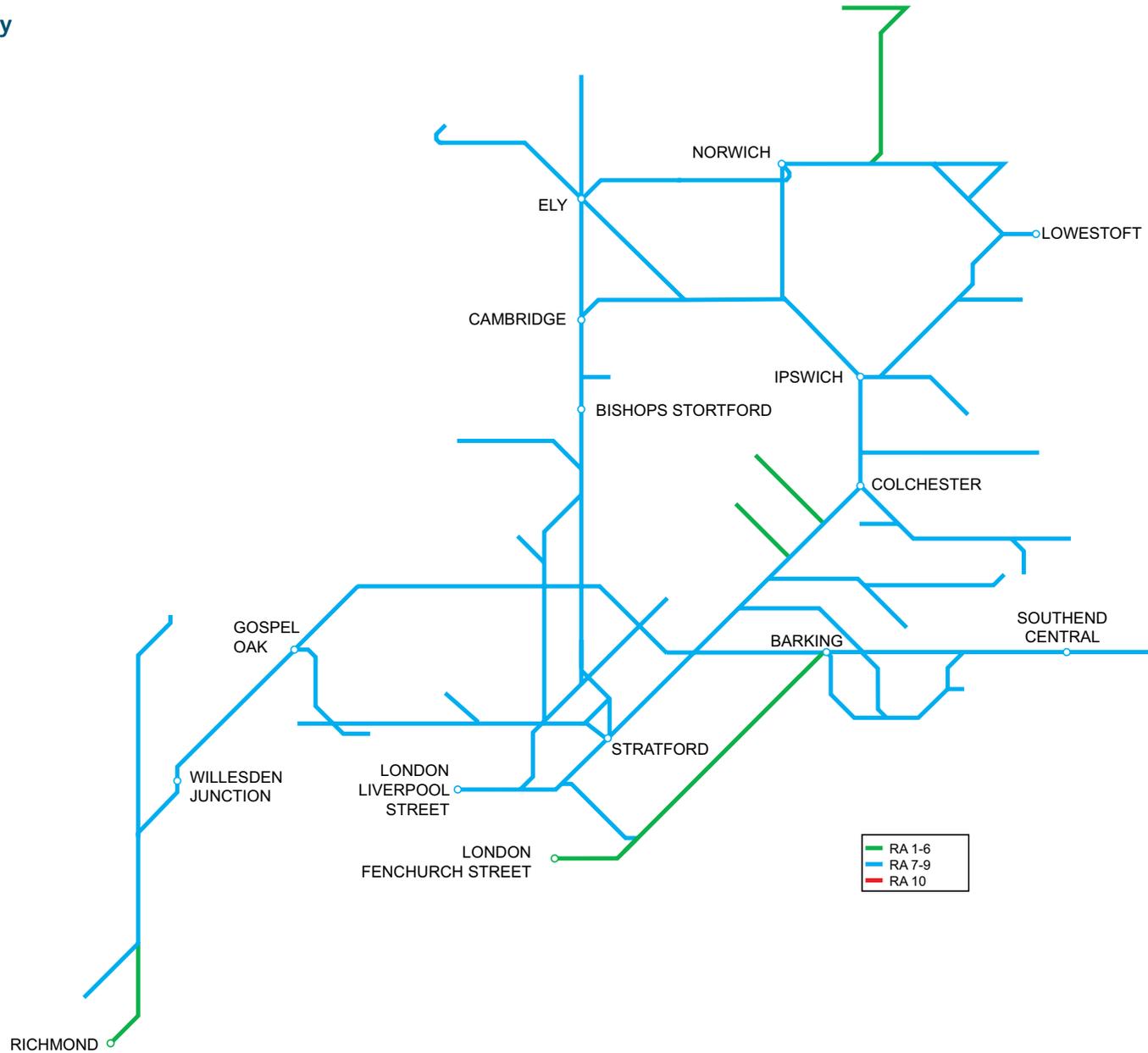
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# Anglia

## Capability maps

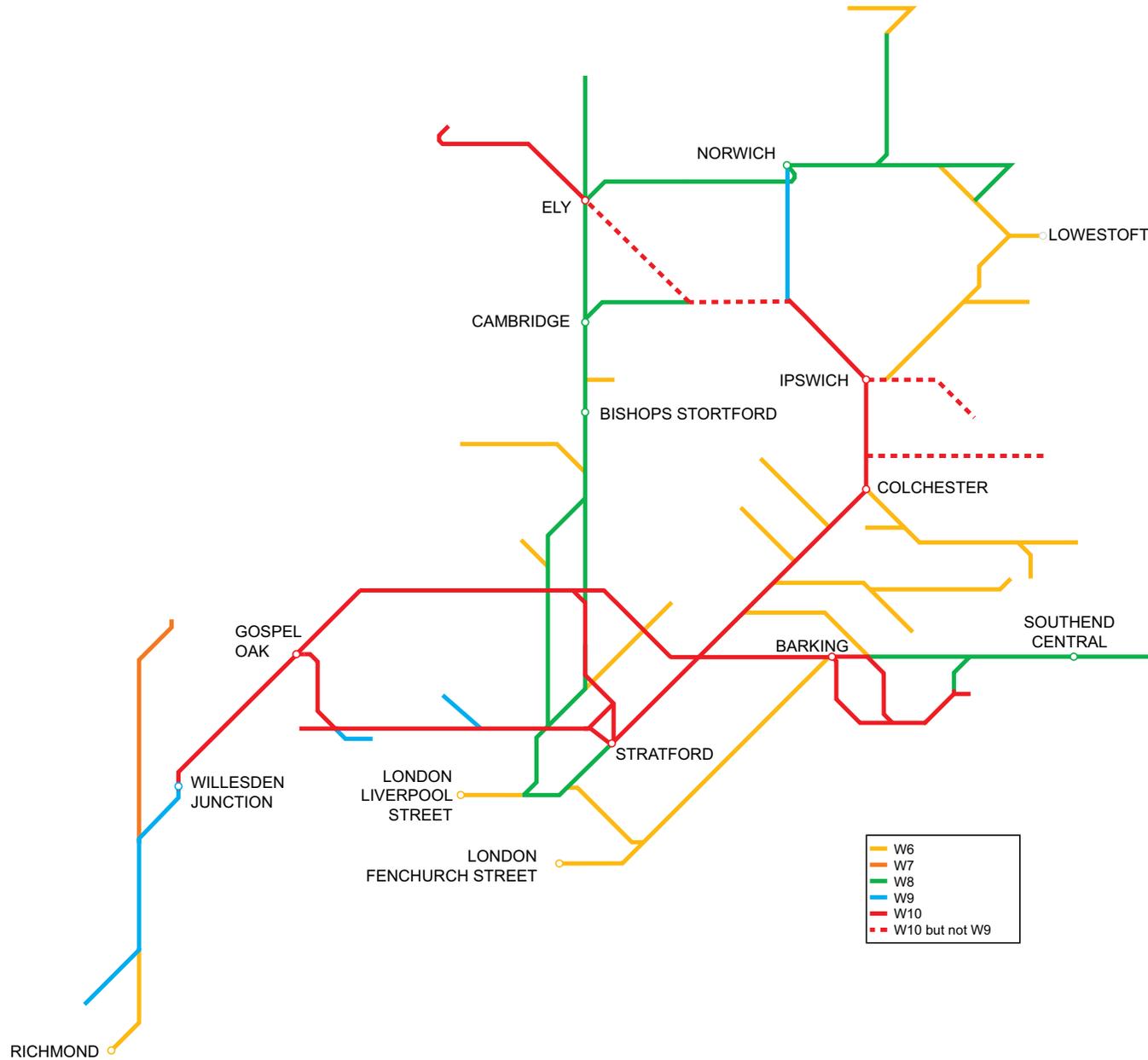
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# Anglia

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**Network Rail Limited**

1 Eversholt Street  
London NW1 2DN

Tel: 020 7557 8000

[www.networkrail.co.uk](http://www.networkrail.co.uk)